



Schumpeter

Death and transfiguration

The golden age of the Western corporation may be coming to an end

EDWARD GIBBON, the great English historian, begins his “Decline and Fall” with a glowing portrait of the Roman Empire in the age of Augustus. The Empire “comprehended the fairest part of the earth”. Rome’s enemies were kept at bay by “ancient renown and disciplined valour”. Citizens “enjoyed and abused the advantages of wealth and luxury”. Alas, this happy state of affairs was not to last: the Empire already contained the seeds of its own destruction. Gibbon soon changed gear from celebrating triumphs to chronicling disasters.

Perhaps the history of the Western corporation will one day be written in much the same vein. Today’s corporate empires comprehend every corner of the earth. They battle their rivals with legions of highly trained managers. They keep local politicians in line with a promise of an investment here or a job as a consultant there. The biggest companies enjoy resources that have seldom been equalled; Apple, for instance, is sitting on a cash pile of more than \$200 billion. And they provide their senior managers and leading investors with “wealth and luxury” that would have impressed even the most jaundiced Roman.

A new report by the McKinsey Global Institute provides some invaluable statistics for any future Gibbon, which MGI calculated by crunching data from nearly 30,000 firms across the world. Corporate profits more than tripled in 1980-2013, rising from 7.6% of global GDP to 10%, of which Western companies captured more than two-thirds. The after-tax profits of American firms are at their highest level as a share of national income since 1929.

Yet the men and women from McKinsey change gear as quickly as Gibbon. The golden age of the Western corporation, they argue, was the product of two benign developments: the globalisation of markets and, as a result, the reduction of costs. The global labour force has expanded by some 1.2 billion since 1980, with the new workers largely coming from emerging economies. Corporate-tax rates across the OECD, a club of mostly rich countries, have fallen by as much as half in that period. And the price of most commodities is down in real terms.

Now a more difficult era is beginning. More than twice as many multinationals are operating today as in 1990, making for more competition. Margins are being squeezed and the volatility of profits is growing. The average variance in returns to capital for North American firms is more than 60% higher today than it was in 1965-1980. MGI predicts that corporate profits may fall from 10% of global GDP to about 8% in a decade's time.

Two things in particular are shaking up the comfortable world of the old imperial multinationals. The first is the rise of emerging-market competitors. The share of *Fortune* 500 companies based in emerging markets has increased from 5% in 1980-2000 to 26% today. These firms are expanding globally in much the same way as their predecessors from Japan and South Korea did before them. In the past decade the 50 largest emerging-world firms have doubled the proportion of their revenues coming from abroad, to 40%. Although the outlook for many emerging markets is more mixed than it was just a couple of years ago, troubles at home may push rising multinationals to globalise more rapidly.

The second factor is the rise of high-tech companies in both the West and the East. These firms have acquired large numbers of customers in the blink of an eye. Facebook boasts as many users each month as China has people: 1.4 billion. Tech giants can use their networks of big data centres

rapidly to colonise incumbents' territories; China's e-commerce giants Alibaba, Tencent and JD.com are doing this in financial services. Such firms can also provide smaller companies with a low-cost launching pad that allows them to compete in the global market.

MGI does not dwell on it, but the political environment is also becoming more hostile. Populists on both the left and the right rage against corporate greed. In America, presidential hopefuls Bernie Sanders and Donald Trump both criticise companies for exploiting tax loopholes. Even middle-of-the-road politicians are sounding a more anti-corporate note. Angela Merkel introduced Germany's first minimum wage in 2014; and in Britain David Cameron is phasing in a "living wage". Companies may find themselves under pressure to "give back" to wider society.

How can Western companies navigate these threats to their rule? MGI advises them to focus on the one realm where they continue to have a comparative advantage—the realm of ideas. Many companies in labour- and capital-intensive industries have been slaughtered by foreign competitors, whereas idea-intensive firms—not just companies in obvious markets such as the media, finance and pharmaceuticals, but in areas such as logistics and luxury cars—continue to flourish. The "idea sector", as MGI defines it, accounts for 31% of profits generated by Western companies, compared with 17% in 1999.

| *Capitalist redemption*

The relative decline of the Western corporation could also lead to a rethinking of some of the long-standing assumptions about what makes for a successful business. Public companies may lose ground to other types of firm: in America the number of firms listed on stock exchanges has fallen from 8,025 in 1996 to about half that number now. The cult of quarterly earnings may lose more of its following. A striking number of the new corporate champions have dominant owners in the form of powerful

founders. They are willing to eschew short-term results in order to build a durable business, such as Mark Zuckerberg at Facebook, the Mahindras and other assiduous families in India, and private-equity firms. Gibbon's great work was a tale of decline and fall, as classical civilisation gave way to barbarism and self-indulgence. With luck, the tale of the relative decline of the Western corporation will also be a tale of the reinvention of capitalism as new forms of companies arise to seize opportunities from the old. ■



熊彼特

死而蜕变

西方企业的黄金时代可能正走向终结

英国伟大的历史学家爱德华·吉本在其《罗马帝国衰亡史》的开章描写了罗马帝国在奥古斯都时代的辉煌图景。罗马帝国“囊括世上最美之疆域”，在其“古老声威与严整军容”的震慑下，敌军不敢来犯。市民“尽享富庶生活，甚而奢华挥霍”。哀哉，这个声色犬马的欢乐国度好景不长：帝国倾覆之祸根早已深种。吉本随即笔锋一转，从高歌胜利转向细数灾祸。

或许有一天西方企业发展史也将被用同样的笔墨写就。今日的企业帝国已延伸至地球的每一个角落，它们调派训练有素的经理人军团与对手交战。为拉拢地方政客，他们或作投资承诺，或以顾问之职相赠。最大的那些企业拥有旁人难以企及的庞大资源，比如苹果公司坐拥超过两千亿美元的现金。这类企业给予管理高层及主要投资者的“财富与奢华”甚至会令当年最偏狭的罗马人也为之叹服。

麦肯锡全球研究院（MGI）发表的最新报告为将来企业史的执笔者提供了宝贵的统计数据，这是MGI用从全球近三万家企业采集的数据计算所得。1980年至2013年间，企业利润增加了两倍还多，占全球GDP比例从7.6%上升至10%，其中西方企业占三分之二以上。美国公司的税后利润占国民收入份额处于自1929年来的最高水平。

然而，麦肯锡的研究员们笔锋转换快如吉本。他们认为，西方企业的黄金时代是两大良性发展趋势的产物：市场全球化以及因此而来的成本下降。自1980年以来，全球新增劳动力约12亿人，主要来自新兴经济体。在此期间，经合组织（主要由富裕国家组成）成员国的企业税率下降了一半之多。大部分大宗商品的实际价格也下跌了。

如今一个更艰难的时代正在开启。今天跨国公司的数目是1990年时的两倍多，竞争更为激烈。利润率受到挤压，利润波动性越来越大。北美企业如

今的资本收益率平均方差比1965至1980年期间高出60%。MGI预测，十年后，企业利润占全球GDP份额可能从现在的10%下跌至8%。

有两件事情尤其给跨国公司安逸的旧帝国带来震荡。首先是新兴市场竞争者的崛起。财富500强企业总部在新兴市场的公司所占份额从1980至2000年间的5%上升到今天的26%。这些公司在全球的扩张之路与其日本及韩国的前辈企业大致相同。过去十年，最大50家新兴市场企业的海外收入占其总收入的份额已翻倍至40%。尽管许多新兴市场的前景比起几年前更为喜忧参半，国内市场的问题可能会驱使更多跨国企业进一步加快业务全球化的进程。

其次是高科技公司在东西方世界都在崛起。这些公司眨眼之间便揽获大量顾客。Facebook号称月活跃用户达14亿，相当于中国人口总数。科技巨头们可以利用其大数据中心网络快速抢占现有企业的市场，中国的电子商务巨头阿里巴巴、腾讯及京东正在金融服务业如法炮制。这些公司也可为小企业提供低成本的启动平台，帮助它们在全球市场上一较高下。

而麦肯锡并无赘述的是，政治环境如今也变得更为恶劣。左右翼的民粹主义者都在怒斥企业贪婪无度。在美国，总统候选人伯尼·桑德斯（Bernie Sanders）和唐纳德·特朗普（Donald Trump）均指责企业利用漏洞，偷税漏税。连走中间道路的政客也日渐唱起反企业的论调。2014年，默克尔在德国推行首个最低工资法案；在英国，卡梅伦也在逐步实施“最低生活工资”政策。企业可能承受压力去“回馈”更广泛的社会。

威胁重重，西方企业该如何应对？MGI建议他们专注于自己仍占相对优势的一个领域——专业知识领域。许多企业在劳动密集型与资本密集型产业被外国对手杀得片甲不留，但专业知识密集型企业则继续蓬勃发展，不单在媒体、金融、制药这类显而易见的行业，也包括了物流和豪华轿车等领域。按MGI的说法，“专业知识部门”占当今西方企业利润的31%，而在1999年仅为17%。

| 资本主义救赎

西方企业的相对颓势也令人反思一些长久以来所谓的企业成功定律。上市企业也可能不敌其他类型的公司：在美国，如今证券交易所上市企业数量已从1996年的8025家减少了一半左右。迷信季度财报可能导致追随者进一步流失。新龙头企业中相当多是由强势创始人掌控。为打造持久的业务，他们愿意忽视短期结果，比如Facebook的马克·扎克伯格、马恒达（the Mahindras）及其他勤勉的印度家族，以及私募股权公司。吉本的伟大著作讲述了一段故事，当古典文明屈服于野蛮与放纵，帝国的衰亡随之而至。幸运的话，西方企业相对式微的故事也将是新型企业从旧式企业手中抢夺机遇，令资本主义蜕变重生的故事。■



Free exchange

Guaranteed profits

Price-match guarantees prevent rather than provoke price wars

“YOUR shopping would have been cheaper elsewhere, so here’s a voucher for the difference.” Anyone who has recently visited a British supermarket will be familiar with such seemingly generous deals, typically extended to shoppers after they pay. The four biggest British supermarket chains all offer some form of price-match guarantee, promising that their customers could not save any money by shopping elsewhere. On the face of it, they seem like a good thing: a sign that fierce competition is lowering prices. But economists have long been suspicious of such promises, which can leave consumers worse off.

The problem is that price-match guarantees can blunt the logic of competition. Suppose a car dealership worries about a rival undercutting its prices and stealing customers. Even if the dealership can respond by cutting its prices too, it might lose sales in the interim. A price-match guarantee offers a pre-emptive defence. By promising to match any discounts, the dealership can persuade its customers that they need not shop around: they will always pay the lowest price available.

As a result, cutting prices no longer wins the competitor new business; buyers stay loyal and invoke the guarantee instead of switching. All that price cuts achieve for the competitor is the erosion of profits on existing sales. It will probably conclude that prices—and margins—are better left high. The result is “tacit collusion”: the maintenance of high prices, without any explicit communication between firms. Consumers end up suffering due to a guarantee that at first glance seems good for them.

There is no evidence that Britain’s current crop of price-match guarantees

has hurt consumers. However, researchers have linked similar promises elsewhere to sustained high prices for groceries, tyres and even shares.*
Wonks have confirmed the finding in the laboratory, too. In an experiment conducted in 2003, Shakun Datta of the University of Richmond and Jennifer Offenberg of Loyola Marymount University paired subjects at random and asked them to play two versions of a computerised price-setting game—one in which players could offer price-match guarantees and another in which they could not. Participants got to keep any profits they made, and were repeatedly reshuffled to prevent any other price-fixing tactics from arising during multiple interactions with the same partner. When the guarantee was possible, it was deployed 94% of the time and as a result, prices rose by an average of 36%. Even when one player had much lower costs than the other, prices still rose, albeit by less.

Price-matching need not always be a con: guarantees can be constructed in ways that work against tacit collusion. Most relate only to another store's advertised prices, not to the sum that it would actually charge after applying its own price-matching offers. This creates a loophole which a clever upstart could exploit. Suppose an incumbent supermarket charges £4 for a steak and offers a price-match guarantee. The savvy entrant could advertise a higher price of £5, while promising not just to match any lower price, but to refund twice the difference. Net of the resulting £2 rebate, the upstart's steak would cost just £3. Yet the advertised price of £5 would not trigger the incumbent's own price-matching guarantee. Customers might still be tempted to switch by price cuts structured in this way.

That may be too clever by half, but there are other reasons why guarantees might be harmless, or even welcome. One relates to their complexity. At British supermarkets, refunds usually come in the form of a discount on the next shop; to take advantage, a customer must return with the voucher. Remembering to do so takes effort, as anyone with a stack of unused gift vouchers knows. This gives a price-cutting rival an opening. Although any

discounts it offers will be matched by the first supermarket in the form of vouchers, customers may value the straightforward price cut more highly, since taking advantage of it is less of a hassle. If enough customers think this way, the result would be a genuine price war—although some might find switching stores more of a chore than remembering to bring their vouchers with them.

| *Match points*

Another mooted justification for the guarantees is price discrimination: selling to different types of consumers at different prices. For instance, if some customers are too busy to shop around, a firm can sell to them at a high price while using a guarantee to attract more price-sensitive, hassle-tolerating customers. This is great for profits, but sometimes benefits consumers too.

Finally, a price-guarantee may be an attempt to signal genuinely lower prices and thus stand out from the crowd. That is probably how most consumers interpret them. This works only if there is a genuine difference in efficiency between rival stores, such that only one can afford to sell on the cheap. Then, the nimble firm might want a price war in order to speed the lumbering one's demise. In such circumstances, any attempt by the lumbering firm to collude tacitly is futile; if it offers a guarantee, its bluff will be called. So when low-cost firms make such promises, consumers can take them as a sign of a competitive offering.

This does not seem to be what is happening in Britain, however. There, it is the more expensive supermarkets that are promising to match each others' prices. Only one has pledged to match the deals on offer at Aldi and Lidl, nimble low-cost rivals that are making inroads into the market.

One British supermarket proclaims to its customers that, thanks to its guarantee, they "don't have to shop around". On close examination, that

sounds like an effort to abate a price war, not start one.

*Studies cited in this article can be found at www.economist.com/pricematching15 ■



自由交流

确保利润

“低价保证”没有挑起反而阻碍了价格战

“您所购货品在别处商家有可能更便宜，这是给您返还差价的购物券。”最近光顾过英国任一超市的人都熟悉这看似慷慨的优惠政策，一般是顾客先付款，然后获得优惠。英国最大的四家连锁超市均作出某种形式的“低价保证”，承诺顾客到别处购物并不会更便宜。表面看来，这像是件好事：表明激烈竞争令价格降低。但经济学家长期以来心存怀疑，认为这类优惠承诺反而有损消费者利益。

问题在于“低价保证”会削弱商业竞争的逻辑。假设一家汽车经销商担忧对手降价抢客，即便可跟随降价，但期间销售还是可能受影响。“低价保证”则是先发制人的防御招数。通过承诺返还差价，经销商可说服顾客无须货比三家：他们支付的总是市面最低价。

结果是，降价不再是争抢新客源的手段；顾客会更忠诚，依赖低价保证，而不是移步别家。降价只能给竞争对手带来对既有销售利润的侵蚀。商家可能得出结论，价格，还有利润率，还是保持高位为妙。结果是达成“默契合谋”：虽无任何明显沟通协商，但商家们都保持高价。消费者最终因为那乍看有利的优惠保证而使利益受损。

虽然没有任何证据表明英国目前涌现的“低价保证”已对消费者造成损害，但研究人员对他国的调查发现类似承诺与日杂百货、轮胎甚至股票价格保持高位相关。专家们也已通过实验确认该发现。在2003年的一项实验中，美国里士满大学（University of Richmond）的莎坤·达塔（Shakun Datta）和洛约拉马利蒙特大学（Loyola Marymount University）的詹妮弗·奥芬伯格（Jennifer Offenberg）把实验对象随机配对，让他们参与两个版本的电脑定价游戏——在其中一个版本中他们可提供“低价保证”，另一个版本则不能。参与者可保留赚得的利润，同时他们被反复重组以避免与同一伙伴在多次互动过程中制定任何其他定价手段。在允许作“低价保证”

时，其使用率达94%，结果价格平均上涨36%。即使一个参加者的成本比另一参加者的要低得多，价格依然上涨，尽管幅度较小。

“比价返差”不一定总是个骗局：面对现存的默契合谋，新的“低价保证”可反其道而行。多数商家的价格只和别家宣称的价格相比较，而不是和对方在实行其自身低价保证后实际收取顾客的总金额比较。漏洞由此而生，聪明的新进商家便可借机获利。假设原本一家超市的牛排卖四英镑，而且有“低价保证”。新登场的精明对手则可定出更高的五英镑价格，并承诺不只退回差价，而且双倍返还。减去两英镑的返还优惠，新超市的牛排实际只卖三英镑，而因为其公开标示的价格为五英镑，原来那家超市的“低价保证”条款就不会被触发。顾客可能还是会被这种形式的减价优惠吸引而改换门庭。

那也许有点机关算尽太聪明，但也有其他理由说明“低价保证”可能无害甚至值得欢迎。一方面在于其复杂性。在英国的超市，价格差额通常以下次购物优惠减免的形式返还，要享受优惠，顾客必须带着优惠券下次再来。手头一大叠折扣券未用的人都知道，要记得这么做实在费劲，这就给直接降价的对手留下了机会。虽然其提供的折扣会被第一家超市以优惠券的形式抵消，但顾客也许更看重这种直截了当的降价，因为享受优惠更简单快捷。如果有足够多的顾客都这么想，结果将是一场真正的价格战——不过也有人觉得到别家店购物比记得带上优惠券还麻烦。

| 赛点

支持“低价保证”的另一理据是差别取价：向不同类型的顾客以不同价格销售货品。举例来说，如果某些顾客无暇货比三家，公司可以高价向其售卖货品，同时，以“低价保证”吸引那些对价格敏感又不怕麻烦的顾客。这从利润角度看极好，而消费者有时也可从中得益。

最后，“低价保证”可能是真正低价的信号，使该商家脱颖而出。大概多数消费者就是这么看的。而只有在商家效率存在真实差距时，这种情况才会发生，这时只有一家能够承受低价。然后，敏捷的商家也许想挑起一场价格战来加速笨拙对手的消亡。如此境况下，弱者想实现默契合谋的任何努

力都是徒劳；若提供“低价保证”，其假言假语必被识破。所以，当低成本商家作出这样的承诺时，消费者可视之为真正实惠的标志。

但英国的情况似乎并非如此。在那里是高价超市之间打出相互低价保证的牌面。其中，只有一家承诺与进袭市场的平价超市阿尔迪（Aldi）和利德（Lidl）火拼低价。

一家英国超市向顾客宣称，得益于“低价保证”，他们无须“货比三家”。仔细看来，与其说那是要挑起价格战，还不如说是在浇灭引捻。

*本文所引的研究可在以下网址找到：www.economist.com/pricematching15 ■



Schumpeter

Capitalism and its discontents

Anti-capitalism is being fuelled not just by capitalism's vices but also by its virtues

DAVE SPART has been a stalwart of *Private Eye*, a British satirical magazine, since the 1970s. The bearded Bolshevik has never wavered in his enthusiasm for denouncing capitalism (“totally sickening”). But in recent years the *Eye*’s editors gave their fictional columnist progressively less space as the left made its peace with free markets and consumerism. Now, Mr Spart is back—not only on the pages of *Private Eye* but in the corridors of power. Britain’s main opposition Labour Party in October held its first conference under a new, hard-left leader, Jeremy Corbyn. In Greece and Spain new left-wing parties have emerged. Greece’s Syriza has come out on top in two successive elections and Spain’s Podemos is set to make big advances in December’s general election. In the United States, Bernie Sanders, a self-described independent socialist, is making a spirited run for the Democratic nomination. And in the Vatican Pope Francis denounces the “invisible tyranny of the market” and recommends “returning the economy to the service of human beings”.

Why is anti-capitalism gaining ground? Dave Spart would no doubt argue that the people are finally realising that the free market is an illusion. Big companies act as rent-seeking monopolies, with their executives lobbying politicians for special favours and tax breaks. The boss-class awards itself huge pay packets regardless of success or failure: it is said that Martin Winterkorn, the departing CEO of Volkswagen, may leave with a pension-plus-severance package worth €60m (\$67m). This argument is gaining ground on the right as well as the left. On September 25th Charles Moore, Margaret Thatcher’s official biographer, wrote in the *Wall Street Journal* that Marx had a valuable insight “about the disproportionate power of the

ownership of capital". A Gallup poll of confidence in American institutions found that "big business" came second to bottom, just above Congress, with only 21% expressing "a great deal" or "quite a lot" of confidence in it.

Free-marketeers have a ready-made answer to this argument. Messrs Spart and Moore are complaining about the problems of corporatism rather than capitalism. The best way to solve the problems of "bad capitalism" (monopolies and cronyism) is to unleash the virtues of "good capitalism" (competition and innovation). The welcome news for such free-marketeers is that good capitalism is gaining ground. Look how hard it is nowadays for big firms and big bosses to entrench themselves. The average time a company spends on the *Fortune* 500 list has fallen from 70 years in the 1930s to about 15 years today; and the average job tenure of a *Fortune* 500 CEO has gone from ten years in 2000 to five years today. The bad news is that good capitalism may be doing as much as bad capitalism to create the current backlash.

Globalisation and digitisation have speeded up the pace of creative destruction. Successful firms can emerge from obscure places such as Estonia (Skype) and Galicia (Inditex) to straddle the globe. Digital technology allows businesses to become huge in no time. WhatsApp, a mobile-messaging platform, reached 500m users within five years of its launch. But the champions of this brave new world can be disconcerting. They are usually light on both people and assets, partly because digital services are highly automated and partly because of outsourcing. Ten years ago Blockbuster had 9,000 shops in America with 83,000 employees. Netflix employs just 2,000 people and rents the computing power for its streaming video from Amazon. Gerald Davis of the University of Michigan's Ross School of Business calculates that the 1,200 firms that have gone public in the United States since 2000 have each created fewer than 700 jobs worldwide, on average, since then. They are also ruthless: the new champions are constantly reinventing and reconfiguring themselves in

order to avoid the fate of former champions such as AOL and Nokia.

Rapid change is provoking anxiety—and resistance. Supporters of good capitalism argue that employability is what matters, not employment. But what happens when change is so fast that “skills security” goes the way of job security? Those in the good-capitalism camp say, too, that rapid change is the price people pay for prosperity. But surely people value stability as well as the fruits of technology? In 1988 William Samuelson and Richard Zeckhauser, two economists, described a case in which the German authorities wanted to move a small town, so the coal underneath it could be mined. They suggested many options for the new town but, rather than something more suited to the age of the car, its citizens chose a design “extraordinarily like the serpentine layout of the old town, a layout that had evolved over centuries without (conscious) rhyme or reason.”

| *I am Spart*

Pro-capitalists rightly argue that the creative bit of creative destruction outweighs the destructive side. Thanks to Google and its likes we can search a good portion of human knowledge in an instant. Thanks to firms like Apple we each carry a supercomputer in our pockets. Thanks to sharing-economy companies such as Uber and Task Rabbit, people who do not want to work regular hours can find work whenever it suits them. The best way to solve some of our most nagging problems is to unleash the power of innovation. Airbnb is cutting the cost of temporary accommodation and MOOCs (massive open online courses) are democratising access to an Ivy League education.

But pro-capitalists should also remember two things. The first is that most people do not distinguish between good and bad capitalism: they see a world in which the winners are unleashing a tide of uncertainty while reserving themselves luxury berths on the lifeboats. The second is that the forces sweeping through the capitalist economy are also sweeping through

politics: the old party machines are imploding, and political entrepreneurs have the wherewithal to take over old parties or to build new ones. Anti-capitalism is once more a force to be reckoned with. ■



熊彼特

资本主义及其令人不满之处

给反资本主义情绪火上加油的不只是资本主义的恶习，还有其优点

自上世纪70年代起，戴夫·斯巴特（Dave Spart）一直是英国讽刺杂志《侦探》（Private Eye）的忠实拥护者。这个留着胡子的布尔什维克从未动摇过他谴责资本主义（“完全令人作呕”）的热情。但最近几年，随着左派与自由市场以及消费主义握手言和，该杂志的编辑给这位天马行空的专栏作家的空间也逐步减小。现在，斯巴特又回来了，不仅回到《侦探》杂志的版面上，而且还进入其权力走廊。英国主要反对党工党10月举行了在强硬的新任左派党魁杰里米·科尔宾（Jeremy Corbyn）领导下的第一次会议。新的左派政党已在希腊和西班牙出现。希腊的激进左翼联盟（Syriza）已连续在两次选举中独占鳌头，而西班牙的社会民主力量党（Podemos）势将在12月的大选中取得重大进展。在美国，自称独立社会主义者的伯尼·桑德斯（Bernie Sanders）正在积极竞选民主党总统候选人。在梵蒂冈，教皇方济各（Pope Francis）谴责“看不见的市场暴政”，建议“经济要回归到为人类服务”。

为什么反资本主义越来越有市场？斯巴特无疑会说，人们终于认识到自由市场是一种错觉。大公司的行为像寻租的垄断企业，其高管通过游说政客来获得特别优惠和税收减免。无论公司成败，老板阶层都用丰厚的薪水犒劳自己。据说大众汽车离职的CEO马丁·文德恩（Martin Winterkorn）可能得到价值6000万欧元（6700万美元）的养老金和离职金。左派和右派都越来越欢迎这一观点。9月25日，撒切尔夫人的官方传记作家查尔斯·摩尔（Charles Moore）在《华尔街日报》上写道，马克思可贵地洞察到“资本所有权的力量过大”。盖洛普就人们对美国机构信心进行的民意调查发现，“大企业”排名倒数第二，仅高于国会，只有21%的人表示对它“非常”或“相当”有信心。

自由市场论者对此观点有一个现成的答案。斯巴特和摩尔都在抱怨的问题是社团主义，而不是资本主义。解决“恶劣资本主义”的问题（垄断和任人

唯亲)的最好途径是发扬“优良资本主义”的优点(竞争和创新)。这些自由市场论者所欢迎的好消息是优良资本主义正在发展壮大。看看现在大公司和老板要维护自己的地位有多难就知道了。公司留在财富500强排行榜上的平均时间已从上世纪30年代的70年下降到现在的大约15年;而财富500强企业CEO的平均任期已从2000年的10年降到今天的5年。然而坏消息是,优良资本主义对导致当前反弹的贡献可能与恶劣资本主义不相上下。

全球化和数字化加快了创造性颠覆的步伐。成功的企业可能从爱沙尼亚(Skype)和西班牙的加利西亚(Inditex)等不起眼的地方崭露头角进而风靡全球。数字技术让企业迅速壮大。手机即时通讯平台WhatsApp在推出后5年里就发展了5亿用户。但这个勇敢新世界里的冠军企业可能会令人不安。它们通常都人手少、资产轻,这一方面是因为数字服务的高度自动化,另一方面是因为外包。十年前,百视达(Blockbuster)在美国有9000家门店、8.3万名员工。现在Netflix只聘用2000名员工,还为其流视频从亚马逊租用计算能力。密歇根大学罗斯商学院的杰拉尔德·戴维斯(Gerald Davis)估算,2000年以来在美国上市的1200家公司中,每一家至今在全球范围内平均创造了不到700个工作岗位。它们也很无情:这些新冠军不断自我重塑和重构,以避免重蹈美国在线和诺基亚等前冠军的覆辙。

快速的变化正在引发焦虑,以及反抗。优良资本主义的支持者认为,重要的是就业能力,而不是就业。但是,当变化飞快到连“技能保障”也继工作保障之后不保时,会发生什么?那些优良资本主义阵营的人还说,快速变化是人们为繁荣所付出的代价。但是人们难道不像看重技术成果那样看重稳定么?1988年,经济学家威廉·萨缪尔森(William Samuelson)和理查德·泽克豪泽(Richard Zeckhauser)描述了一个案例,德国当局想迁移一个小城镇以开采其地下的煤炭。他们为新城提出了许多选择,但是,小镇市民选择的那个设计“非常像老城那历经了几个世纪发展而来、没有(有意设计的)章法或缘由的蜿蜒布局”,而没有选择更适合汽车时代的其他设计。

亲资本主义者理所当然地认为在创造性颠覆中创造的一面比颠覆的一面更重要。多亏谷歌和其他类似公司，我们可以在一瞬间搜索到人类知识的一大部分。多亏苹果这样的公司，我们每个人的口袋里都能装一台超级计算机。多亏优步和任务兔子（Task Rabbit）等共享经济企业，那些不想按时坐班的人能找到符合他们时间的工作。要解决我们部分最棘手问题的最好办法是解放创新能力。Airbnb正在削减短期住宿的成本，而大型开放式网络课程（MOOC）正在使接受常春藤联盟的教育变得更大众化。

但是，亲资本主义者也应该记住两点。首先，大多数人分不清优良资本主义和恶劣资本主义的区别：他们看到的世界是，胜者释放充满不确定性的浪潮，同时在救生艇为自己保留了豪华舱位。第二，目前席卷资本主义经济的力量也正在席卷政治：陈旧的政党机器正在崩溃，政治企业家有资源接管旧党派或者建立新党派。反资本主义再一次成为了一股不可忽视的力量。 ■



Data-centre software

Progress without profits

A flock of startups is making cloud computing faster and more flexible, but most of them will not survive

“WHEN my hair gets long, I kind of look like him.” Matei Zaharia jokingly evades the question about what he thinks of being compared to Bill Gates. But the 30-year-old Romanian-Canadian computer scientist is indeed reminiscent of Microsoft’s former boss in his early days: he is considered one of the most brilliant geeks of his generation; he has developed an exciting new technology, called Spark, to crunch data; and he is one of the founders of a promising startup, Databricks.

Yet in an important way the two men are different: Mr Zaharia has no interest in making billions. After spending two years helping get Databricks off the ground, he has recently reduced his involvement with the firm and become a professor at the Massachusetts Institute of Technology. “I like to work on long-term and risky projects—something you can do at university, but not at startups,” he explains.

This combination—progress without profits—makes Mr Zaharia a poster-child for a branch of the IT industry that is crucial to many websites and apps, but gets much less attention than the latest smartphone or the next social-media sensation. Databricks, and a bunch of other startups, provide software that makes data centres run more efficiently and lets them handle vast amounts of data.

The operators of the biggest data centres, such as, say, Amazon or Facebook, already have this sort of software installed. But the next stage, which the startups are concentrating on, is to make it sufficiently user-friendly for non-tech businesses. The sector is improving rapidly, but may never make

anyone filthily rich—even those who are keener than Mr Zaharia on money.

The model for this sort of software was virtualisation, the idea of splitting a computer into several “virtual machines”, each with its own operating system and programs. Originally developed for mainframe computers, virtualisation became popular in the late 2000s as a way of making corporate data centres more efficient by spreading work around servers that were being under-used. The company that pioneered this, VMware, has grown rapidly.

A startup called Docker is now seeking the same sort of success with “containerisation”. It slices big and complex online applications into more manageable parts, which can be handled separately, meaning that small teams of programmers can focus on improving the code in one container. Upgrades can be installed at any time without the need to wait until a new version of the entire application is ready.

Since containers make developers much more productive, Docker’s software has proved hugely popular. The firm claims there have been more than 800m downloads since the program was first released in March 2013. Some of Docker’s customers have already made it an important part of their software supply chain. Gilt, an e-commerce site, for instance, used containers to cut seven big applications into 400 smaller ones.

“Orchestration” is perhaps the most important addition to this class of software. Whereas virtualisation carves up one computer into many, orchestration makes a bunch of machines (a “cluster”) look like one big computer by moving containers around between them. In July Google made public its version of the technology, called Kubernetes, so others can use it. CoreOS, another startup, has added a version to its software package. Mesosphere, which makes an operating system for data centres, has integrated Kubernetes into it.

Firms not only need help with running and updating their applications, they also need assistance in managing their growing piles of data. This is the remit of Hadoop, a database program with an accompanying set of number-crunching tools. The package also originated at Google, but is now marketed by firms such as Cloudera and Hortonworks. The software lets companies create and analyse “data lakes”, vast repositories for all kinds of information.

Sifting through these digital waters is often slow, which is why Databricks’ Mr Zaharia developed Spark, a sort of spreadsheet for big piles of data. It allows these to be handled in real time as the information comes in, for instance, from websites and sensors. Although it is only a few years old, Spark has already attracted a following of hundreds of developers and users. In June IBM announced that it would put its weight behind the software.

Their popularity notwithstanding, it is not clear whether these startups will ever become good businesses. In contrast to software firms in the past, they will not make money by selling copies of their programs. In most cases these are “open-source”, ie, the software’s creators publish the source code, so anybody can work with it. They do so out of a mixture of altruism and a belief that the product, and thus the market for it, will develop quicker if people are free to collaborate on it.

Instead, the startups are looking to make a living by charging for add-ons of various sorts. Hortonworks offers subscriptions for things such as troubleshooting and updates. Docker and CoreOS are planning to charge for management tools. Databricks has turned Spark into a set of web-based services which, for instance, allow subscribers to visualise data.

Even so, it will be tough to survive in competition with giants like Amazon and Microsoft, which are offering comprehensive cloud-computing

services. What is more, many potential customers may prefer to get all the pieces from one firm rather than stitching together software from startups, says Simon Crosby, a virtualisation veteran who works for Bromium, a provider of online-security software.

The current plethora of data-centre-software startups is likely to shrink as they run out of venture capital. Some firms will be gobbled up by established software firms, such as VMware and Red Hat. But they may be remembered fondly by data-centre managers for having made computing cheaper, faster and more flexible. ■



数据中心软件

有进步，没利润

一些创业公司正在把云计算变得更快更灵活，但它们中的多数不会存活下来

“我头发长长时看着有点像他。”被问到对被比作比尔·盖茨有何感想时，马泰·扎哈里亚（Matei Zaharia）用玩笑回避了问题。不过这位30岁的罗马尼亚裔加拿大计算机科学家早年确实让人联想到微软的前老板：他被视为他这一代人当中最才华横溢的技术怪才之一；他开发了激动人心的数据处理新技术Spark；他是前景颇佳的创业公司Databricks的创始人之一。

不过，这两人有一个重大差异：扎哈里亚并无兴趣赚大钱。他花了两年时间帮助Databricks起步后，最近减少了对公司事务的参与，成了麻省理工学院的一名教授。“我喜欢从事长期、有风险的项目，你可以在大学里干这样的事，但在创业公司不行。”他解释道。

有进步却没利润——这两个因素的结合让扎哈里亚成了信息技术一个分支的代表人物。这个分支对许多网站和应用都很关键，但和最近的智能手机或之后的社交媒体所引发的轰动相比得到的关注要少得多。Databricks等一批创业公司提供的软件让数据中心更高效地运行，并能处理海量数据。

像亚马逊和Facebook这类最大的数据中心的运营者已经装配了这类软件，但下一个阶段是要让这些软件变得对非技术领域的企业用户足够便捷好用，这正是这批创新公司专注在做的事。这个领域发展迅速，却可能永远不会让任何人富得流油，即使是比扎哈里亚更爱财之人。

这种软件的模式是虚拟化，即把一台计算机拆分成数个“虚拟机器”，每个都有自己的操作系统和程序。这种模式最初为大型计算机研发，在2000年代末开始流行，通过给未被充分利用的服务器摊派工作，让企业的数据中心变得更加高效。引领虚拟化技术的企业VMware迅速成长。

现在，一家名叫Docker的创业公司寻求用“容器化”来获得同样的成功。它把大型、复杂的网上应用分割成更便于管理的小部分，可被分开处理，这样一小批程序员就可以专注于改进一个容器里的编码，同时在任何时候都可以做升级，而不需要等到整个应用的新版本准备完毕。

容器让开发者的成效大增，因而Docker的软件已广为流行。该公司声称，自从这个软件于2013年3月首次发布以来，已被下载超过8亿次。该公司的一些客户已经把它变成其软件供应链的一个重要部分，比如，电子商务网站Gilt用这些容器把七个大型应用切割成了400个较小的应用。

“编排”可能是这类软件最重要的添加技术。虚拟化把一台计算机分割成许多台，这种编排则通过在一组机器（一个“集群”）间调度容器而让它们看上去更像一台大型计算机。7月谷歌发布了该公司在这项技术上的成果Kubernetes，让其他人人都可以使用它。另一家创业公司CoreOS已在其软件包中添加了Kubernetes的一个版本。为数据中心制作操作系统的Mesosphere已把Kubernetes融合其中。

企业在运行和升级应用时需要帮助，在管理它们越垒越高的数据上也是如此。这正是Hadoop的任务所在。这个数据库软件带有一套辅助的数据处理工具。这个工具包也起源于谷歌，但现在由Cloudera和Hortonworks等公司做营销推广。这一软件让企业可以创建和分析“数据湖”，即存有各种信息的巨大储蓄库。

对这类数据湖做筛选分析通常都很耗时，Databricks的扎哈里亚为此研发了处理大批量数据的电子表格程序Spark。它能实时处理从网站、传感器等地涌入的信息。Spark创建不过几年，已经吸引到成百上千的开发者和用户追随。6月IBM宣布将支持这个软件。

虽然这些创业公司大受欢迎，但尚不清楚它们有没有“钱途”。和从前的软件公司不同，它们不会靠售卖软件拷贝赚钱。在大部分情况下这些软件都是“开源”的，也就是说软件的创造者公开发布源代码，让任何人都能使用它。他们这么做是出于一种利他主义，同时也是因为他们相信，如果人们

可以自由地合作开发一个产品，那么这个产品及其针对的市场都会发展得更快。

这些创业公司寄望通过对各种附加产品收费来维持经营：Hortonworks的用户可以订购故障处理和升级等服务；Docker和CoreOS正计划就管理工具收费；Databricks已经把Spark变成了一套基于网络的服务，比如让订购用户把数据可视化。

即便如此，要和亚马逊、微软这类提供综合性云计算服务的巨头竞争并活下来并不容易。而且许多潜在客户可能更倾向于从同一家企业获得所有软件，而不是把来自各家创业公司的软件拼接在一起，虚拟技术的资深人士西蒙·克罗斯比（Simon Crosby）说。他为网络安全软件供应商Bromium工作。

随着目前数量过剩的数据中心软件创业公司渐渐耗尽风险资本，它们很可能会收缩，一些企业会被VMware和Red Hat这类成熟的软件公司吞并。不过，它们让计算变得更便宜、更快速也更灵活，因而可能会被数据中心的管理人员深情地铭记。■



Property in Sweden

Home is where the heartache is

House prices in Sweden continue to soar, to regulators' despair

ASK a central banker what regulators should do when rock-bottom rates cause house prices to soar, and the reply will almost always be “macropru”. Raising rates to burst house-price bubbles is a bad idea, the logic runs, since the needs of the broader economy may not square with those of the property market. Instead, “macroprudential” measures, meaning restrictions on mortgage lending and borrowing, are seen as the answer. But this medicine is hard to administer, as Sweden’s housing market vividly illustrates.

Swedish house prices have doubled in the past decade, their rapid ascent only briefly interrupted by the financial crisis (see chart). So far this year they have risen by about 14%. Apartment prices have been even giddier, rising by more than 150% in ten years.

In part, this is a simple function of supply and demand. Stockholm is among Europe’s fastest-growing cities, with the recent influx of Middle Eastern refugees only adding to the demand for housing. Last month the country’s migration agency said it expected as many as 190,000 new arrivals by the end of the year, double its previous estimate. Sluggish and restrictive planning procedures limit supply: the current shortage of around 150,000 homes is expected to triple by 2025. A counterproductive rent-control regime has crimped the supply of flats in particular, and led to long waiting lists. Earlier this year an apartment in central Stockholm went to someone who had been in the queue since 1989.

Low interest rates have given Swedes the capacity to borrow more, pushing prices ever higher. The debt of the average household has reached 172% of

income after tax. For people with mortgages in the big cities, the figure is nearly double that.

The most obvious way to calm things down is to raise rates. But the Riksbank, Sweden's central bank, tried that in 2010-11, with disastrous results. Unemployment stopped falling and inflation soon withered, stirring fears of deflation. That prompted the Riksbank to reverse course in late 2011 and start cutting rates again. The benchmark has ended up lower than it was to begin with, at -0.35%, increasing the sums flooding into housing. "It's like mopping whilst the tap is running at full flow," complains one official.

To try to stanch the flow, the Finansinspektionen (FI), the country's financial watchdog, has adopted curbs on both lending and borrowing. In 2013 it tightened capital requirements for mortgages, and since September it has required banks to hold an extra counter-cyclical capital buffer of 1% of all risk-weighted assets, to increase to 1.5% by next June. This will help if the property bubble bursts, but clearly has not been enough to stop it inflating.

Caps on how much individuals can borrow, in the form of maximum loan-to-value (LTV) and debt-to-income ratios, are another option. A recent IMF study found that in more than half of countries where this has been tried, credit growth and asset-price inflation fell. In 2010 the Riksbank embraced this policy, requiring a deposit of at least 15% for new mortgages.

The authorities have also tried to restrict the use of interest-only mortgages, which are common in Sweden. If borrowers use these to protect themselves from temporary financial problems while still paying down their debt, they can be helpful. But if they take out interest-only loans simply to borrow more, they exacerbate the bubble. Almost 40% of Swedish mortgages by value are not being paid down at all, and for many of the

remainder the pace of repayments is slow. The FI has been trying to push banks and borrowers to agree voluntary repayment plans. It suggested that those with LTVs above 70% pay down at least 2% a year, and those with LTVs of 50-70% pay 1% a year. But in April a court quashed such efforts, arguing the FI had no authority to promote such plans.

In any case, the allure of cheap loans is so great that households in Sweden and beyond will find ways around the restrictions that remain in place. When the Slovakian government put limits on housing loans, banks boosted other forms of lending to bridge the gap. In Sweden, so-called “blanco-loans”, more expensive unsecured loans, can be used for that purpose. All told, credit is still growing and asset prices climbing, despite regulators’ efforts.

A better solution might be to eliminate the tax code’s various incentives for home ownership. Property taxes were abolished in Sweden in 2008; up to 30% of mortgage interest can be deducted from personal tax bills and a rebate of up to 50% can be claimed on home extensions and repairs. The Riksbank thinks that abolishing mortgage-interest relief alone could cut aggregate debt as a share of income by more than 50 percentage points over the next 50 years. Reducing the maximum LTV ratio to 80% would only trim debt-to-income ratios by five percentage points; the FI’s repayment scheme would cut them by 12.

The tax code is in the hands of politicians, as are the planning and rent-control regimes that impede the construction of new homes. An independent commission last year recommended urgent reforms to all three, but has been ignored. Politicians at least seem to be warming to the idea of cutting mortgage-interest relief, partly because they are looking for money to pay for the influx of refugees. But for the most part, measures to slow the property boom seem politically unpalatable. “People feel rich today thanks to these crazy prices,” says one member of parliament.

“Nobody wants to be the one who breaks the spell.”

Politicians and regulators also know that any measure that obliges Swedes to spend more of their income on deposits or mortgage payments would be a drag on consumption, and thus a blow to an already fragile economy.

“Ideally, I’d like to have something in my toolkit with which I could influence the housing market and nothing else,” says Henrik Braconier of the FI, “but up to now I have not found it.” ■



瑞典房地产

家是心头的痛

瑞典房价继续飙升，让监管部门感到绝望

当跌至谷底的利率导致房价飙升时，若问某个央行行长监管机构该如何应对，得到的回答几乎总是“宏观审慎”。按照逻辑，提高利率来使房价泡沫破裂并不是一个好主意，因为更广泛的经济领域与房地产市场的需求可能并不一致。而“宏观审慎”措施，即限制抵押贷款和借款，被人们视为解决方案。但这副药并不容易下咽，瑞典的住房市场就生动地证明了这一点。

过去十年中，瑞典的房价已翻了一番，其迅速攀升之势只被金融危机短暂中断（见图表）。今年，房价已上升了14%左右。公寓的价格更是令人目眩，十年间上涨超过150%。

在一定程度上，这是简单的供求关系在起作用。斯德哥尔摩是欧洲增长最快的城市之一，最近的中东难民潮愈发加大了对住房的需求。瑞典移民局上个月表示，到今年年底，预计新移民将高达19万，是之前估计的两倍。缓慢而约束繁多的规划程序限制了供应：目前住房缺口约为15万套，到2025年，这个数字预计将增加两倍。适得其反的租金控制制度尤其限制了公寓的供应，导致漫长的等待。今年早些时候，一位从1989年就开始排队等候的租客终于租到了斯德哥尔摩市中心的一套公寓。

低利率让瑞典人能够承担更多的贷款，进一步推高了房价。普通家庭的负债已经达到税后收入的172%。对大城市的抵押贷款者来说，负债比率则几乎翻倍。

要给房价降温，最显而易见的方法就是提高利率。瑞典中央银行（Riksbank）在2010年至2011年间曾试图这么做，但却招致了灾难性的结果。失业率停止下降，通胀很快减弱，引发了对通缩的担忧。这促使瑞典央行于2011年底调转了航向，开始再度降息。基准利率最后降至-0.35%，比开始时还低，更增加了涌入住房市场的资金。一位官员抱怨道：“这就

像一边把水龙头开到最大，一边拖地。”

为了遏制资金涌入，瑞典的金融监管机构金融监督管理局（FI）对贷款与借款都做出限制。2013年，它收紧了对抵押贷款的资本要求；今年9月起，它要求银行拿出所有风险加权资产的1%作为额外的逆周期资本缓冲，到明年6月，该比例将升至1.5%。如果房地产泡沫破裂，这些限制将有所帮助，但显然尚不足以阻止泡沫膨胀。

用设立最高贷款价值比（LTV）与负债收入比的形式，对个人贷款金额设定上限，是另一种选择。国际货币基金组织（IMF）最近的一项研究发现，在尝试这种方法的国家里，超过半数国家的信贷增长和资产价格上涨均已下降。2010年，瑞典央行采取了这一政策，要求新抵押贷款至少要有15%的首付。

当局也试图限制只付利息抵押贷款（interest-only mortgages）的运用，这类贷款在瑞典很常见。如果借款人用这种方法来保护自己免受暂时性财务问题的困扰，同时仍在偿还债务，这类贷款会有帮助。但是，如果他们办理这类贷款只是为了借更多的钱，就会吹大泡沫。瑞典抵押贷款总额的近四成完全没有偿还，而剩余的部分中很多贷款的还款速度都非常缓慢。FI已努力促使银行和借款人达成自愿还款计划。FI建议LTV在70%以上的借款人每年至少偿还2%，而LTV在50%和70%之间的人每年偿还1%。但在4月，法院否决了这种努力，认为FI没有权力推动这样的计划。

无论如何，廉价贷款的吸引力非常大，瑞典和其他国家的家庭会找到各种办法绕过已有限制。斯洛伐克政府限制房贷时，银行用其他的贷款类型来填补缺口。在瑞典，所谓的“无指定用途贷款”（blanco-loans），即一种更昂贵的无抵押贷款，可用于这一目的。尽管监管部门有种种措施，但是总体而言，信贷仍在增长，资产价格仍在攀升。

更好的解决方案可能是取消税法中对置业的各种激励措施。瑞典于2008年废除了财产税；高达30%的按揭利息可从个人所得税中扣除，而住宅扩建和维修最高可获50%的退税。瑞典央行认为，未来50年里，仅取消按揭利

息抵税一项就可以让总债务占收入的比例减少超过50个百分点。把最高LTV降至80%只能让债务收入比削减5个百分点，而FI的还款计划能削减12个百分点。

税法由政客把持，阻碍新住房建设的规划和租金控制机制也一样。去年，一个独立的委员会建议对这三项都进行紧急改革，但一直被忽视。至少，政客们现在似乎开始对削减按揭利息抵税的主意感兴趣了，部分原因是他们正在筹钱以支付难民大量涌入的费用。但在大多数情况下，拖慢房地产发展的措施似乎在政治上难被接受。一位国会议员表示：“由于疯狂的房价，人们如今感到富足。没有人愿意成为打破魔咒的人。”

政客和监管者也知道，任何迫使瑞典人把更多收入用于储蓄或按揭还款的措施都会拖累消费，从而打击业已脆弱的经济。FI的亨利克·巴拉肯尼亚（Henrik Braconier）表示：“最理想的是，我希望我的工具箱里有一样能够影响住房市场而不涉及其他领域的东西，但到目前为止我还没有找到它。”■



Free exchange

Forget the 1%

It is the 0.01% who are really getting ahead in America

AMONG the most controversial of Thomas Piketty's arguments in his bestselling analysis of inequality, "Capital in the Twenty-First Century", is that wealth is increasingly concentrated in the hands of the very rich. Rising wealth inequality could presage the return of an 18th century inheritance society, in which marrying an heir is a surer route to riches than starting a company. Critics question the premise: Chris Giles, the economics editor of the *Financial Times*, argued earlier this year that Mr Piketty's data were both thin and faulty. Yet a new paper suggests that, in America at least, inequality in wealth is approaching record levels.*

Earlier studies of American wealth have tended to show only small increases in inequality in recent decades. A 2004 study of estate-tax data by Wojciech Kopczuk of Columbia University and Emmanuel Saez of the University of California, Berkeley, found an almost imperceptible rise in the share of wealth held by the top 1% of families, from about 19% in 1976 to 21% in 2000. A more recent investigation of the Federal Reserve's data on consumer finances, by Edward Wolff of New York University showed a continued but gentle increase in inequality into the 2000s. Mr Piketty's book, which drew on this previous work, showed similarly modest rises in wealth inequality in America.

A new paper by Mr Saez and Gabriel Zucman of the London School of Economics reckons past estimates badly underestimated the share of wealth belonging to the very rich. It uses a richer variety of sources than prior studies, including detailed data on personal income taxes (which the authors mine for figures on capital income) and property tax, which they check against Fed data on aggregate wealth. The authors note that not every

potential source of error can be accounted for; tax avoidance strategies, for instance, could cause either an overestimation of the wealth share of the rich (if they classify labour income as capital income in order to take advantage of lower rates) or an underestimation (if they intentionally seek out lower yielding investments for their tax advantages). Yet they believe their estimates represent an improvement over past attempts.

The results are enough to make Mr Piketty blush. The authors examine the share of total wealth held by the bottom 90% of families relative to those at the very top. Because the bottom half of all families almost always has no net wealth, the share of wealth held by the bottom 90% is an effective measure of “middle class” wealth, or that held by those from the 50th to the 90th percentile. In the late 1920s the bottom 90% held just 16% of America’s wealth—considerably less than that held by the top 0.1%, which controlled a quarter of total wealth just before the crash of 1929. From the beginning of the Depression until the end of the second world war, the middle class’s share of total wealth rose steadily, thanks largely to collapsing wealth among richer households. Thereafter the middle class’s share grew along with national wealth thanks to broader equity ownership, middle-class income growth and rising rates of home-ownership. The expansion of tax breaks for retirement savings also helped. By the early 1980s the share of household wealth held by the middle class rose to 36%—roughly four times the share controlled by the top 0.1%.

From the early 1980s, however, these trends have reversed. The ratio of household wealth to national income has risen back toward the level of the 1920s, but the share in the hands of middle-class families has tumbled (see chart). Tepid growth in middle-class incomes is partly to blame; real incomes for the top 1% of families grew 3.4% a year from 1986-2012 while those for the bottom 90% grew 0.7%. But Messrs Saez and Zucman reckon the main cause of falling middle-class net worth is soaring debt. Rising home values did little to raise middle-class wealth since mortgage debt also

soared. The recession battered home prices but left the debt untouched, further squeezing middle-class wealth.

| *The really, really rich get much, much richer*

On the other side of the spectrum, the fortunes of the wealthy have grown, especially at the very top. The 16,000 families making up the richest 0.01%, with an average net worth of \$371m, now control 11.2% of total wealth—back to the 1916 share, which is the highest on record. Those down the distribution have not done quite so well: the top 0.1% (consisting of 160,000 families worth \$73m on average) hold 22% of America's wealth, just shy of the 1929 peak—and exactly the same share as the bottom 90% of the population. Meanwhile the share of wealth held by families from the 90th to the 99th percentile has actually fallen over the last decade, though not by as much as the net worth of the bottom 90%.

The outsize fortunes of the few would not be too worrying were they largely the product of entrepreneurial activity: riches amassed by hardworking billionaires who are as likely as not to give their bounty away through philanthropy. Messrs Saez and Zucman find some evidence for this dynamic. Wealthy families are younger than they were a generation or two ago, and they earn a larger share of the country's income from labour: 3.1% in 2012 versus less than 0.5% prior to 1970.

Yet one should not yet rule out the return of Mr Piketty's "patrimonial capitalism". The club of young rich includes not only Mark Zuckerbergs, the authors argue, but also Paris Hiltons: young heirs to previously accumulated fortunes. What's more, the share of labour income earned by the top 0.1% appears to have peaked in 2000. In recent years the proportion of the wealth of the very rich held in the form of shares has levelled off, while that held in bonds has risen. Since the fortunes of most entrepreneurs are tied up in the stock of the firms that they found, these shifts hint that America's biggest fortunes may be starting to have less to do

with building businesses, just as Mr Piketty warned.

*Studies cited in this article can be found at www.economist.com/inequality14 ■



自由交流

忘记那1%吧

真正一马当先的是美国最富有的0.01%

托马斯·皮凯蒂（Thomas Piketty）分析不平等现象的畅销书《21世纪资本论》中最具争议的论点之一就是：财富正日益集中在巨富人群手中。贫富不均愈演愈烈可能预示着18世纪世袭式社会的回归，那时和富豪继承人结婚比开办公司更能致富。批评家质疑其前提：今年早些时候，《金融时报》经济编辑克里斯·贾尔斯（Chris Giles）指出皮凯蒂的数据单薄且有错误。但一份新研究报告表明，至少在美国，贫富不均正在接近历史最高水平。*

此前对美国财富的研究往往显示近几十年来不平等现象只是稍有加剧。哥伦比亚大学的沃伊西克·克普祖克（Wojciech Kopczuk）和加州大学伯克利分校的伊曼纽尔·赛斯（Emmanuel Saez）在2004年一份对遗产税数据的研究中发现，美国最富有的1%家庭所占的财富比重几乎不知不觉地从1976年的19%上升至2000年的21%。纽约大学的爱德华·沃尔夫（Edward Wolff）对美联储消费者财务数据一项更近期的研究显示，2000年以来贫富不均持续加剧，但趋势平缓。皮凯蒂的书引用了这一研究，同样证明美国贫富不均现象有小幅增长。

由赛斯和伦敦经济学院的加里布埃尔·祖克曼（Gabriel Zucman）发表的一篇新论文认为，此前的论断严重低估了巨富人群拥有的财富比重。这份报告采用了比以往研究更多样的资料来源，包括详细的个人所得税（作者从中挖掘资本利得的数据）和财产税数据，他们把后者和美联储的总财富数据相核对。作者特别指出，并非所有潜在的错误源头都能被计入考虑，比如，避税策略可能导致富人的财富比重被高估（假如他们把劳动所得归入资本利得，以便利用后者较低的税率）或者低估（假如他们刻意寻找较低收益的投资机会，因为其税务筹划的优势）。但作者相信他们的判断比过往研究有所进步。

这些研究结果足以让皮凯蒂脸红。作者仔细对比了底层90%家庭和顶层最富家庭财富的比重。由于底层50%的家庭几乎总是没有净资产，底层90%家庭的财富比重是衡量“中产阶级”——即从中位数到前10%以下的家庭——之财富的有效标准。二十世纪20年代末期，底层的90%家庭只拥有全美财富的16%——远远小于0.1%的最富家庭，后者在1929年股灾前控制了美国总财富的四分之一。从经济大萧条初期到二战结束，主要由于更富裕家庭的财富暴跌，中产阶级财富的比重稳步上升。由于更广泛持有股票、中产阶级收入上升和房产拥有率提高，中产阶级财富比重与国民财富相伴增长。退休储蓄税收优惠的推广也起到一定作用。到二十世纪80年代早期，中产阶级家庭财富的比重升至36%——大概是0.1%最富家庭的四倍。

但从那时开始，这些趋势逆转了。家庭财富占国民收入的比率向上世纪20年代的水平回升，但中产阶级家庭财富的比重却大幅下跌（见图表）。部分原因是中产阶级的收入增长不温不火；1986年至2012年间，最富1%家庭的实际收入年均增长3.4%，而底层90%家庭的增速为0.7%。但赛斯和祖克曼认为，中产阶级净资产下滑主要是因为高企的债务。房价走高未能增加中产阶级的财富，因为房贷也在暴增。经济衰退严重打击了房价，却没有影响债务，这导致中产阶级的财富进一步缩水。

| 巨富者益富

另一方面，富人尤其是巨富人群的财富增加了。0.01%的巨富人群由16,000个家庭组成，平均净资产达3.71亿美元，目前掌控全美财富的11.2%——重回1916年时的历史最高水平。在此下分布区间的表现就没这么好了：最富的0.1%（有16万家庭，平均净资产7300万美元）掌握全美财富的22%，略低于1929年时的巅峰水平——和底层90%人口的财富比重完全相同。同时，最富1%以下至10%家庭的财富过去十年里实际是下降了，尽管幅度没有底层90%那么大。

倘若这少数人拥有的庞大财富主要源自创业成果，那就不用太过担心：靠辛勤劳动致富的亿万富翁们很可能会豪爽慷慨地大做慈善。赛斯和祖克曼发现了这种动力的一些佐证。富人们比上一两代更年轻，他们的劳动所得占国民收入的比例增大：2012年达到3.1%，而1970年以前不超过0.5%。

然而，我们尚且不能排除皮凯蒂所说的“世袭制资本主义”回归的可能。作者认为，年轻富人俱乐部不单有马克·扎克伯格（Mark Zuckerberg）这样的白手起家者，还有帕丽斯·希尔顿（Paris Hilton）这样的富二代。此外，最富0.1%人群劳动所得的比重似乎已在2000年达到顶点。近年来，巨富人群以股票形式持有的财富比例已经趋于平稳，而以债券形式持有的比例则呈上升之势。由于大多数企业家的财富体现为其所创立公司的股票，上述变化提示我们：一如皮凯蒂警告的那样，美国最大的财富与创建企业的关系可能开始减少了。

*本文引用的研究可参见 www.economist.com/inequality14 ■



Mergers and antitrust in America

Pushing the limits

A frenzy of deals is awakening America's antitrust regulators

AMERICA is in the midst of one of the biggest dealmaking booms in its history. Since Lehman Brothers failed in September 2008, \$11 trillion of mergers and acquisitions have been done or await completion. Activity in 2015 has been at a record high. The latest marriage was of Dow Chemical and DuPont, two of America's oldest firms that together dominate the chemicals industry, combining to create a \$130 billion giant.

Antitrust regulators are finally losing their rag. Responsibility for policing deals is mainly shared between the Federal Trade Commission (FTC) and the Department of Justice (DOJ). So far in December the DOJ has scuppered the planned sale of General Electric's electrical-appliance division to Electrolux, and the proposed sale of Bumble Bee Seafoods, owned by a private-equity firm, to a Thai rival. On December 7th the FTC said it would try to block the acquisition of Office Depot by Staples. A big railway takeover—Canadian Pacific wants to buy Norfolk Southern—is also causing a stink. Railroads have been at the heart of antitrust battles since the 19th century. Norfolk fears that the deal will not pass muster with the transport regulator.

Most merger waves eventually lead to blowback as ever more ambitious companies test the boundaries of what is permissible. In the late 1990s and early 2000s, regulators blocked deals in defence (Lockheed Martin and Northrop Grumman), telecoms (WorldCom and Sprint) and helicopter-making (Bell and Boeing) among others. European officials terminated General Electric's takeover of Honeywell in 2001.

This time round, too, some big deals are attracting political heat. The public

already detest some industries that have consolidated, or plan to, such as airlines and health insurers. On the campaign trail, Hillary Clinton has criticised plans to merge several large insurers. On December 8th Congress held hearings on the combination of AB InBev and SABMiller. “Nobody wants to take a seat at a bar and discover their only choices are between a Bud and a Miller,” grumbled Chris Coons, a thirsty senator. (The firms, if combined, promise to sell one of the brands of watery brew.)

There are more serious grounds for a tougher approach than politicians’ boozing preferences. In four-fifths of America’s big industries the top 50 firms had a higher market share in 2007 than in 1997. Profit margins are at a near-record high, hinting at a lack of competition. The scale of dealmaking—total transactions since Lehman’s failure amount to 46% of American firms’ current market value—points to more concentration, too. In the run-up to the financial crash many takeovers were by private-equity firms, which assembled vast portfolios of unrelated businesses. Now most deals are “strategic”, with two firms seeking to combine similar operations, boost their prices and cut costs. Food, cable TV, telecoms, airlines, computer chips and other industries all have consolidated in the past half-decade.

Acquisitive firms are now trying clever tactics, which they hope will annoy regulators less. After combination, Dow and DuPont are likely to split again into three smaller firms, each with a speciality. Canadian Pacific has proposed putting itself into an independent trust, that will be combined with Norfolk but be run separately from it until regulators give the nod. If they do not, the two firms will be split again.

But regulators are changing their approach, too. In the Bumble Bee case, the DOJ defined the market narrowly, examining the sale of just canned tuna, rather than all canned fish. And Nelson Fitts, a lawyer with Wachtell Lipton, a law firm, points out that in 2010 the DOJ and the FTC changed their

merger guidelines. Rather than emphasising traditional yardsticks such as market shares in specific places, or barriers to entry, they are using a broader sense of whether a deal hurts competition—for example whether margins or prices will rise. In June a judge blocked the merger of Sysco and US Foods, arguing that they would have pricing power nationwide over restaurants, hospitals, hotels and other food buyers. A similar argument is being used in the case against Staples and Office depot: the FTC argues that it would raise prices for large businesses.

How far will the antitrust backlash go? One measure is the number of pending deals where the shares of the target are trading at a big discount to the proposed offer price, suggesting that arbitragers and investors do not expect the transaction to go through. Of the 20 largest pending transactions nine are trading at a discount of over 10%, including the merger of Baker Hughes and Halliburton, two oil-services firms.

A few more nasty jabs from America's regulators could create more uncertainty about the \$1.4 trillion of deals outstanding that involve North American firms. It could also make executives thinking about new deals more nervous—one banker says that some chief executives are already getting cold feet about potential deals, when faced with a protracted period of wrangling with antitrust officials.

As antitrust regulators get tougher, firms that already have high market shares may come to fear being broken up, even if they won their position under their own steam, rather than through takeovers. Tech firms such as Google and Facebook may be deemed to dominate their industries. Microsoft barely escaped being dismembered in 2001. With America in a populist mood, antitrust is back in fashion and the tremors could even reach Silicon Valley. ■



美国的并购与反垄断

挑战极限

并购狂潮警醒美国反垄断监管机构

美国正处在史上最大的并购潮之一当中。自2008年9月雷曼兄弟公司破产以来，已完成或待完成的并购交易总值达11万亿美元。2015年，并购活动创下新高。最新一宗交易是称霸美国化工界的两大最老牌企业陶氏化学（Dow Chemical）与杜邦公司（DuPont）之间的联姻，两者整合为市值1300亿美元的巨无霸。

反垄断机构终于按捺不住了。美国的并购交易主要由联邦贸易委员会（FTC）和司法部（DOJ）负责监管。12月，因司法部插手而泡汤的案例就包括通用电器向伊莱克斯出售家电部门的计划，以及“大黄蜂海产”（Bumble Bee Seafood，为一家私募股权公司所有）由泰国对手企业收购的交易。12月7日，FTC表示将努力阻止史泰博（Staples）收购欧迪办公（Office Depot）。加拿大太平洋铁路（Canadian Pacific）欲收购美国诺福克南方铁路公司（Norfolk Southern）的大交易也引起轩然大波。铁路业自19世纪以来一直是反垄断斗争的核心战场。诺福克南方铁路公司担心计划无法通过运输监管部门的审批。

随着越来越多野心勃勃的企业挑战监管极限，并购浪潮最后大多遭到驳回。上世纪90年代末至本世纪初，监管机构阻止了涉及国防（洛克希德·马丁公司和诺斯洛普·格鲁门公司）、电信（世通和Sprint）、直升机制造（贝尔和波音公司）等领域里的并购项目。欧洲官员们在2001年叫停了通用电气对霍尼韦尔公司（Honeywell）的收购。

这一轮同样也是如此，一些大宗并购案惹来政治压力。公众早对已发生或将出现整合的部分行业深恶痛绝，比如航空和医疗保险业。在竞选活动中，希拉里·克林顿批评了多家大型保险公司的合并计划。12月8日，美国国会就百威英博（AB InBev）和南非米勒（SABMiller）的合并举行了听证会。“没人希望在酒吧坐下后，发现只有百威和米勒两种啤酒可选。”爱

喝酒的参议员克里斯·昆斯抱怨道。（两家公司承诺，假如成功合并，将出售其中一个淡味啤酒品牌。）

推行更强硬的管制措施不仅关乎政客们选酒的自由，还有更严肃的理由。在美国五分之四的大型行业里，50强企业在2007年的市场份额均比1997年时高。它们的利润率均接近史上最高，这意味着市场缺乏竞争。整合并购的规模也显示集中度变得更高——自雷曼破产后，并购交易的总额相当于美国企业当前总市值的46%。在金融危机爆发前，发起收购行动的大多是私募股权公司，它们集中了大量不相关业务的投资组合。如今大多数交易则是“战略性”行为，两家企业寻求整合相近的部门，抬高价格并削减成本。过去五年，食品、有线电视、电信、航空、计算机芯片等行业都经历了整合。

野心勃勃的企业如今尝试以更巧妙的手段展开并购，希望能减少触怒监管部门。陶氏化学和杜邦公司合并后很可能会再分拆成三家规模较小但各有专攻的公司。加拿大太平洋铁路已提议让独立信托接管自身，这一信托将与诺福克南方铁路公司合并，在监管方审批期间两者仍将独立运营。如果无法获批，两家公司将重新拆分。

但监管机构也在变换手段。以“大黄蜂海产”的并购案为例，美国司法部收窄了对市场的定义，只审查金枪鱼罐头而非所有鱼罐头的销售额。沃切尔利普顿律师事务所（Wachtell Lipton）的律师纳尔逊·菲茨（Nelson Fitts）指出，司法部及FTC在2010年修订了企业并购指引。其中不再强调企业在某地的市场份额或进入壁垒这类传统标准，而是更广泛地考虑并购交易是否会损害市场竞争，比如利润率或价格会否提升。6月，一位法官阻止了西斯科（Sysco）和美国食品（US Foods）合并，认为它们会对全国的餐厅、医院、酒店及其他食品买家形成价格垄断。史泰博与欧迪办公的合并也由于类似的考虑而被否决：FTC认为合并后集团将向大型企业买家提价。

这轮反垄断反制将进行到何种程度？一则可以观察公司股价远低于提议收购价的并购提案数量，这种情况显示套利者和投资者并不看好交易获批。

在20宗最大规模的待定并购交易中，有九宗所涉公司的交易股价比提议收购价低超过10%，包括两大油田服务公司贝克休斯（Baker Hughes）和哈利伯顿（Halliburton）的合并。

美国监管机构还有一些狠招，可能令北美企业总值1.4万亿美元的待定并购计划更难预测。这也可能令考虑新的并购计划的高管们更加紧张。一位银行家表示，有些首席执行官面对与反垄断官员旷日持久的角力，已对计划中的并购案萌生退意。

随着反垄断监管变得愈加严厉，即便未经并购而是靠自身实力获得高市场份额的企业或许也会担心自己被拆分。谷歌和Facebook这类科技公司可能被视为其所在行业的支配者。微软在2001年就险被肢解。随着美国民粹主义情绪高涨，反垄断再度风行，此番震荡甚至可能波及硅谷。 ■



Schumpeter

The Piggly Wiggly way

Businesses should think carefully about continuing to heap work on their customers

IN 1916 Clarence Saunders changed the face of retailing when he opened his first Piggly Wiggly supermarket in Memphis, Tennessee. Hitherto, shops had kept all their goods behind the counter: customers told the staff what they wanted, waited while their purchases were bagged up, then handed over their money. Saunders came up with the idea of self-service. Customers selected their own groceries from the shelves, and took their baskets to a cashier on the way out. Saunders proclaimed that by cutting labour costs his idea would “slay the demon of high prices”.

At its height, in 1932, the Piggly Wiggly empire had 2,660 stores. Saunders had lost control of the company in the 1920s but he kept innovating, seeking to perfect the fully automated shop. This included working on a “shopping brain”, which shoppers would use to keep a tally of their bills. As a business Piggly Wiggly is now a shadow of its former self: it has only about 600 stores in 17 American states. But as an idea it has conquered the world.

The self-service revolution rolls on to this day. CVS, an American pharmacy chain, has replaced cashiers with self-service pay-points. Waitrose, a British grocery chain, offers customers a modern-day version of Saunders’s shopping brain, to scan and tot up their purchases. Banks are making it ever easier to do transactions online, while cutting their branches. Following a model pioneered in America by such firms as Avon and Tupperware, Unilever and other consumer-goods giants are seeking to convert some of their emerging-market customers into freelance salesfolk, who peddle their products to friends and neighbours.

The travel industry has been particularly ruthless in engineering its own staff out of its business. You book your trip using a price-comparison app on your smartphone. You print your boarding passes before setting out. At the airport you scan them, and your passport, at a machine. Some airlines now expect you to weigh and tag your own luggage, and haul it on to the conveyor. At your hotel, there may be no check-in staff, let alone porters: Omena hotels, a Scandinavian hotel chain, sends its customers PIN codes which they can use to open their doors. Soon, a wave of the Apple Watch on your wrist will be all it takes.

The variety of businesses touched by the self-service revolution is ever greater. Threadless, a group of clothes designers, invites customers to submit their own patterns and to vote on which ones should go into production. Tech companies turn their most knowledgeable customers into unpaid troubleshooters by encouraging them to participate in “user forums”, where they solve others’ technical problems. The *Huffington Post*, an online newspaper, gets its readers to write as unpaid columnists. GE is working towards a world in which it no longer has to keep a stock of spare parts for its jet engines: customers will download digital designs of the parts, and make them on their own 3D printers.

This is all wonderful for businesses. But what about their customers? In a new book, “Shadow Work”, Craig Lambert presents a dystopian vision of the self-service revolution. The reason why so many people feel overworked these days is that they are constantly being asked to do “unseen” jobs by everybody from Amazon to the Internal Revenue Service to the local school board. And the reason why they feel so alienated is that they spend so much time pressing buttons and speaking to machines rather than interacting with other people.

Mr Lambert is perhaps too gloomy. The self-service revolution is partly driven by customers’ own preferences: it is quicker to choose your own

groceries than to wait for someone to do it for you; it is easier to print your boarding passes at home than queue at the check-in counter. And customers can fight back: complaints about automated telephone services have forced some companies to revert to having people answer the phone. Many people are now refusing to drive to out-of-town, self-service supermarkets, choosing instead to have their shopping delivered.

But he is right about the enervating cumulative effect of all the instances where personal service has been replaced with self-service. Being able to do one or two things for yourself can feel liberating; having to do everything can make you feel like a slave to the machine. And the trend is far from over. Some bars are trying out a technology called iPourIt, in which drinkers have to wear a wireless wristband that monitors how much booze they are serving themselves from the taps. Before long, no doubt, self-service barbershops will invite customers to pop their heads into a clipping machine and turn a dial to select the severity of the cut.

| *The pampered and the paupers*

The rise and rise of the self-service business raises two worries in particular. The first is for society as a whole. Even as they eliminate the personal touch from their mass-market offerings, service industries keep chasing the well-heeled with extravagant, premium-priced offerings. Consumers are being ever more clearly divided into a “cattle class”, herded into the back of the cabin and offered precious little service, and a pampered “business class”, for whom no amount of fawning is too much. (Fly Virgin Atlantic in its ironically titled Upper Class and you get a private car to take you to and from the airports, and flunkies waiting in the lounge to polish your shoes and cut your hair.) Not only might this intensify resentment of the haves by the have-nots; it also robs the have-nots of entry-level jobs.

The second worry is for businesses themselves. If they never meet their

customers, they will lose touch with them. And although self-service is great for saving costs, its effect over time is to train customers to shop on price, and thus to switch as soon as a slightly cheaper rival comes along. If firms abandon trying to differentiate themselves with good service, they are making themselves vulnerable to the sort of attack Britain's mainstream supermarkets are now suffering from an invasion of German discounters. That's where the Piggly Wiggly way leads. ■



熊彼特

“小猪扭扭超市”模式

顾客自助有风险，商家企业须留心

1916年，克拉伦斯·桑德斯（Clarence Saunders）在田纳西州孟菲斯市创立了第一家“小猪扭扭超市”（Piggly Wiggly supermarket），从此改变了零售业的面貌。此前，商店一直把商品放在柜台后面，顾客告诉售货员想买什么，等他们把货品包装好，自己再递上货款。桑德斯构思出自助服务的理念。顾客从货架上挑选商品，装在篮子里拿到门口收银处结账。桑德斯宣称该理念能减低劳动力成本，从而“斩除高价恶魔”。

1932年，处于鼎盛时期的“小猪扭扭超市”帝国拥有2660家门店。上世纪20年代，桑德斯已失去对该公司的控制权，但他继续创新求变，希望完善全自动超市的经营方式，包括构思方便顾客用以计算货品总价的“购物大脑”。作为一家企业，如今的“小猪扭扭超市”已大不如前：仅在美国17个州拥有600家门店。但它所开创的理念已经征服了全世界。

自助服务的革命延续至今。美国连锁药房CVS已采用自助付款台取代收银员。英国连锁超市维特罗斯（Waitrose）向顾客提供当年桑德斯构想的“购物大脑”之现代版，方便大家扫描购入的货品来计算总价。银行正在把在线交易变得日益方便，同时削减实体网点。联合利华及其他消费品巨头追随雅芳、特百惠（Tupperware）等美国公司当年率先采用的销售模式，正努力将其在新兴市场的部分顾客转化为兼职销售人员，向亲朋友邻推销公司产品。

说到谋划裁员节流，旅游行业一直尤为心狠手辣。通过智能手机上的比价应用，你可以预订旅程，并在出发前打印好登机牌。到了机场，通过一台机器可扫描登机牌和护照。有些航空公司现在会要求乘客自己给行李称重、贴标签，并放到传送带上。到了酒店，也许没有工作人员给你办理登记入住，更别说行李搬运工了。北欧一家连锁酒店欧美纳（Omena）给住客提供识别码来直接开门入住。在不久的将来，只需挥一挥腕上的苹果手

表，一切就已办妥。

自助服务革命触及的行业种类在不断扩大。一群服装设计师组建的公司 Threadless 会邀请顾客提交设计样式，然后投票选出投产的款式。科技公司鼓励富有经验的顾客参与“用户论坛”，给别人解决技术疑难，化身为公司的义务检修员。网络报纸《赫芬顿邮报》（Huffington Post）让读者成为无偿的专栏作者。通用电气正朝这样一个方向发展，希望不再需要为其喷气机引擎配备零件库存：顾客将可下载零件的数码设计图，然后在自己的 3D 打印机上自制零件。

对企业而言，这一切自是美妙。但顾客呢？在新书《影子工作》（Shadow Work）中，克雷格·兰伯特（Craig Lambert）呈现了自助服务革命的反乌托邦一面。为什么现在那么多人感到工作过于劳累，原因是他们总被要求去做许多“看不见”的工作。亚马逊、美国国税局、本地学校董事会等等都能给你下达任务。人们之所以变得疏远，是因为他们花了大量时间在按按钮，与机器说话，而不是跟其他人互动。

兰伯特也许太过悲观了。自助服务革命一定程度上是由顾客的心愿驱动的：自选货物比等别人替你选取要快捷；比起在柜台前排队等待办理登机手续，在家里打印登机牌更为方便。而且，顾客也可以还击：对自动电话服务的投诉已经令部分公司恢复采用人工回复。许多人现在不愿开车到郊外的自助超市购物，而是选择让人送货上门。

但兰伯特提到的一点是对的——自助服务取代人员服务的累积效应会让人身心俱疲。能自己完成一两件事情让人感觉自由放松，一切都得自己做则令人感到沦为了机器的奴隶。而且这种趋势远未结束。一些酒吧正在尝试一项名为 iPourIt 的技术，酒客得佩戴一款无线腕带以监测自己从啤酒龙头自斟的酒量。不要怀疑，用不了多久，自助理发店将请顾客把头探到剪发机里，然后旋动转盘选择头发修剪的长短。

| 娇惯富者与劳苦贫民

自助服务的节节进逼尤其催生了两大忧虑。第一个忧虑是对整个社会的影

响。即使服务业在大众市场中消除人工服务，他们还是会提供奢华的高价服务博取富人的青睐。越来越明显，顾客被分为两批人，有的给赶到机舱后部的“放牛舱”，服务少得可怜；有的则被领进呵护备至的“商务舱”，享受百般奉承。（搭乘维珍航空，选择那名字极具讽刺意味的“上等舱”，你会享受到专车接送往返机场，还有仆人在候机室待命给你擦鞋剪发。）这不但加剧了穷人的仇富心理，同时也剥夺了穷人所就业的初级职位。

第二个忧虑是对企业自身而言，如果从不直面顾客，企业将与其脱节。虽然自助服务大大有利于节约成本，但长此以往，会令顾客养成只看价钱的习惯，只要对手稍作减价，顾客就会转向。假如公司放弃以优质服务突显自我，很容易陷入英国主流超市遇到的那种麻烦——它们正遭受德国折扣店的打击。那就是“小猪扭扭超市”模式带我们走入的世界。■



Free exchange

The gifts of the moguls

Extreme philanthropy is the upside of a worryingly unequal distribution of wealth

THE month of December began with something to like: a post on Facebook in which its founder, Mark Zuckerberg, and his wife, Priscilla Chan, promised to use the vast majority of their vast fortune to support charitable causes. (More than 1.5m people responded with a thumbs-up.) In celebration of the birth of their first child, the pair announced the creation of the Chan Zuckerberg Initiative, which will eventually receive 99% of the shares they own in Facebook, a pile currently valued at \$45 billion.

Mr Zuckerberg has already added to the lives of more than a billion people by creating an extraordinarily popular social network. Now he is compounding that good with an act of generosity that can only be applauded. Nonetheless, the donation—and others like it—raise two thorny questions. The first concerns how such a staggering fortune could ever have been accumulated; the second whether philanthropy can salve the sting of the increasingly unequal distribution of wealth that it exemplifies.

That the rich are getting richer, and the richest are getting richer fastest, is beyond doubt. Research* by Emmanuel Saez and Gabriel Zucman of the University of California, Berkeley, suggests that the share of American wealth held by the richest 0.1% of households rose from 7% in 1979 to 22% in 2012; that of the richest 0.01% (about 16,000 households, with average wealth in 2012 of \$371m) jumped from 2% to 11%. Even the 1% of Facebook shares Mr Zuckerberg plans to retain is worth \$450m—400 times the lifetime income of the median college graduate.

Economists worry about such highly unequal distributions of resources for reasons that go beyond questions of fairness. One concern is that as wealth

concentrates, democratic societies will lose faith in the fairness of liberal, market-oriented government. That, in turn, could lead to political crises—a point made most recently by Thomas Piketty, an economist at the London School of Economics, in his book “Capital in the Twenty-First Century”. But another fear is that unequal wealth may be a sign of inefficiency, accumulated not just through economically beneficial innovation, but also by exploiting market power.

In recent years the gap between the haves and the have-nots seems to have grown among individuals in part because it has been growing among companies. A recent paper by Jason Furman, Barack Obama’s chief economic adviser, and Peter Orszag, a former lieutenant of Mr Obama’s now at Citigroup, a bank, notes that the return on investment at the most profitable non-financial firms in America is at record levels. It tops 100% for firms in the 90th percentile, compared with just over 20% 30 years ago. Returns at the most profitable firms are now about ten times those in the middle of the distribution; in the 1990s they were just three times larger. This gap has boosted the fortunes of their owners.

To some extent, outsize returns are the reward for innovation. Apple achieved its dominant market position thanks largely to the superiority of products like the iPhone. But the modern corporate landscape is a winner-take-all environment. Tech titans are often supported by network effects—the fact, for instance, that a social network becomes more valuable to potential users as the user base grows. Facebook’s users (like Uber’s drivers and passengers, and Amazon’s buyers and sellers) benefit from being on the same platform as everyone else. Consequently, Facebook’s technology and strategy only needed to be a bit better than the second-best social network to push it into the market-dominating position it now occupies.

Network effects may not be the only forces at work. Many businesses have

become more concentrated in recent years: ten of the 13 sectors into which government statisticians divide American industry were more top-heavy in 2007 than in 1997. The biggest firms have not been bashful about buying up rivals. America's pharmaceutical companies are in the midst of a trillion-dollar merger blitz. Facebook has acquired a number of popular social networks, such as Instagram and WhatsApp, turning their owners into moguls while defusing competitive threats.

One solution—to break up the tech behemoths—seems like an extreme response in an industry that evolves at lightning speed anyway.

Incumbents argue that their dominant market position has been good for consumers. People love free e-mail and cheap music downloads, after all. But in some respects, Facebook and its ilk resemble utilities—the kind of firm whose profits are normally limited by regulation.

| *Spending review*

Many will view donations like Mr Zuckerberg's as a reason not to worry about the intense concentration of wealth, whatever its source. Gifts of extraordinary size are increasingly common, thanks largely to the efforts of Bill and Melinda Gates, whose foundation is supported by a \$44 billion trust. Warren Buffett, America's second-richest person, is a big donor, too. Messrs Buffett and Gates have so far recruited more than 100 billionaires to join them in pledging to give away most of their fortunes. If billionaires are giving money away, that is redistribution of a sort.

Yet extreme philanthropy, as laudable as it is, is no answer to worries about inequality. For one thing, it is hard to spend enormous sums both quickly and well. The Gates Foundation is among the world's most ambitious charities. It chooses its donations carefully; as a result, the \$5 billion it gave away in 2014 was less than the \$7.4 billion it accumulated thanks to new contributions, investment income and rising asset values.

Mr Zuckerberg, Mr Gates and others seem to be doing their best to put their wealth at the service of humanity. But humanity is also served by markets that support healthy competition.

* Studies cited in this article can be found at www.economist.com/inequality15 ■



自由交流

富豪的馈赠

大手笔的慈善捐赠是益事，但背后的财富不均之严重令人忧心

十二月由一件让人称“赞”的事件开启：Facebook的创始人马克·扎克伯格和他的妻子普莉希拉·陈（Priscilla Chan）在Facebook上发帖宣布，将捐出他们巨额财富的绝大部分用于慈善事业（超过150万人对此点赞）。为了庆祝他们第一个孩子的出生，这对夫妇宣布创建“陈-扎克伯格行动”公司（Chan Zuckerberg Initiative）来最终接收他们所持有的99%的Facebook股份，这些股份目前的市值为450亿美元。

通过创建一个无比流行的社交网络，扎克伯格已经为超过10亿人的生活增色。现在，他慷慨大方的捐赠让人们只能鼓掌称赞，与他的事业交相辉映。然而，这笔捐赠以及其他类似的举动仍然引出了两个棘手的问题。首先，如此令人咋舌的巨额财富是如何积累起来的？其次，巨额捐赠恰恰印证了日益增长的财富分配不均，慈善能抚慰这种刺痛吗？

富者益富，而最富者财富增长最快，这一点已毋庸置疑。由加州大学伯克利分校的伊曼纽尔·塞斯（Emmanuel Saez）和加布里埃尔·祖克曼（Gabriel Zucman）所做的研究*发现，从1979到2012年，美国最富有的0.1%的家庭所持有财富的比例从7%上升到22%，而最富有的0.01%的家庭（约1.6万户，2012年平均每家拥有3.71亿美元的资产）所持有财富的比例则从2%跃升至11%。即使扎克伯格只计划保留其所持股份的1%，这部分资产仍价值4.5亿美元，相当于普通大学毕业生终生收入的400倍。

经济学家对如此程度的资源分配不公忧心忡忡，不仅仅是出于公平的问题。一大担忧是，随着财富集中，民主社会将会对市场导向的自由主义政府的公平性丧失信心。这继而可能导致政治危机，伦敦政治经济学院的经济学家托马斯·皮凯蒂（Thomas Piketty）最近在其著作《二十一世纪资本论》中对此做了大量论述。但还有另一个担忧：财富分配不公可能是低效的表现，这些财富的积累不仅依赖经济上有利可图的创新，也通过利用

市场支配力牟利获得。

近年来，个人贫富差距似乎已进一步扩大，原因之一是公司间的差距在扩大。奥巴马的首席经济顾问贾森·福尔曼（Jason Furman）和前任助理、现就职于花旗银行的皮特·奥斯扎格（Peter Orszag）最近发表的文章显示，美国最赚钱的非金融企业的投资回报处于创纪录水平。前10%的公司的投资回报超过100%，相比之下，30年前的投资回报仅刚过20%。如今最赚钱的公司的回报约为中间水平公司的十倍，而在上世纪90年代这一差距仅为三倍。这种差距推动了公司所有者财富的增长。

在某种程度上说，巨额回报是对创新的奖励。主要受益于像iPhone这样优秀的产品，苹果公司取得了市场支配地位。但是现代企业的格局是赢者通吃。科技巨头通常受到网络效应的支持，例如随着用户基数的增长，社交网络对潜在用户变得越来越有价值。Facebook的用户（还有优步的司机和乘客，以及亚马逊的卖家和卖家）由于和其他所有人都使用同样的平台而受益。这样一来，Facebook的技术和战略只需要比处于第二位的社交网络平台好一点点，就把自己推上了如今的市场主导地位。

网络效应可能不是唯一发挥作用的力量。近年来，很多行业变得越来越集中：美国政府统计部门划分的13个产业中有10个在2007年比1997年更集中。最大的公司毫不避讳地大举收购竞争对手。美国的制药企业正身处万亿美元的并购闪击战中。Facebook已经收购了一系列流行的社交网络平台，如Instagram和WhatsApp，在排除竞争威胁的同时也令这些平台的所有者变为富豪。

一个解决方法是拆分这些科技巨兽，在一个原本就风驰电掣般发展的行业里，这有点反应过激。成熟企业声称它们的市场支配地位对消费者有利，毕竟人们喜欢免费的电子邮件服务和廉价的音乐下载。但在一些方面，Facebook及同类公司类似公用事业企业，而这类企业的利润通常要受到监管的限制。

| 审视花费

很多人会因为扎克伯格们做出这样的捐赠，而认为无需担心财富过度集中，无论财富的来源为何。这样的巨额捐赠越来越普遍，主要是得益于盖茨夫妇的努力，他们的基金会由440亿美元的信托支持。美国的第二号富豪巴菲特也是一位慷慨的捐赠者。迄今为止，巴菲特和盖茨已经号召了超过100位亿万富翁加入他们的行列，承诺捐出大部分财产。如果亿万富翁们正在捐出财产，这是另一种形式的重新分配。

然而，大手笔的慈善之举固然值得赞赏，却并非解决不平等问题的答案。首先，要迅速而得当地使用这些巨额资金并非易事。盖茨基金会是世界上最雄心勃勃的慈善机构之一，但它在做出捐赠时很谨慎，因此它在2014年捐出了50亿美元，少于其通过接受新捐赠、投资和资产升值而新积累的74亿美元。

扎克伯格和盖茨等人似乎正在竭力用他们的财富为人类造福。但是，支持良性竞争的市场也可为人类服务。

*本文所引研究可见www.economist.com/inequality15 ■



China's economy

The yuan and the markets

Strains on the currency suggest that something is very wrong with China's politics

“WHAT if we could just be China for a day?” mused Thomas Friedman, an American columnist, in 2010. “...We could actually, you know, authorise the right solutions.” Five years on, few are so ready to sing the praises of China's technocrats. Global markets have fallen by 7.1% since January 1st, their worst start to the year since at least 1970. A large part of the problem is China's management of its economy.

For well over a decade, China has been the engine of global growth. But the blistering pace of economic expansion has slowed. The stockmarket has been in turmoil, again. Although share prices in China matter little to the real economy, seesawing stocks feed fears among investors that the Communist Party does not have the wisdom to manage the move from Mao to market. The rest of the world looks at the debts and growing labour unrest inside China, and it shudders. Nowhere are those worries more apparent—or more consequential—than in the handling of its currency, the yuan.

| *Faulty forex*

China's economy is not on the verge of collapse. Next week the government will announce last year's rate of economic growth. It is likely to be close to 7%. That figure may be an overestimate, but it is not entirely divorced from reality. Nevertheless, demand is slowing, inflation is uncomfortably low and debts are rising. The bullish case for China depends partly upon the belief that the government can always lean against the slowdown by stimulating consumption and investment with looser monetary policy—just as in any normal economy.

Yet China is not normal. It is caught in a dangerous no-man's-land between the market and state control. And the yuan is the prime example of what a perilous place this is. After a series of mini-steps towards liberalisation, China has a semi-fixed currency and semi-porous capital controls. Partly because a stronger dollar has been dragging up the yuan, the People's Bank of China (PBOC) has tried to abandon its loose peg against the greenback since August; but it is still targeting a basket of currencies. A gradual loosening of capital controls means savers have plenty of ways to get their money out.

A weakening economy, a quasi-fixed exchange rate and more porous capital controls are a volatile combination. Looser monetary policy would boost demand. But it would also weaken the currency; and that prospect is already prompting savers to shovel their money offshore.

In the last six months of 2015 capital left China at an annualised rate of about \$1 trillion. The persistent gap between the official value of the yuan and its price in offshore markets suggests investors expect the government to allow the currency to fall even further in future. And, despite a record trade surplus of \$595 billion in 2015, there are good reasons for it to do so, at least against the dollar, which is still being propelled upwards by tighter monetary policy in America.

The problem is that the expectation of depreciation risks becoming a self-fulfilling loss of confidence. That is a risk even for a country with foreign-exchange reserves of more than \$3 trillion. A sharply weaker currency is also a threat to China's companies, which have taken on \$10 trillion of debt in the past eight years, roughly a tenth of it in dollars. Either those companies will fail, or China's state-owned banks will allow them to limp on. Neither is good for growth.

The government has reacted by trying to rig markets. The PBOC has

squeezed the fledgling offshore market in Hong Kong by buying up yuan so zealously that the overnight interest rate spiked on January 12th at 67%. Likewise, in the stockmarket it has instructed the “national team” of state funds to stick to the policy of buying and holding shares.

| *One step back, two forwards*

Yet such measures do nothing to resolve a fundamental tension. On the one hand, the state understands that the lack of financial options for Chinese savers is unpopular, wasteful and bad for the economy. On the other, it is threatened by the ructions that liberalisation creates. For Xi Jinping, the president, now in his fourth year in charge, that dilemma seems to crop up time and again. He needs middle-class support, but feels threatened by the capacity of the middle class to make trouble. He wants state-owned enterprises to become more efficient, but also for them to give jobs to the soldiers he is booting out of the People’s Liberation Army. He wants to “cage power” by strengthening the rule of law and by invoking the constitution, yet he is overseeing a vicious clampdown on dissent and free speech.

It is easy to say so now, but China should have cleaned up its financial system and freed its exchange rate when money was still flowing in. Now that the economy is slowing, debt has piled up and the dollar is strong, it has no painless way out.

A sharp devaluation would wrong-foot speculators. But it would also cause mayhem in China and export its deflationary pressures. The poison would spread across Asia and into rich countries. And because interest rates are low and many governments indebted, the world is ill-equipped to cope.

Better would be for China to strengthen capital controls temporarily and at the same time to stop stage-managing the yuan’s value. That would be a loss of face for China, because the IMF only recently marked the yuan’s progress towards convertibility by including it in the basket of currencies

that make up its Special Drawing Rights. But it would let the country prepare its financial institutions for currency volatility, not least by starting to scrub their balance-sheets, before flinging their doors open to destabilising flows. Mr Xi could embrace more complete convertibility later, when they were less vulnerable.

One reason the PBOC is rushing towards convertibility, despite the risks, is that it feels that it must seize the chance while it has Mr Xi's blessing. But better to retreat temporarily on one front than to trigger a global panic. That might also lead to some clearer thinking. There is a contradiction between liberalisation and party control, between giving markets their say and silencing them when their message is unwelcome. When the time is right, China's leaders must choose the markets. ■



中国经济

人民币和市场

人民币承受的压力表明，中国的政策存在一些严重错误

“如果我们能成为中国哪怕一天，会怎么样？”美国专栏作家托马斯·弗里德曼（Thomas Friedman）在2010年思索道。“.....那我们就可以实施正确的解决方案了。”五年过后，几乎再无人愿意为中国的技术官僚高唱赞歌。自1月1日以来，全球市场已经下跌了7.1%，这至少是1970年以来最糟糕的开年。其中一大主因是中国对其经济的管理。

十多年来，中国一直是全球增长的引擎。但是曾经迅猛的经济扩张步伐业已放缓。股市再度陷入动荡。尽管中国的股价对实体经济影响不大，但股价波动不定，在投资者中注入恐慌，令他们担忧共产党缺乏智慧来管理从毛主义向市场经济的转变。世界其他国家则看到中国国内的债务和日益增长的劳动力市场动荡，并为之战栗。而最明显抑或后果最严重的担忧，莫过于中国对人民币的管理。

| 有缺陷的外汇市场

中国经济并非濒临崩溃。下周中国政府将公布上一年的经济增速。这一数字很可能接近7%，也许被高估了，但并非完全脱离实际。然而需求日渐放缓，通胀率过低，债务正在上升。看多中国在一定程度上是相信中国政府总能够通过宽松的货币政策来刺激消费和投资，从而抵御增长放缓——正如任何正常的经济体那样。

但中国并非一个正常的经济体。它正陷于市场经济和国家管制之间危险的无人区，而人民币是这一区域危险性的最佳例证。在一系列自由化的小步措施之后，中国处于人民币半自由化、资本管制半松动的状态。自去年8月以来，部分由于美元走强推高了人民币汇率，中国人民银行已经试图放弃其对美元已经放松了的联系汇率，但它仍盯住一篮子货币。资本管制的逐步放松意味着国内储蓄会有很多渠道流向国外。

疲弱的经济、半固定的汇率和更为宽松的资本管制合在一起构成波动因素。放松货币政策可能将提振需求，但这也将使人民币贬值。这种市场预判已经促使大量储蓄外流。

2015年下半年，资本流出的年化值约为1万亿美元。人民币的官方价格和它在离岸市场上持续的价差表明，投资者预期政府会允许人民币在未来更进一步下跌。而且，尽管2015年的贸易顺差达到创纪录的5950亿美元，人民币仍然有充分的理由贬值，至少对美元应该贬值，后者仍在被美国紧缩的货币政策推高。

问题是，对贬值的预期很可能导致信心丧失愈演愈烈。即使对于外汇储备超过3万亿美元的中国而言，这仍是一种风险。人民币的迅速贬值也会危及中国的公司，它们在过去八年里已经积累了10万亿美元的债务，其中约十分之一以美元计价。要么这些公司破产，要么中国的国有银行支持它们苟延残喘。无论哪种情况，对经济增长都没有益处。

政府已经做出的反应是试图操纵市场。中国人民银行在香港大举买入人民币，以致离岸人民币隔夜拆借利率在1月12日飙升至67%，新兴的离岸市场也因此遭打压。在股市也一样，政府授意国有资金组成“国家队”，坚持买入并持有股票。

| 退一步，进两步

然而这些措施在解决基本矛盾上于事无补。一方面，政府明白，中国储蓄者缺乏投资选择，这不得人心、造成浪费且有害经济。另一方面，自由化所造成的混乱又威胁到政府。国家主席习近平已经开始了任期的第四年，对他而言，这种两难之境似乎不断出现。他需要中产阶级的支持，但却又感到威胁：中产阶级也能制造很多麻烦。他想要让国有企业变得更高效，但又希望它们能为大量裁撤的军人提供工作岗位。他想要加强法治，并援引宪法，“把权力关进笼子”，但又在督促严厉镇压异见人士和言论自由。

现在这么说好像是马后炮，但中国确实应该在资金尚在流入时就清理其金融体系，放开汇率。如今，经济放缓，债务堆积，美元走强，已无坦途可

走。

人民币快速贬值可能会让投机者乱了阵脚，但也将在中国造成混乱并向外传导通缩压力。这剂毒药可能会向整个亚洲散布，并进入富裕国家。由于利率处于低位，多国政府负债累累，全世界并未做好应对这种情况的准备。

更好的办法是中国临时加强资本管制，同时停止操纵人民币汇率的做法。这对中国可能是一件丢脸的事情，因为国际货币基金组织才刚刚嘉许了人民币在可自由兑换方面的进展，将其纳入到构成特别提款权的一篮子货币。但这将使中国的金融机构做好应对汇率波动的准备，在敞开大门迎接不稳定的资本流动之前，起码先把资产负债表清理干净。在金融机构变得不那么脆弱后，习近平可以接受更彻底的自由兑换。

尽管有风险，央行急于向自由兑换迈进的一个原因是它感到必须在获得习近平的支持后抓住这个机会。然而，在某一方面暂时后退好过引发全球性的恐慌。退后一步，思虑更清。在自由化和党的管制之间存在矛盾，一方面想要让市场发声，另一方面，当这种声音不受欢迎时却又要塞其口舌。在时机成熟之时，中国领导人必须选择市场。■



The world economy

Who's afraid of cheap oil?

Low energy prices ought to be a shot in the arm for the economy. Think again

ALONG with bank runs and market crashes, oil shocks have rare power to set monsters loose. Starting with the Arab oil embargo of 1973, people have learnt that sudden surges in the price of oil cause economic havoc.

Conversely, when the price slumps because of a glut, as in 1986, it has done the world a power of good. The rule of thumb is that a 10% fall in oil prices boosts growth by 0.1-0.5 percentage points.

In the past 18 months the price has fallen by 75%, from \$110 a barrel to below \$27. Yet this time the benefits are less certain. Although consumers have gained, producers are suffering grievously. The effects are spilling into financial markets, and could yet depress consumer confidence. Perhaps the benefits of such ultra-cheap oil still outweigh the costs, but markets have fallen so far so fast that even this is no longer clear.

| *The new economics of oil*

The world is drowning in oil. Saudi Arabia is pumping at almost full tilt. It is widely thought that the Saudis want to drive out higher-cost producers from the industry, including some of the fracking firms that have boosted oil output in the United States from 5m barrels a day (b/d) in 2008 to over 9m b/d now. Saudi Arabia will also be prepared to suffer a lot of pain to thwart Iran, its bitter rival, which this week was poised to rejoin oil markets as nuclear sanctions were lifted, with potential output of 3m-4m b/d.

Despite the Saudis' efforts, however, producers have proved resilient. Many frackers have eked out efficiencies. They hate the idea of plugging their wells only for the wildcatter on the next block to reap the reward when prices rebound. They will not pack up so long as prices cover day-to-day

costs, in some cases as low as \$15 a barrel. Meanwhile oil stocks in the mostly rich-country OECD in October stood at 267 days' net imports, almost 50% higher than five years earlier. They will continue to grow, especially if demand slows by more than expected in China and the rest of Asia. Forecasting the oil price is a mug's game (as the newspaper that once speculated about \$5 oil, we speak from experience), but few expect it to start rising before 2017. Today's price could mark the bottom of the barrel. Some are predicting a trough of as low as \$10.

The lower the better, you might say. Look at how cheap oil has boosted importers, from Europe to South Asia. The euro area's oil-import bill has fallen by 2% of GDP since mid-2014. India has become the world's fastest-growing large economy.

Yet the latest lurch down is also a source of anxiety. Collapsing revenues could bring political instability to fragile parts of the world, such as Venezuela and the Gulf, and fuel rivalries in the Middle East. Cheap oil has a green lining, as it drags down the global price of natural gas, which crowds out coal, a dirtier fuel. But in the long run, cheap fossil fuels reduce the incentive to act on climate change. Most worrying of all is the corrosive new economics of oil.

In the past cheap oil has buoyed the world economy because consumers spend much more out of one extra dollar in their pocket than producers do. Today that reckoning is less straightforward than it was. American consumers may have been saving more than was expected. Oil producers are tightening their belts, having spent extravagantly when prices were high. After the latest drop in crude prices, Russia announced a 10% cut in public spending. Even Saudi Arabia is slashing its budget to deal with its deficit of 15% of GDP.

Cheap oil also hurts demand in more important ways. When crude was over

\$100 a barrel it made sense to spend on exploration in out-of-the-way provinces, such as the Arctic, west Africa and deep below the saline rock off the coast of Brazil. As prices have tumbled, so has investment. Projects worth \$380 billion have been put on hold. In America spending on fixed assets in the oil industry has fallen by half from its peak. The poison has spread: the purchasing managers' index for December, of 48.2, registered an accelerating contraction across the whole of American manufacturing. In Brazil the harm to Petrobras, the national oil company, from the oil price has been exacerbated by a corruption scandal that has paralysed the highest echelons of government.

The fall in investment and asset prices is all the more harmful because it is so rapid. As oil collapses against the backdrop of a fragile world economy, it could trigger defaults.

The possible financial spillovers are hard to assess. Much of the \$650 billion rise in emerging-market corporate debt since 2007 has been in oil and commodity industries. Oil plays a central role in a clutch of emerging markets prone to trouble. With GDP in Russia falling, the government could well face a budgetary crisis within months. Venezuela, where inflation is above 140%, has declared an economic state of emergency.

Other oil producers are prone to a similar, if milder, cycle of weaker growth, a falling currency, imported inflation and tighter monetary policy. Central banks in Colombia and Mexico raised interest rates in December. Nigeria is rationing dollars in a desperate (probably doomed) effort to boost its currency.

There are strains in rich countries, too. Yields on corporate high-yield bonds have jumped from about 6.5% in mid-2015 to 9.7% today. Investors' aversion spread quickly from energy firms to all borrowers. With bears stalking equity markets, global indices are plumbing 30-month lows.

Central bankers in rich countries worry that persistent low inflation will feed expectations of static or falling prices—in effect, raising real interest rates. Policymakers' ability to respond is constrained because rates, close to zero, cannot be cut much more.

| *Make the best of it*

The oil-price drop creates vast numbers of winners in India and China. It gives oil-dependent economies like Saudi Arabia and Venezuela an urgent reason to embrace reform. It offers oil importers, like South Korea, a chance to tear up wasteful energy subsidies—or boost inflation and curb deficits by raising taxes. But this oil shock comes as the world economy is still coping with the aftermath of the financial crash. You might think that there could be no better time for a boost. In fact, the world could yet be laid low by an oil monster on the prowl. ■



世界经济

谁害怕廉价石油？

走低的能源价格应该是经济的一剂强心针。但请三思

和银行挤兑及股市崩盘一样，石油危机具有释放猛兽的罕见力量。1973年阿拉伯石油禁运事件发生后，人们已经认识到，油价突然飙升会引发经济浩劫。相反，当油价因供给过剩而暴跌——就像1986年所发生的那样——则给世界带来了有益的影响。经验法则是油价每下跌10%，经济增长就会提升0.1到0.5个百分点。

过去18个月油价已经下跌了75%，从每桶110美元跌至不到27美元。不过这一次，它的好处却没那么确定。虽然消费者已从中获益，但生产商受损严重。其影响正蔓延到金融市场，继而可能令消费者信心下挫。超低油价带来的好处可能仍然会超过所付出的代价，然而市场下跌之多之快，即使连这一点也已不再确定。

| 新石油经济学

世界快要溺毙在滚滚的石油之中。沙特阿拉伯正以接近满负荷开采石油。普遍认为，沙特人想把成本较高的生产商驱逐出石油业，包括一部分美国的页岩油生产商，后者将美国的石油产量从2008年的每天五百万桶增加到如今的九百多万桶。沙特阿拉伯同时也将准备好承受巨大的痛苦来挫败死敌伊朗。伊朗核协议达成后经济制裁被撤销，准备于本周重新加入石油市场，日产量可能达到三百万至四百万桶。

尽管沙特如此费力挤压，生产商却显现出了韧性。许多页岩油生产商竭力提升了效率。他们不愿封上油井，让隔壁的石油投机商在油价反弹时大赚一笔。只要价格尚能应付日常营运开支——就一些企业而言可以低至15美元一桶——他们就不会打包走人。与此同时，富裕国家俱乐部经合组织10月的石油储备已达到267天的净进口量，比五年前增加了近50%。这些储备还会继续增加，尤其如果中国和亚洲其他地区需求放缓超出预期的话。预测油价是一种徒劳的游戏（以经验之谈而言，本刊就曾推测过约5美元

的油价），但没人预期它会在2017年前开始反弹。今天的价格可能标志触底，但也有一些人预测会跌至10美元一桶的谷底。

你可能会说，越低越好。看看廉价石油如何提振了从欧洲到南亚的石油进口国。欧元区的石油进口支出自2014年中以来已经减少了相当于GDP的2%。印度已成为全球增长最快的大型经济体。

然而，最近一次油价下跌同样也是忧虑的源头。收入暴跌可能会给世界上脆弱的地区带去政治不稳定性，比如委内瑞拉和海湾地区，并加剧中东地区的冲突。廉价石油有一定的环保效应，因为它拉低了天然气的全球价格，继而会减少煤炭这种更肮脏的燃料的使用。但长期而言，廉价的化石燃料减少了人们对气候变化采取行动的动力。而最让人担忧的是腐蚀性的新石油经济学。

过去，廉价石油提振了全球经济，这是因为就省下的每一美元而言，消费者花掉的比石油生产商要多得多。今天，这种计算方法不像以前那么简单直接了。美国消费者存下的钱可能多于预期。石油生产商在油价高企时挥霍无度，如今正勒紧腰包。最近一次原油价格下跌后，俄罗斯宣布削减公共开支10%。即使是沙特阿拉伯也在削减预算，以应对高达GDP15%的财政赤字。

廉价石油还从更重要的方面挫伤了需求。当原油价格高于每桶100美元时，在北极、西非及巴西近海盐岩深处等偏远地带投资勘探合乎情理。而随着油价大跌，投资也已大减。总额3800亿美元的项目已经搁浅。在美国，花费在石油产业固定资产上的金额已较顶峰时期减少了一半。毒害已经扩散：12月采购经理人指数为48.2，显示美国制造业加速全面萎缩。在巴西，油价对巴西国家石油公司（Petrobras）的损害因贪腐丑闻而加剧，这一丑闻已经令巴西政府的最高层陷入瘫痪。

投资的减少和资产价格的下跌由于发生得太快而更具杀伤力。油价大跌发生在全球经济脆弱之时，这可能会引发违约。

金融市场可能发生的溢出效应很难评估。自2007年以来，新兴市场企业新

增的6500亿美元债务大部分产生于石油和大宗商品产业。在那些容易陷入麻烦的新兴市场，石油扮演着核心的角色。俄罗斯的GDP下跌后，该国政府很可能在未来数月内面临一场预算危机。委内瑞拉的通货膨胀超过了140%，已经宣布进入经济紧急状态。

其他石油生产国也可能面临类似但较温和些的经济下行周期：增长乏力、货币贬值、输入性通胀，货币政策收紧。哥伦比亚和墨西哥的央行12月都实施了加息。尼日利亚开始限制美元供应，不顾一切地提振本币，结果可能凶多吉少。

富裕国家也在受压。企业高收益债券的收益率已从2015年中的约6.5%跃升至目前的9.7%。投资者的避险情绪迅速从能源企业蔓延到所有借贷方。股市熊市近逼，全球股指下挫至30个月低位。富裕国家的央行担心，持续的低通胀将助长价格停滞或下跌的预期，结果将提高实际利率。而政策制定者的应对能力受限，因为利率已经接近零，无法再大幅下调。

| 尽力做最好

油价下跌在印度和中国制造了大量的赢家。它给了沙特阿拉伯和委内瑞拉这类高度依赖石油的经济体拥抱改革的紧迫理由。它为诸如韩国这样的石油进口国废除浪费颇多的能源补贴提供了机遇，或者使其可以通过加税来推动通胀并遏制赤字。然而，这场石油危机来临之时，世界经济仍在应对金融危机的余波。你可能认为再没有更好的时机让低油价来提振经济了。但实际上，世界可能会被徘徊觅食的石油猛兽扑倒。 ■



Oil benchmarks

Crude measure

American oil exports have boosted the WTI benchmark, for now

FORTY years ago America, still reeling from the 1973 oil crisis, banned most exports of crude oil. That prohibition was lifted by Congress in mid-December. The first shipment under the new rules set sail on December 31st from the Texan port of Corpus Christi. The renewed flow of crude is already changing how oil is priced.

Not all barrels of oil are alike. Crudes can be viscous like tar or so “light” they float on water. Their sulphur content ranges from the negligible (“sweet”) to the highly acidic (“sour”). Though hundreds of grades are bought and sold, traders use a handful of benchmarks to make sense of the market. Brent, from the North Sea, is the current international standard. Americans prefer to use a similar grade known as West Texas Intermediate (WTI).

WTI was once the main global benchmark. It has a number of advantages over Brent. For one thing, it arrives at the delivery point—Cushing, Oklahoma—by pipeline, and so can be sold in batches of variable size. Brent, in contrast, can only be sold by the tankerload. As Brent sees fewer, bigger transactions, generating continuous prices is tricky. The ever-shifting price of WTI can be observed directly, making it more transparent. And Brent is umbilically connected to a declining oil province. It comes from only a handful of oilfields, whereas a WTI contract can be satisfied by any suitable oil delivered to Cushing.

WTI had one vital flaw, though. The export ban meant that it could detach from world oil prices if America produced more crude than expected, since the surplus could not be exported. For most of the late 20th century that

risk was hypothetical, as America's output steadily declined. But in recent years the shale-oil boom revived American production. A glut of crude emerged, first at Cushing and then by the cluster of refineries on the Gulf of Mexico. That pushed American crude prices below Brent. The spread peaked in 2011 at \$28 a barrel. As the price of WTI began to say less and less about the state of the world market, traders spurned it in favour of Brent. Trading in contracts linked to Brent overtook those linked to WTI in early 2012.

The resumption of American exports has changed all that. The two benchmarks now trade at more or less the same price. WTI has duly regained its position as the most traded oil benchmark. This back-and-forth, however, may prove a distraction compared with another shift in the oil market: its centre of gravity is moving inexorably eastwards. OPEC, a cartel of oil exporters, expects demand in Asia to grow by 16m barrels a day by 2040. If that happens, Asia would end up consuming more than 46m barrels a day—four times as much as Europe. As Asia grows, it will become the dominant force in the world market.

A good benchmark has to reflect supply and demand for oil wherever it is used. WTI may continue to be influenced by bottlenecks in the American market. Brent reflects the market for oil in north-west Europe. That was once a positive, but as Europe's share of global demand for oil declines, proximity to the continent is no longer the advantage it was.

That suggests that an Asian benchmark will rise to the fore. The Shanghai International Energy Exchange plans to launch its own yuan-denominated contract this year. The new benchmark will have trouble getting off the ground. For one thing, China's capital controls make it difficult for foreigners to buy the yuan needed to trade the contracts. The wild swings in China's equity markets set an unnerving example for investors. But time is on its side. ■



油价基准

粗略衡量

美国石油出口已经提升WTI原油的基准地位，目前如此

四十年前，美国仍受累于1973年石油危机的不良影响，下令禁止了大部分原油的出口。2015年12月中，这一禁令被国会解除。新规定下第一批原油于12月31日驶离得克萨斯州的科珀斯克里斯蒂港（Corpus Christi）。新出口的原油已经在改变石油的定价方式。

并非所有的石油都是相同的。原油可能像沥青一样粘稠，也可能密度小到可以浮在水上。其中含硫量各异，从可以忽略不计的低硫原油到强酸性的高硫原油。尽管买卖的原油有成百上千个等级，贸易商仅使用几个基准来理清市场。北海布伦特原油是目前国际标准，而美国人更倾向于用另一个类似的等级，称为西得克萨斯中质原油（以下简称WTI）。

WTI原油曾是主要的全球基准。较之布伦特原油，它有一些优势。第一，它通过管道到达交割地点——美国俄克拉荷马州的库欣（Cushing），因此能够以各种数量分批出售。相反，布伦特原油只能按油轮计。因为布伦特原油交易次数较少、交易额较大，难以形成持续的价格走势。而不断变化的WTI原油则更直观、更透明。布伦特原油与产量不断下降的产油区紧密相连，它只来自几个油田，而输送到库欣的任何合适的石油都能满足一份WTI原油合约的要求。

不过，WTI原油有个致命的缺陷。出口禁令意味着当美国生产的原油超过预期时，WTI原油价格可能与全球石油价格脱离，因为过剩的原油也不能出口。20世纪晚期的大部分时间里，这样的风险只是一种假设，因为美国的石油产出稳步下降。但近年来页岩油的蓬勃发展重振了美国的产油量。过剩的原油先是在库欣出现，之后是聚集在墨西哥湾周边的炼油厂里，这让美国原油价格低于布伦特原油。这一价差在2011年达到顶峰，每桶相差28美元。随着WTI原油越来越无法代表全球市场的状态，贸易商抛弃了它，转而以布伦特原油为标准。2012年初，在交易中与布伦特原油挂钩的

合约超过了与WTI原油挂钩的合约。

美国恢复原油出口改变了一切。现在这两大基准的交易价格相差无几。WTI原油已如预期般夺回了它的地位，成为最常用于交易的油价基准。但是，这样的反复可能与石油市场的另一个转变不相符：全球市场的重心正在东移，无可阻挡。石油出口国联盟欧佩克预计，到2040年亚洲的日需求量会增加1600万桶。若果真如此，亚洲最终每日会消耗4600万桶石油，是欧洲的四倍。随着亚洲的增长，它将成为全球市场的主导力量。

无论用于何处，一个好的基准价应当反映出石油的供需。WTI原油可能仍会受到美国市场瓶颈的影响。布伦特原油价格反映出西北欧的石油市场，这曾经是积极的一面，但随着欧洲占石油全球需求的份额下降，接近欧洲大陆不再是一个优势。

这表明亚洲基准将升至显著的地位。上海国际能源交易中心计划今年推出自己以人民币计价的合约。新基准将很难起步。首先，中国的资本管制让外国人很难购买交易合约所需的人民币。中国股市的强烈波动也让投资者深感不安。然而，时间站在它这一边。■



China's market meddling

The control quagmire

A desire to limit volatility is giving rise to even bigger risks

“LOVE is like war: easy to begin but very hard to stop,” observed H.L. Mencken, an American writer. Less poetically, he might have added market meddling to the mix. China had planned this week to dismantle some of the rescue measures put in place when the stockmarket crashed last summer. That prospect helped to spook investors: stocks fell by 7% on January 4th, the first trading day of 2016, their worst-ever start to a new year. Chinese regulators are once again wading in, however haplessly—on January 7th, shares dropped by another 7%.

So what, you might ask. The unruliness of China's stockmarket is not news. And for all the headlines generated by its tumult, it is a poor indicator of the economy's health. Growth was already slowing early last year when share prices raced to vertiginous heights. Parts of the economy—the property market and consumer spending—have actually improved since stocks cratered by more than 40% during the summer (although manufacturing remains weak). Companies raise little financing from the market and savers store little wealth in it.

Yet the stockmarket is the clearest expression of the fragile state of financial reform in China. The government has declared that it will relax its grip on the economy and give more sway to market forces. Doing just that, first in agriculture and then in manufacturing, is an important reason for the remarkable growth of the past 35 years. But in finance, the desire for the more efficient allocation of capital clashes with the Communist Party's reflexive instinct for control.

It seems that a falling stockmarket sends too transparent a signal of

negative sentiment for officials to bear. The fingerprints of the “national team”—a motley crew of state-owned financial institutions—were all over the buy orders that swooped in when the market tumbled. The regulator was supposed to end a ban this week on share sales by big investors. Now it has drafted permanent restrictions, in effect telling investors that they are welcome to buy shares, but not to sell. It would be hard to conceive of a better plan for scaring money away. The poor design of circuit-breakers, trading halts ostensibly designed to calm the market, has added fuel to the fire.

The tension between reform and control is also evident in the currency market. The central bank has started to back away from obsessive management of the yuan’s exchange rate. But the more leeway that it creates for trading the currency, the bigger its headache. The central bank judges that the yuan is more or less at fair value; the market disagrees and has pushed it steadily lower. Selling dollars to prop up the yuan so as to make for an orderly depreciation, China has run down its foreign-exchange reserves by some \$300 billion over the past half-year. The government still has a plump cushion, but its reserves are not limitless. Accepting more volatility, even if that means a sharper depreciation now, would be better.

| *Control peak*

The government’s hunger for control is now clouding the broad economic picture. Burdened by the mountain of debt that it has accumulated over the past decade, China needs to begin deleveraging. That in turn means tolerating slower growth, at least for a while. Instead, all indications are that the government will set its annual growth target at 6.5% for the next five years in a plan to be unveiled in March. That is above what most analysts think it can credibly achieve without piling on yet more debt and bringing closer a real economic crisis. China has reached a point in its development where it needs to move faster in ceding power to the

market—over shares, its currency and the growth rate. Unless the government gives up more control now, it risks some day losing it altogether. ■



中国的市场干预 控制的泥淖

想要限制波动的欲望正在引发更大的风险

“爱就像战争：开始得容易，要结束很难。”美国作家亨利·路易斯·门肯（H.L. Menckel）写道。如果他不是那么的诗意，可能会把市场干预也加入这一类比当中。中国原本计划于本周取消一部分于去年夏天股市崩盘时引入的救市手段。这种前景增加了投资者的恐慌：股市在1月4日即2016年的首个交易日下跌了7%，是中国股市有史以来最糟糕的新年开局。中国的监管部门又一次插手干预，然而很不幸地，1月7日股市再跌7%。

那又如何？你可能会问。中国股市的狂乱无序已经不是什么新闻。而尽管股市的骚动登上各种头条，它并不是中国经济健康状况的一个好指标。去年上半年股市冲上令人晕眩的高点时，经济增长已经放缓。而自去年夏天股市跌去40%多以来，经济的某些领域实际上已经改善，比如房地产市场和消费者支出（虽然制造业仍然疲软）。企业从股市获得的融资不多，储蓄者投入股市的财富也很少。

然而，股市是中国金融改革脆弱状态最清晰的体现。中国政府已经宣称将放松对经济的掌控，让市场发挥更大的影响力。它先后在农业和制造业做出了这样的改变，这是过去35年经济实现惊人增长的重要原因。但在金融业，更高效配置资本的愿望和党本能的控制欲发生了冲突。

看起来，下跌的股市过于清晰地传递出一种负面情绪，令官员们难以忍受。当股市暴跌时，“国家队”（一个七拼八凑而成的国有金融机构团队）从天而降大举买入。监管部门原订于本周撤销对大股东的抛售禁令，现在它又推出了永久的限制令，实际上等同于告诉投资者：欢迎你们买股票，但不许卖。很难想象还有什么比这更好的吓退资金的方法了。从糟糕设计的熔断机制看，表面上为了暂停交易以安抚市场，实际上却是火上浇油。

改革和控制之间的张力在汇率市场也很明显。中国央行已经开始减少对人

人民币汇率的过度管理，但它为人民币交易创造的自由空间越大，它越感到头疼。央行认为人民币目前或多或少处在公允价，但市场并不这么认为，并将它不断往下推。中国卖出美元来支持人民币，以寻求让人民币有序贬值，为此在过去半年中已经消耗了约三千亿美元的外汇储备。中国政府仍然有充足的缓冲，但其外汇储备也并非永无止尽。接受更多的波动，即使这意味着眼下会有更剧烈的贬值，会是更佳对策。

| 控制的顶峰

中国对控制的欲望正令广泛的经济前景笼罩上一层阴云。中国正在承受过去十年里累积如山的债务重压，需要开始去杠杆。这就意味着要容忍至少在一段时间内的增长放缓。然而，目前各种迹象显示中国政府将在3月公布的计划中把未来五年的年增长目标设定在6.5%。这超出了多数分析师的预期：如果真要达到这一目标，需要堆积更多的债务，并将把中国推近一场真正的经济危机。中国的发展已经走到了一个阶段，需要加快放权给市场，包括对股市、汇率和经济增速的影响力。除非政府现在放弃更多的控制，否则某天它可能会完全地失去它。 ■



Fannie Mae and Freddie Mac

A funny form of conservation

The government may soon need to rescue America's mortgage giants again

TEMPORARY solutions have a way of becoming permanent. The fate of Fannie Mae and Freddie Mac, the two “government-sponsored enterprises” (GSEs) that stand behind much of America’s housing market, is a case in point. The GSEs, which buy American mortgages from banks and other originators, bundle them into securities and resell them to investors with a guarantee, are stuck in a technocratic no-man’s land. Their status has not yet been normalised after their first bail-out, but they may soon require a second. If they do, the administration of Barack Obama, which has been running them since 2009, will be largely responsible.

Fannie and Freddie were tethered to America’s housing market when it fell off a cliff in 2008. The GSEs faced a double impact: they had to cough up to honour their guarantees, while also suffering losses on their own big portfolios of mortgage-backed securities. The firms had an odd ownership structure, with a public charter, and thus an implicit government guarantee, but private shareholders. To stop them collapsing, which would have further hurt both the housing market and the financial system, the government injected \$188 billion and placed them into conservatorship—a form of government control. A further backstop, currently \$258 billion, has yet to be invoked. All in all, the rescues were the largest in financial history.

Since 2012, however, in an effort to claw back the bail-out, the Treasury has hoovered up all of the GSEs’ profits—much to the dismay of their shareholders, whose rights have been suspended, prompting some of them to sue the government. Altogether, the taxpayer has recouped \$239 billion from the firms—more than the cost of the rescue, but not yet enough to compensate for the risk taxpayers have assumed, says Edward Pinto of the

American Enterprise Institute, a think-tank.

These profits, though, are not guaranteed. On November 3rd, Freddie Mac announced that it had lost \$475m in the third quarter of 2015—its first loss since 2011. Write-downs on the value of interest-rate derivatives, which both GSEs use to hedge their risks, were to blame.

Such paper losses would be no cause for worry, were it not for the firms' thinning capital cushions. Under the terms the Treasury imposed in 2012, GSEs must reduce their capital by \$600m a year, remitting those funds to the taxpayer in addition to any profits. As a result, by 2018, the GSEs will have no capital whatsoever. Even a single paper loss will leave them insolvent.

At the same time, the GSEs are becoming less profitable. Their portfolios of mortgage-backed securities, although lucrative in good times, look a lot like taxpayer-financed speculation. Under the terms of the bail-out, they must run them down and focus only on issuing guarantees.

A second bail-out would not be proof of mismanagement at the GSEs; it would be necessary only because the Treasury has been feasting on their capital. But it might provide fresh political impetus for reform. In the aftermath of the crisis there was widespread agreement that the GSEs needed to be replaced or overhauled, says Jim Parrott, a former White House adviser now at the Urban Institute, a think-tank. But Congress has yet to settle on a new arrangement (a recent effort stalled in the Senate last year). Rumours that the administration had given up waiting and was about to release the firms from conservatorship caused their share prices to spike in October, before Jack Lew, the treasury secretary, insisted that nothing had changed.

Getting the government out of the housing market will be difficult. Every

time Fannie or Freddie guarantees a new long-term mortgage, the Treasury's backstop is in effect renewed for 30 years. Last year Fannie and Freddie stood behind half of new mortgage lending, according to *Inside Mortgage Finance*, a newsletter (other government agencies guaranteed a further 20% of lending). Politicians who withdraw this support, or raise its price, risk being blamed for any subsequent housing slowdown. In any case, most want to retain a government guarantee of some sort; many Democrats, especially, want the agencies to boost lending to minority groups.

Congress has been able to agree on one thing: on November 16th the House passed a Senate bill to cap the salaries of the GSEs' chief executives at \$600,000. That does not address the problem at hand—but taxpayers will doubtless cheer anyway. ■



房利美和房地美

有趣的接管形式

政府可能很快要再次援救美国两大房贷巨头

权宜之计有时会成为永续的选择。房利美（Fannie Mae）和房地美（Freddie Mac）的命运就是个恰如其分的例子，这两大“政府支持企业”（GSE）支撑起了美国房地产市场的很大部分。它们从银行和其他贷款承揽人那里买入美国房贷资产，打包成证券，再重新卖给投资者，并提供担保。这两家公司目前陷入技术官僚无可解决的境地。在接受第一次救助之后，它们的情况至今还未正常化，不过很快可能又需要第二次救助了。果真如此的话，自2009年以来就一直经营这两家公司的奥巴马政府要负主要责任。

2008年美国房地产市场坠崖时，房利美和房地美一起倒下。两房面临着双重打击：一方面不得不努力履行担保，同时自己持有的大量MBS（住房抵押贷款证券化）组合又遭受损失。两房之前的所有制结构很奇怪，有公立特许状，因此有政府隐形担保，但又是私人持股。为防止它们倒闭，进而损害房地产市场和金融体系，政府注入了1880亿美元，并将其纳入接管，即一种形式的政府控制。目前，还有2580亿美元的进一步支持有待启用。总而言之，这是金融史上最大规模的救助。

然而，自2012年起，为了设法收回救助投入，美国财政部征收了两房的所有利润，这让权利被中止的公司股东大为沮丧，促使一部分股东起诉政府。纳税人总共已从两家公司收回了2390亿美元，智库美国企业研究所（the American Enterprise Institute）的爱德华·平托（Edward Pinto）称，这超过了救助支出，但还不足以弥补纳税人所承担的风险。

不过这些利润并没有保障。11月3日，房地美宣布2015年第三季度亏损4.75亿美元，这是它2011年以来第一次亏损。此次亏损来自利率衍生工具价值的资产减记，两家均使用了这些工具进行风险对冲。

如果不是因为公司的资本缓冲越来越少，这样的账面损失本来无需担忧。根据2012年财政部实施的条款，它们必须每年缩减6亿美元的资本金，连同所有利润一起交还给纳税人。到2018年，“两房”将没有任何资本缓冲，任何一点账面损失都会让它们破产。

同时，两房的盈利性也越来越差。它们的MBS投资组合虽然在经济繁荣时获利丰厚，但看来更像是纳税人资助的投机生意。依照救助的条款，它们必须逐步减少这项业务，而只专注于发行担保。

第二次救助并不能证明两家公司管理不善。只因为财政部一直在攫取其资本，它们才需要再次接受纾困。但这可能会为改革提供新的政治动力。白宫前顾问，目前任职于智库城市研究所（the Urban Institute）的吉姆·派洛特（Jim Parrott）称，金融危机之后就有广泛共识，认为两房需要被取代或彻底改革。但国会仍未确定新的解决方案（最近一次努力去年在参议院陷入僵局）。曾有传言称本届政府已放弃等待，打算不再接管这两家公司，这导致两家公司的股价在10月飙升，之后美国财政部长杰克·卢（Jack Lew）坚称情况没有发生任何改变。

让政府置身于房地产市场之外很难。每次房利美或房地美为一笔新的长期房贷提供担保时，财政部的支持相当于又续期了30年。根据《抵押贷款财经透视》简报（*Inside Mortgage Finance*）的数据，去年两房担保了一半的新按揭贷款（其他政府机构担保了另外的20%）。如果任何政客撤销了这一支持或提升了其价格，一旦后续楼市有任何放缓，他都可能遭受指责。在任何情况下，大部分人都想保留某种形式的政府担保，尤其是许多民主党人，他们希望这些机构提高对少数群体的贷款。

国会在一件事上达成了一致意见：11月16日，众议院通过了一项参议院法案，将两房首席执行官的薪酬限定在60万美元以下。这并未解决当前的问题，但纳税人无疑会欢呼雀跃。 ■



Grid-scale storage

Smooth operators

Matching output to demand is hard with wind and solar power. The answer is to store surplus juice on the grid until it is needed

ON OCTOBER 28th a battery factory opened in Concord, North Carolina. That was good for an area which has seen dark economic times, but the event made few headlines. Perhaps it should have made more, though, for this factory's owner, Alevo, a Swiss company, is not in the business of manufacturing cells for torches, mobile phones or even laptop computers. Rather, it is making batteries that can store serious amounts of electricity—megawatt-hours of it. And it plans to sell them to power-grid operators.

To start with, the new batteries will be used to smooth the consequences of irregular demand through the day by absorbing electricity during troughs and regurgitating it during peaks. If that pans out, it will eliminate the need for gas-powered “peaker” stations which fire up quickly when needed, but are expensive to run. It would also allow non-peaker stations to operate more efficiently. Alevo reckons that if a grid as big as America's Western interconnection (which supplies the west of the United States and Canada) were to use 18GW-worth of its batteries the grid could save \$12 billion a year. Though the company has no North American contract yet, it does have an agreement to deploy its batteries in Guangdong, China.

Smoothing the operation of existing grids, however, may be only the beginning. In the longer run, optimists believe, batteries like these, or some equivalent technology, are the key to dealing with the problem not just of irregular demand, but of irregular supply. As the unit cost of solar and wind energy drops ever closer to that of power from fossil fuels, the fact that the wind does not always blow and the sun does not always shine becomes

more and more irksome. It is not just the great power-gap that is night which matters. As the chart below shows, even during the day—and even in deserts—the amount of sunlight can vary from minute to minute. And the wind, of course, is equally fickle.

Cheap grid-scale storage would overcome these irregularities. Renewables could then compete on cost alone. And there are many ideas for how to make this happen. Some, such as Alevo's, are ready to be sold. Others work in laboratories but have yet to be scaled up for use in the real world. Others still are little more than twinkles of varying plausibility in their inventors' eyes. But if even one of them is up to the task, then renewable energy may, at last, be able to stand on its own, rather than having to be subsidised and regulated into existence.

At the moment, grid-scale storage is dominated by pumped hydro. According to the Electric Power Research Institute, an American think-tank, 140GW-worth of this is installed around the world, with a capacity of 1.4TWhr. Pumped storage requires friendly geography. You need two reservoirs separated by a good gap of altitude. But it is then just a matter of linking them with pipes and using turbines that, if turned by falling water, generate electricity, but, when fed electricity, turn the other way to pump that water whence it came. Send it uphill when power is cheap, and let it flow down when there are spikes in demand, and you have a nice little business.

Not everywhere, though, has compliant hills and valleys. And pumped storage takes a long time, and a lot of money, to build. Technologies that start small, but can be scaled up as needed, are often a better answer.

| *Batteries now included*

The immediate future of grid-scale storage, then, probably lies with real batteries rather than topographical ones. At least, Alevo thinks so. At full

capacity, the firm's factory in Concord should be able to turn out 16.2GWhr-worth of them a year. And Alevo is not alone. Tesla is building an even bigger factory near Reno, Nevada to make batteries for its electric cars and for local and grid storage.

Several stations that use batteries to regulate the output of wind farms have already been built, or are under construction. In Sendai, Japan, Toshiba is creating one based on lithium-ion batteries. This should open in 2015. It will have a maximum power of 40MW, and will be able to run at that rate for half an hour. The Notrees Battery Storage Project, which opened in Texas in 2013, uses lead-acid batteries—sophisticated versions of the type found in petrol and diesel cars. It has a maximum power of 36MW and could run for 40 minutes at full tilt. Another Japanese project, of 34MW, in Rokkasho, uses sodium-sulphur batteries. And one in Alaska, of 27MW, uses nickel-cadmium ones.

As that list suggests, many types of grid-scale battery technology are available. Alevo uses electrodes made of lithium iron phosphate and graphite. These are connected by an inorganic sulphur-based electrolyte, a combination, the firm claims, that is particularly propitious because cycling between charged and discharged states produces only a 1°C change in the battery's temperature. This should eliminate the risk of overheating, to which some sorts of lithium-based cells are prone.

There are types of battery that actually require high temperatures to work. In sodium-sulphur cells of the sort deployed at Rokkasho both of those elements need to be liquid, meaning the battery has to be maintained at a temperature of 300-350°C. And an approach being developed by Donald Sadoway of the Massachusetts Institute of Technology would use two sorts of liquid metal, separated by a liquid electrolyte. The clever thing about this design is that, by picking a dense metal such as a mixture of antimony and lead, a light one such as lithium, and an electrolyte whose density falls

between the two, the three substances will float as separate layers in a container, rather as oil separates from vinegar in a salad dressing.

Despite their superficial differences, one thing all these batteries have in common is that the energy they contain is stored chemically within their electrodes. This has a consequence, at least for those with solid electrodes. The constant change in the electrodes' composition as they are charged and discharged gradually wears them out. This limited lifespan is one reason using batteries for grid-scale storage is still pricey. Indeed, Alevi's claim that its batteries can undergo more than 40,000 cycles of charging and discharging without noticeable loss of function is an important part of its sales pitch.

An alternative approach, known as a flow battery, does not suffer from this difficulty. A flow battery's energy is stored in its electrolytes (of which there are two, separated by a membrane), rather than its electrodes (see illustration 1). Not only does that stop the electrodes wearing out, it also means that there is no upper limit, based on the sizes of those electrodes, on how much energy such a battery can store. Its capacity depends instead on the size of the tanks used to hold the electrolytes.

Flow batteries are a much less developed technology than standard batteries, but they are beginning to become commercially available. Many of those on sale at the moment (by firms such as Gildemeister of Germany and UET of Washington state) use vanadium-based electrolytes. Vanadium is a good material because its multiple ionic states mean it can be used to store energy without having to involve other reagents, and thus complicate the design.

Unfortunately, vanadium is expensive. But systems that use cheaper materials are being developed. Several firms are trying zinc and bromine in electrolytes and others iron and chromium. Ideas still in the lab include

flow batteries based on cheap organic compounds called anthraquinones. If these prove robust enough to commercialise, they will be strong competitors in the grid-scale storage market. But they will not be alone. For batteries are not the only route to the destination.

| *Pumped up*

If the engineers at Gravity Power in Goleta, California, get their way, even pumped storage is in line for a makeover. Their approach, it should be said from the outset, is one of the most twinkly of the twinkling eyes in the field. Even if it ultimately fails it shows the originality of thought that is being brought to bear on the problem.

Instead of two large reservoirs at different altitudes on a hillside, Gravity Power proposes two water-filled cylindrical shafts—one wider than the other—dug into the ground (see illustration 2). The shafts will be linked top and bottom to form a circuit, with a combined pump-turbine, similar to the ones used in conventional pumped storage, in the upper link. The wider shaft will contain a huge cylinder, made either of the rock the shaft is cut through or of concrete, to act as a piston.

When the pump-turbine is opened, the piston sinks, driving water around the circuit and through the turbine, generating power. Spin the device the other way using electricity, and the reversed water flow pushes the piston up again.

How much energy this arrangement can store depends on how deep the shafts go. And that is where it gets tricky, for some serious civil engineering will be needed if the idea is to work. Gravity Power proposes the shafts descend hundreds of metres. This will require large thicknesses of suitable rock—in practice this will probably be limestone, which is soft enough to cut into—so deployment will be limited not so much by geography as geology. And making a good seal between piston and shaft will hardly be

trivial. So it will be expensive. A unit 700 metres deep, with a main shaft 26 metres across and a return shaft (or penstock) of about a tenth of that, would cost \$170m. It would, though, be able to store about 200MWhr of energy, with an output of 50MW. Building one that size is years away, but the firm hopes to start work in 2015 on a demonstration plant near Penzberg, in Germany, with a depth of 140 metres, a capacity of 500 kWhr and an output of 1MW.

Nor is Gravity Power's approach the only one to rely on underground spaces and friendly geology. Another is to fill a subterranean cavern with compressed air. For that, the cavern needs to be hermetically sealed and this means using an underground salt dome that has been hollowed out by solution mining (ie, the salt has been extracted with hot water).

Given such a cavern, compressed-air storage is a bit like classical pumped storage, except with a gas, rather than a liquid. Air is pumped into the cavern, increasing its pressure, and then let out to drive a turbine. But there is a catch: gases heat up when compressed and cool when they expand. For compressed-air storage to work, therefore, the air released from the cavern has to be heated (usually by burning natural gas), otherwise it would freeze the turbine. That makes compressed-air storage inefficient—one reason there are only two grid-scale examples of it in the world (one in Germany, the other in Alabama).

This would change if the heat of compression could be captured, stored and recycled. And that is the goal of LightSail Energy, a firm based in Berkeley, California. LightSail has developed a small, but still grid-scale, compressed-air system that sprays water into the compression chamber, to cool the air as its volume shrinks. The air is then stored in a set of tanks with a total volume of 42,000 litres, and the water, with its heat load, is put into two tanks that have, in total, about a quarter of the volume of the air tanks.

At the moment, this device can store 700kWhr of energy, but that should rise to 1.1MWhr when (as is the plan) it is pressurised to 300 atmospheres instead of the current 200. That is a fraction more than one of Alevo's battery packs, which store 1MWhr. For comparison, the Alabama salt dome can store 2.9GWhr.

If heat is to be stored at scale some inventors would prefer to simplify the process, get rid of the compressed air, and concentrate on sequestering the heat itself. Isentropic, a company in Fareham, Britain, plans to employ the compression and expansion of a gas (in this case, argon) to create heat and cold respectively in two large containers of gravel—one of the cheapest solid heat-storage media imaginable. Once again, a pump-turbine is involved. It does the compression and expansion when electricity is abundant, and when it is scarce the gas flow, and thus the heat flow and therefore the whole process, is reversed.

Nor are these ideas the end of the list. Several firms, from giants such as ABB of Zurich, to minnows such as Berkeley Energy Sciences, a neighbour of LightSail, are pushing giant flywheels as at least part of the answer. Another suggestion—for filling in the shortest irregularities in supply, those lasting a few seconds or minutes such as are caused by the passage of a cloud in front of the sun—is to use supercapacitors, which store electricity as an actual electric charge, rather than converting it into chemical or physical potential energy of a non-electric form. At the other end of the scale as far as the size of the gap in supply is concerned, namely the nocturnal hours when solar energy cannot operate, several research groups are trying to use molten salts (usually sodium and potassium nitrates) to store heat gathered during the day and then, at night, raise steam for generators with it.

And there is one further idea around that, though it relies on new storage technology being developed, does not rely on that technology being

developed specifically for grid-scale storage. This is to use the fleet of electric cars that its proposers hope will take over from ones driven by internal-combustion engines over the course of the next couple of decades.

In the imaginations of such people, the batteries of these cars (which would, when idle, be attached to the grid in order to charge them), could be employed as a giant storage network, to be plundered with the car owners' permission at times of peak demand. It is an intriguing thought—but the overlap between those times and the times cars are most likely to be on the road might scupper it in practice. As might the answer to the question about how ubiquitous electric cars will actually become. For that will depend on the future success and affordability of batteries.

The path from startup to success is littered with corpses, and an awful lot of business models depend for their putative profit on what is, according to your point of view, either a subsidy or a factoring in of the economic externalities (in the form of climate change) imposed by fossil fuels. In particular, Germany's Energiewende and California's Renewable Energy Programme have, by requiring a large fraction of those jurisdictions' electricity to be renewable, helped fuel the boom.

| *Your bill, sir*

The world would no doubt be a better place if the externalities imposed by fossil fuels were properly accounted for in the price of electricity. But that is a hard sell, not least because of disagreements about those externalities' true size. In the meantime, it is better if grid-scale storage can be rolled out without taxpayer support.

That is the main reason for watching the example of Alevo. It says it can make money even in unsubsidised grids, because it has been ruthless about reducing manufacturing costs and simplifying the technology as far as possible.

This is a businesslike approach. If it works, and others prove able to mimic it, then the cost of running a grid, and thus the price of electricity, will fall. That alone will be a good thing. But success will change the very nature of such a grid, enabling it to absorb more wind and solar power even if this is a consequence unintended by the grid owners. How much more is yet unknown, for fossil fuels (particularly natural gas) are getting cheaper too. But renewables will no longer be fighting the battle with one hand tied behind their back. ■



电网级存储

平稳运行的电网

在风力和太阳能发电中，要让产出和需求匹配很难。解决方法是把电网上过剩的电存起来，留待需要时使用

10月28日一家电池工厂在北卡罗来纳州的康科德市（Concord）投产。在一个经历过经济黑暗时期的地区，这是件利好之事，却鲜少见诸头版头条。或许它本该被大肆报道，因为这家工厂所属的瑞士企业Alevo集团并不制造用于手电筒、手机甚至笔记本电脑的电池。相反，它生产的电池可以存储大量的电——以兆瓦时计。而它计划把它们卖给电网运营商。

这些新电池首先会被用于消除一整天里因不规律的需求造成的后果，方法是在用电低谷期储存电，在用电高峰期反吐。如果这能成功，就不再需要用天然气供电的尖峰负荷电站。这种电站在有需要时会迅速启动，但运行成本昂贵。新电池也会让非尖峰负荷电站更高效地运转。Alevo认为，如果像美国西部连通电网（为美国和加拿大西部地区供电）那样大规模的电网使用总功率18吉瓦[1吉瓦=1百万千瓦]的该公司电池，每年能节省120亿美元。虽然该公司目前还没有北美地区的合同，但已经达成一项协议，将在中国广东省配备使用它的电池。

但是，让现有电网的运作变得更稳定可能只是个开端。乐观者相信，长远而言，像这样的电池，或者一些等效的技术，不仅是应对不规则需求的关键，也是解决不规律供电的关键。随着太阳能和风能的单位成本日益接近化石燃料的发电成本，不是时时刻刻都有风和阳光这件事变得越来越恼人。不止夜晚这个巨大的发电缺口是个问题，正如下方图表所示，即使在白天，甚至沙漠地区，日照光量也随时在变化。风当然同样飘忽不定。

低廉的电网级存储将克服这些不规律性，而后可再生能源只需进行成本竞争即可。如何实现这一点，目前有许多创意。其中一些，如Alevo生产的电池，已可以商业化。其他一些则已在实验室里获得成功，但尚未在实际应用中大规模推广。另一些还只是它们发明者眼里闪现着的各种不同阶段

的假想。然而，甚至只要其中一种能够胜任，那么可再生能源或许将能最终自力更生，不再需要政府补贴和监管以维持生存。

目前，电网级存储由抽水蓄能主导。根据美国智库电力研究协会的数据，全世界建造的抽水蓄能总功率达140吉瓦，蓄电容量达1.4太瓦时[1太瓦时=1000吉瓦时]。抽水蓄能需要合适的地形，建造两个隔开相当落差的水库。然后就只要用管道连接它们并使用涡轮机。上层水库放水会驱动涡轮机转动发电，但当电力驱动涡轮机时，它反向转动将水抽回至上层水库。在电力便宜时把水往上送，电力需求飙升时让水向下流，这样就有了一个不错的小生意。

不过，并非到处都有符合需要的山坡山谷，而建造抽水蓄能要耗费很长的时间和大量财力。那些投资规模小、但可按需求扩张的技术往往是更好的解决方案。

| 电池入选

由此，电网级存储的近期发展可能在于真的电池而非“地形电池”，至少Alevo公司这么认为。该公司位于康科德的工厂如全负荷运转，应该能年产存储总量达16.2吉瓦时的电池。Alevo并非一枝独秀，特斯拉正在内华达的里诺市（Reno）附近建造更大的工厂，为它的电动车以及本地和电网存储制造电池。

几家使用电池调节风力发电场发电的电站已经建设完成或正在建设中。在日本仙台，东芝正在创建基于锂电池的电站，预期会在2015年投产。它的最大功率将为40兆瓦，能以此功率运行半小时。于2013年在德克萨斯投产的诺特里斯电池存储项目（Notrees Battery Storage Project）使用铅酸电池，是汽油和柴油车所用电池的复杂版本。它的最大功率为36兆瓦，能全速运行40分钟。另一个项目位于日本青森县六所村（Rokkasho），最大功率为34兆瓦，使用钠硫电池。还有一个位于阿拉斯加的电站，最大功率27兆瓦，使用镍镉电池。

这个名单显示目前存在许多类型的电网级电池技术。Alevo使用由锂铁磷

酸盐和石墨制造的电极。它们由无机硫基电解液连接。该公司称这种组合尤其有利，因为充电和放电状态间的周期循环只带来电池温度1摄氏度的变化。这应该会消除某些锂基电池易过热的风险。

有些类型的电池事实上需要高温运作。在六所村使用的钠硫电池中，钠和硫元素都必须为液态，也就是说电池的温度必须保持在300至350摄氏度。而麻省理工学院的唐纳德·沙德维（Donald Sadoway）正在研发的方法使用两种液态金属，它们被液体电极隔开。这种设计的高明之处是选择了一种高密度金属如铈和铅的混合物、一种轻金属如锂，以及密度处于两者之间的电极，这三种物质会在容器中分层漂浮，就像沙拉酱中油和醋分离一样。

尽管有表面上的差异，所有这些电池有一个共通点：它们包含的电能都是以化学方式存储在电极中。这有一个后果，至少对那些使用固态电极的电池而言。在充放电过程中电极构成的不断变化会逐渐磨损电极。有限的使用寿命是电池用于电网级存储仍然昂贵的原因之一。实际上，Alevo宣称其电池能经受超过4万次充放电而无明显功能损耗，正是它的一个重要卖点。

一个替代方案是流体电池，它没有这种困境。流体电池的电能存储在其电解质（有两层电解质被一层薄膜隔开）而非其电极中（见图1）。这不会再损耗电极，也意味着电池可存储的电量没有上限。因为其存电量并不基于电极的尺寸，而取决于装电解质的容器大小。

流体电池相比标准电池是一项远欠成熟的技术，但它们正开始投放市场。许多目前正在销售的流体电池都使用钒基电解质。它们由德国的吉特迈集团（Gildemeister）和华盛顿州的UET等公司生产。钒是一种好材料，因为其多种离子状态意味着它不需要用到其他反应物来存储电能，从而简化了设计。

可惜的是，钒很昂贵。但使用更廉价材料的系统正在研发中。几家公司正尝试在电解质中使用锌和溴，其他公司则用铁和铬。尚在实验室阶段的创

意包括基于名为葱醌的廉价有机复合物的流体电池。如果能证明这些电池足够耐用而可被商业化，那么它们会成为电网级存储市场的强有力竞争者。不过，它们不会是唯一的选择，因为电池并非实现这种存储的唯一路径。

| 抽水蓄能

如果位于加州戈利塔（Goleta）的重力发电公司（Gravity Power）的工程师们得偿所愿，甚至连抽水蓄能也可能被改头换面。他们的方法应该说从一开始就是这个领域里最耀眼的明星。即使最终告败，它仍展现出为解决电网蓄电问题产生的创新思想。

不同于在山坡上建造有地势落差的两个大水库，重力发电公司提议向地下挖两口圆柱形充水竖井，其中一口比另一口宽（见图2）。两口竖井上下相连形成回路，在上方连接中有一套组合式水泵水轮机，类似传统抽水蓄能中使用的设备。更宽的竖井中会有一个巨大的圆筒充当活塞，它用挖井时取出的岩石或水泥制造。

当水泵水轮机打开时，活塞下沉，推动水在回路中流动并穿过水轮机，从而产生电能。用电力驱动设备反方向旋转，反向的水流会把活塞重新推高。

这种设计能存储多少电能取决于竖井挖多深。而在这个部分问题变得棘手，因为若要成功，会需要实施一些重大的土木工程。重力发电提议竖井下挖几百米。这需要找到大块适合的岩石，在实际操作中可能是石灰岩，因为它足够柔软可被切割。因此这个项目的部署会更多受到地质而非地形的限制。而让活塞和竖井间具有良好密封性可不是桩小事，因此造价会很昂贵。一套700米深的设备，主井26米宽，回流井（或称导水管）约为主井的十分之一宽，造价在1.7亿美元。不过它将能存储约200兆瓦时的电能，输出功率为50兆瓦。要建造如此规模的系统还要等很多年，但该公司希望2015年在位于德国潘茨堡（Penzberg）的一个示范工厂内开工，挖井深度140米，蓄电容量500千瓦时，输出功率1兆瓦。

并不只有重力发电公司的方法倚赖地下空间和有利地质，另一个方法是在地下岩洞中填充压缩空气。这需要岩洞完全密闭，意味着要使用水溶开采形成的地下盐穴（即用热水提取盐）。

在这样一个岩洞中，压缩空气蓄能有点像传统的抽水蓄能，除了用的是气体而非液体。空气被泵进岩洞中，增加其压力，然后释放出来驱动汽轮机。但有一个隐藏的问题：气体在压缩时升温，扩张时冷却。要让压缩空气蓄能奏效，从岩洞中排放的空气必须被加热（通常靠烧天然气），否则它会汽轮机冻住。这让压缩空气蓄能效率低下，这是全球只有两套电网级压缩空气蓄能（一套在德国，另一套在美国阿拉巴马州）的原因。

如果压缩空气产生的热量可被捕捉、存储和再利用，事情就会改观。而这正是总部位于加州伯克利的光帆能源公司（LightSail Energy）的目标。光帆能源研发了小型的、但仍属电网级的压缩空气系统。该系统把水洒入压缩舱中，在空气体积收缩时给气体降温。空气而后被存储在一组总容量4.2万升的气罐中，而带着热负荷的水则被放进另两个罐子中，总容量约为气罐的四分之一。

目前，这套设备可以存储700千瓦时的电能，但它计划把空气压缩程度从目前的200标准大气压增至300标准大气压，届时将能存储1.1兆瓦时的电能。这比Aleva的一套电池组1兆瓦时的存储量多了一点点。相比之下，阿拉巴马的盐穴能存储2.9吉瓦时的电。

如果热量要被大规模存储，那么一些研发者宁可简化过程，不保留压缩后的空气，而专注于隔绝保存热量本身。位于英国费勒姆（Fareham）的Isentropic公司计划利用一种气体（在此案例中是氩）的压缩和扩张在两个大型砾石容器中分别产生热和冷。砾石是可能想到的最便宜的固体蓄热媒介。这里再一次用到了水泵水轮机。当电力丰沛时，水泵水轮机压缩和扩张空气，当电力稀缺时，气体流动带动热量流动，整个过程逆转。

创意并不终结于此。几家公司正在推动巨型调速轮来解决至少部分问题。它们包括像苏黎世的ABB集团这样的行业巨头，也有伯克利能源科学

（Berkeley Energy Sciences，比邻光帆能源）这样不起眼的小公司。另一个建议是使用超级电容器，以实际电荷的状态蓄电，而不是把电转换成非电形态的化学或物理势能。这种方法是为了填补供电过程中最短暂的缺口，比如因为一片云遮住太阳而导致几秒或几分钟没有阳光。另一方面的研发关注供电缺口的规模，主要是晚间太阳能无法运作时的缺口。几个研究团队正尝试用熔融盐（通常是钠和硝酸钾）存储白天收集的热量，而后在夜间产生蒸汽来驱动发电机。

而在这个方面还有一个设想，虽然它依赖正在研发的新存储技术，而不是那些专门为电网级存储研发的技术。它利用电动车车队。提议者期冀未来二三十年里电动车会取代内燃机驱动的汽车。

在这些人的设想中，这些汽车的电池（在闲置不用时会连上电网充电）可被用作巨大的存储网络，在用电高峰期经车主允许而被大规模利用。这是一个非常有趣的想法，但是，那些用电高峰时段和汽车最有可能在路上跑的时段会重叠，从而在实际操作中可能让这个创意落空。此外，还有电动车实际会变得多普及这个问题，因为这取决于未来电池的成功与廉价。

从创业到成功的路上尸横遍野，而有大量商业模式把其假设利润建立在——就不同观点去看——或是一种政府补贴，或是把使用化石燃料的经济活动外部性（表现为气候变化）计入了成本核算。德国的能源转型计划（Energiewende）和加州的可再生能源计划（Renewable Energy Programme）要求这两个地区电力的一大部分为再生能源发电，尤其推动了这种创新热潮。

| 先生，花的是您的钱

如果使用化石燃料造成的经济外部性被恰当计入电价，那么世界无疑会变得更好。但这一点很难说服人，主要是因为对于那些外部性的真实规模尚无共识。与此同时，如果电网级存储无需纳税人的支持就可实现，则会更好。

这是我们关注Alevo这个例子的主因。该公司称，即使在没有政府补贴的

电网中它也能赚钱，因为它毫不留情地大幅削减制造成本，尽可能地简化技术。

这是一种务实的做法。如果成功，且证实可被其他企业复制，那么运行电网的成本及电力的价格都将下跌。这本身是件好事。但这种成功会改变这样一个电网的根本特性，让它能够吸纳更多风力和太阳能发电，即使这并非电网运营商预期的结果。增加的规模尚未可知，因为化石燃料（尤其天然气）也在变便宜。但是，可再生能源不会再被缚住手脚来打这场仗。■



Buttonwood

Tales of the unexpected

Five potential surprises for 2016

INVESTORS often start the calendar year in a buoyant mood, only to be caught out by unexpected events. It is almost inevitable that the consensus will be proved wrong in some respects, not least because the views of most investors will already be reflected in market prices.

So this column would like to suggest five potential surprises for 2016. The definition of a surprise is something that the consensus (as judged by betting sites or polls of fund managers) does not expect.

The first surprise may be that the dollar weakens, not strengthens. The consensus view is that the Federal Reserve, having pushed up rates before Christmas, will tighten monetary policy two or three more times in 2016. Higher rates will make investors eager to buy the dollar, especially as both the European Central Bank and the Bank of Japan will keep their rates near zero. However, the dollar has already had a very good run, so higher rates may already be priced into the currency. As it is, investors seem to doubt that the Fed will tighten as much as the central bank currently projects. The actual outcome may be feebler still.

The second surprise may be too familiar to deserve the name.

Commentators have been calling an end to the bull market in government bonds for many years now, and the pundits are expecting much the same in 2016. But persistently low inflation and the support of central banks have kept yields low to date, and may keep doing so. It is all reminiscent of Japan: since 2000, so many investors have failed to profit from betting on higher Japanese yields that the trade is known as the “widowmaker”. In the developed world, pension funds, insurers and retired workers are all eager

buyers of fixed-income assets. Perhaps bond yields will edge higher in 2016, but not by very much.

These two surprises may have a common cause: the failure of the global economy to grow as rapidly as some hope. In turn, economic sluggishness seems likely to drive voter discontent. And that may lead to the third and fourth surprises.

American political risk could dog the markets in late 2016. At the start of 2015, investors probably anticipated a dynastic clash between Jeb Bush and Hillary Clinton. But the Republican candidate seems more likely to be either Donald Trump or Ted Cruz. The former has argued for a ban on Muslims coming to America and a wall on the southern border; the latter's proposals include a flat income tax, a sales tax and a monetary system linked to gold. Although Mrs Clinton would be the favourite in a race against either man, she is a flawed candidate, mistrusted by many voters. The prospect of a Cruz or Trump presidency would lead to considerable uncertainty in the markets: should either man be elected, would they try to stick to their campaign pledges and would Congress let them? Indeed, this uncertainty might be another reason why the dollar may struggle in 2016.

Political risk might also be a problem in Britain, which is likely to hold a referendum on leaving the European Union in 2016. It is widely assumed that Britons will vote for the status quo: that outcome has a 78% probability on the PredictIt website. But opinion polls show that the "remain" and "leave" camps are almost deadlocked and the press is fairly Eurosceptic. Voters might use the referendum as a means of protesting against high levels of immigration, which the government has promised, but failed, to reduce.

If Britain votes for exit, there will be much uncertainty about the country's attractiveness to foreign investors. Scottish voters are much more pro-EU

than English ones, and Brexit would prompt calls for a second independence referendum so Scotland could stay in the single market. David Cameron, Britain's prime minister, would surely have to resign if his referendum gamble backfired. All this might be good reason to sell the pound.

The final surprise might be more benign: emerging markets could perform rather better than investors expect. A poll of fund managers in December by Bank of America-Merrill Lynch found that pessimists on emerging markets outnumbered optimists by 27 percentage points. There is plenty of bad news: China's slowdown, falling commodity prices and recessions in Brazil and Russia, for example. But this may have been built into prices; the MSCI emerging-market index has fallen by 20% over the past six years while the S&P 500 index is up by 40% (see chart). It may be time for a rebound.

Not all of these surprises will come to pass, of course. But it seems likely that at least one or two will. Predicting which ones may mark the difference between success and failure for investors in 2016. ■



梧桐

意外之说

2016年可能发生的五大意外

一年之始，投资者往往热情高涨，却不料会被突发情况所困。市场共识的某些方面几乎总难免被事实推翻，尤其是因为大部分投资者的观点早已反映在市场价格之中了。

因此，本专栏想要指出2016年可能发生的五个意外事件。所谓意外事件，即市场共识（如博彩网站的判断或者对基金经理们的调查）未能预料到的情况。

第一个意外也许是美元会变得疲弱，而非走强。市场普遍认为，美联储继圣诞节前加息后，还会在2016年收紧货币政策两到三次。利率提高将令投资者争相购入美元，尤其是在欧洲央行和日本央行仍将利率保持在接近零的情况下。然而，美元升势已经相当不俗，其价位或许已提前消化了美元再度加息的市场预期。事实上，投资者似乎不太相信美联储会像其目前预测的那样收紧货币政策。实际结果可能是美元更显疲弱。

第二个意外或许为人们熟知，而称不上什么意外。评论员们多年来一直高呼国债牛市要结束，这些专家对2016年的预期也差不多。但长期低通胀及央行的支持令目前国债收益保持在较低水平，且情况可能持续。这一切令人联想到日本：自2000年来，众多投资者做空日本国债均无法获利，以致这样的交易落得“寡妇制造者”之名。在发达国家，养老基金、保险公司和退休人士都热衷于购买固定收益资产。也许国债收益在2016年会有所上升，但幅度不会太大。

这两个意外也许有一个共同原因：全球经济无法如部分人所希望的那样快速增长。而反过来，经济低迷似乎会令选民不满，这或许会导致出现第三及第四个意外。

美国的政治风险可能在2016年底困扰市场。2015年初，投资者大概预期美国大选会是杰布·布什和希拉里·克林顿之间的一场王朝之争。但如今共和党候选人似乎更可能是唐纳德·特朗普（Donald Trump）或特德·克鲁兹（Ted Cruz）。前者主张禁止穆斯林进入美国，并提出在南部边境修建围墙；后者主张实施单一所得税、销售税及与黄金挂钩的货币体系等政策。尽管相比这两位先生，希拉里胜算较高，但她也不无缺陷，许多选民对她心存疑虑。克鲁兹或特朗普可能当选总统会给市场带来相当大的不确定性：如果两人中的任何一人当选，会否坚持其竞选承诺，国会又会否通过其主张？的确，这种不确定性也许是2016年美元可能挣扎的另一原因。

政治风险可能也是英国要面对的问题，该国很可能就是否脱离欧盟在2016年举行公投。普遍认为，英国人将投票支持维持现状。根据PredictIt网站预测，此结果的概率为78%。但民意调查则显示“去”、“留”两大阵营几近势均力敌，而媒体则在相当程度上持欧洲怀疑论。选民或许会通过公投抗议大量移民涌入，毕竟政府曾承诺要减少移民数量，却未能兑现。

假如英国公投结果是脱离欧盟，英国对外国投资者的吸引力将平添很大的变数。苏格兰选民远比英格兰选民更倾向支持欧盟，英国脱欧将会促使苏格兰为求留在欧洲单一市场而发起第二次独立公投。英国首相卡梅伦的公投赌博如果事与愿违，他肯定不得不辞职。所有这一切可能是抛售英镑的好理由。

相较而言，最后一个意外也许并非坏事：新兴市场的表现或许会好于投资者预期。美国美林银行（Bank of America-Merrill Lynch）在2015年12月对基金经理们做的一项调查发现，看淡新兴市场前景的基金经理比看涨的多27个百分点。坏消息不少，比如中国经济放缓、大宗商品价格下跌，以及巴西和俄罗斯经济陷入衰退。但这或许已经反映在市场价格之中；在过去六年里，MSCI新兴市场指数已下跌20%，而标准普尔500指数则上升了40%（见图表）。也许是到了反弹的时候了。

当然，并非所有这些意外都会成真，但其中至少一两个情况很可能发生。投资者在2016年成败的关键也许就在于他们预测哪些情况将至。■



Free exchange

Wookienomics

Like the Force, economics binds the galaxy together

THE latest chapter in the “Star Wars” saga, “The Force Awakens”, opened in cinemas worldwide on December 16th, after *The Economist* went to press. Most fans will queue up to watch nail-biting lightsaber duels and catch up on the lives of beloved characters. Economists, who can render the most exciting of material dull, will be more interested in the state of the galactic economy. Did the destruction of the Death Star at the end of the sixth film in the series trigger a massive financial crisis, as a recent paper* by Zachary Feinstein, a professor of financial engineering at Washington University in St Louis, speculates? What sort of structural reforms might the new galactic government adopt?

While awaiting answers to these and other important questions, *The Economist* undertook an exhaustive, popcorn-fuelled examination of the first six episodes of the saga, in search of broad economic lessons. The “Star Wars” galaxy is both technologically advanced and economically stagnant, plagued by inequality and ossified political institutions. It is not entirely alien, in other words. Though far, far away, it offers three important lessons for residents of the Milky Way.

The first is the value of trade: the freer the better. Fans moaned in dismay when the opening blurb of the first prequel (Episode I, released in 1999) dwelt on the details of a trade dispute. Yet in the distant galaxy, as in this one, trade conflicts are a rich source of dramatic tension. Among the most important technologies in the “Star Wars” universe is the hyperdrive, which allows travellers to evade the constraints of relativity and travel fantastic distances in a jiffy. Without the hyperdrive, moving between even the closest star systems would take years or decades, even assuming travel at

near-luminal speeds—making trade difficult and costly.

Hyperdriven trade, in turn, enables a higher level of income per person than would be possible in a galaxy of planetary autarky. Some planets—those with a diversity of species and resources—would do well enough in a tradeless galaxy. But those like the desert planet Tatooine or the ice planet Hoth would be barren without the possibility of imports from other worlds.

Trade allows desolate planets to specialise in the production of valuable commodities—minerals in Tatooine’s case. Others can turn their entire surface over to farming, or to urbanisation (the imperial capital, Coruscant, is a planet-sized city). Richly endowed planets gain by specialising in industries in which they enjoy the biggest comparative advantage, using some of the proceeds to obtain goods or services they are not quite as good at producing themselves. At the same time, trade allows bleaker planets to export what resources they have in exchange for the imports needed to make them habitable—food, most obviously.

The gains from galactic trade are reduced, however, by the monopolies granted to powerful industry groups, such as the Trade Federation, which invades the peaceful planet Naboo in Episode I. Trade franchises are troubling for a number of reasons. They allow the monopolist to charge a premium, capturing benefits that would otherwise flow to producers or consumers. They encourage criminality by those seeking to circumvent the monopoly (like the smuggling of spice, a narcotic, by Han Solo, on behalf of the gangster Jabba the Hutt). And they encourage monopolists to devote valuable resources to rent-seeking. The Republic’s bureaucrats, we learn from Naboo’s then-senator, Sheev Palpatine, are “on the payroll of the Trade Federation”.

Although globalisation, or rather galacticisation, is an economic boon, it

presents all sorts of political challenges that are not easily managed. This is the second lesson. Dani Rodrik, an economist at Harvard University, argues that globalisation prevents countries from achieving more than two of three desirable goals: economic integration, national sovereignty and democracy. The inhabitants of the “Star Wars” universe face similar problems: the price of participation in the galactic economy is the acceptance of rules that irk planetary governments. In Episode II, a “Confederacy of Independent Systems” moves to secede from the Republic in response to regulations seen as placing an undue economic burden on poorer planets. The Rebel Alliance that battles the Empire in Episodes IV to VI is trying to restore democracy and planetary sovereignty, although that may well undermine the economic integration enabled by unitary government.

| *The droids we're looking for*

The third lesson is for those pondering their career options in an era of machine intelligence. The humans in the saga still labour at dangerous and unpleasant tasks—flying the galactic equivalent of fighter jets, for example, and toiling in dangerous spice mines—despite the crowds of clever robots that populate the galaxy. Indeed, the robots of “Star Wars”, for all their technological wizardry, do not seem to be able to do everything humans can. When Obi-Wan Kenobi, a Jedi knight, is shown an army of human clones—soon to become storm-troopers—commissioned by a colleague, he is told that they are “immensely superior to droids, capable of independent thought and action”. So far, so reassuring.

Yet humans also work because of the inequities of the galactic political system. Anakin Skywalker, the emotionally scarred Jedi who later becomes Darth Vader, first appears in the series as a slave on Tatooine. Anakin’s son Luke, though not a slave, harvests atmospheric moisture in relative poverty while those at the heart of the galaxy live in luxury. Humans will work for a

pittance, if necessary, to scrape by. This may lead them to the dark side. Worse, it might prompt inquisitive souls to ask what forces drive such an uneven distribution of wealth, turning them into those most dreaded of creatures: economists.

* Studies cited in this article can be found at www.economist.com/starwars15 ■



自由交流

星球大战经济学

像“原力”一样，经济学把星系联系在一起

《星球大战》系列的最新一集《原力觉醒》12月16日在全球影院上映。大多数影迷都会排队观看那扣人心弦的光剑决斗，了解自己喜爱的角色发生了什么新故事。那些能把最令人兴奋的素材搞得沉闷不堪的经济学家们则会对星系经济更感兴趣。《星球大战》第六集结尾时死星（the Death Star）毁灭了，这会不会如同圣路易斯华盛顿大学（Washington University in St Louis）金融工程教授扎卡里·范斯坦（Zachary Feinstein）在最近一篇论文*里推测的那样，引发一场大规模的金融危机？新的星系政府会进行哪种结构性改革？

在等待这些问题和其他重要问题的答案的同时，《经济学人》在爆米花的助力下对该系列电影的前六集进行了详尽的盘点，找寻经济方面的普遍经验教训。《星球大战》中的星系在技术上很先进，同时经济上停滞不前，饱受不平等和僵化政治制度的困扰。换句话说，这并不完全陌生。虽然这个星系很遥远，但它为银河系的居民提供了三条重要的经验。

首先是贸易的价值：越自由越好。当前传一（第一集，1999年上映）在开幕宣传中详述一场贸易争端的细节时，影迷们发出了惊恐的悲叹。但和我们的银河系一样，在那个遥远的星系中，贸易冲突也是造就戏剧性紧张态势的丰富来源。在《星球大战》的宇宙中，最重要的技术之一是超光速驱动器（hyperdrive），它让旅行者摆脱相对论的制约，在瞬间跨越惊人的距离。没有超光速驱动器，即使假设以接近光速的速度旅行，穿越最近的恒星系统也需要几年或几十年，这使贸易变得困难且代价高昂。

比起星系中行星自给自足的情况，由超光速驱动器帮助达成的贸易反过来又能提高人均收入。如果星系里没有贸易，那些拥有多样物种和多种资源的行星会过得很不错。但是，如果不能从其他星球进口物资，像沙漠行星塔图因（Tatooine）或者冰雪星球霍斯（Hoth）这样的行星将会是不毛之

地。

贸易使荒凉的行星能专注于生产有价值的商品，例如塔图因就专门生产矿物。其他行星可以把自己的整个表面都变成农田或城市（帝国首都科洛桑 [Coruscant] 就是一个行星大小的城市）。贸易能使一些得天独厚的行星获益，它们可以专门从事自身拥有最大比较优势的产业，并使用部分收入来获取它们不太擅长生产的商品或提供的服务。同时，贸易也使较荒凉的行星能出口自己拥有的资源以换取那些让它们变得宜居的进口商品，最显而易见的就是食品。

然而，把垄断权授予强大的企业集团（比如在第一集里入侵和平的纳布星 [Naboo] 的“贸易联盟” [the Trade Federation]）使星系贸易的收益减少。贸易专营权令人困扰，有几个原因。它们让垄断者能够收取额外的费用，截取本可流向生产商或消费者的利益。它们助长了试图规避垄断的犯罪行为（比如汉·索罗 [Han Solo] 就为匪徒赫特人贾巴 [Jabba the Hutt] 走私香料，即一种毒品）。它们还鼓励垄断者把宝贵的资源用于寻租。我们从当时纳布星的参议员希夫·帕尔帕廷（Sheev Palpatine）那里得知，共和国的官员们都“拿着‘贸易联盟’的工资”。

尽管全球化（更确切地说星际化）是经济福利，但它带来了各种棘手的政治挑战。这是第二条经验。哈佛大学的经济学家丹尼·罗德里克（Dani Rodrik）认为，全球化使国家无法实现经济一体化、国家主权和民主这三个理想目标中两个以上的目标。《星球大战》宇宙里的居民也面临同样的问题：参与星系经济的代价就是要接受那些激怒行星政府的规则。在第二集中，因为一些法规被视为向较穷的行星过度施加经济负担，“独立星系邦联”（Confederacy of Independent Systems）努力要脱离共和国。在第四集和第六集中，“义军同盟”（Rebel Alliance）与帝国作战，试图恢复民主和行星主权，尽管这很可能会破坏由中央集权制政府促成的经济一体化。

| 我们要找的机器人

第三条经验是给那些在机器智能时代里苦思自己职业选择的人。尽管星系

中居住着大量聪明的机器人，这个系列电影里的人类仍然从事着危险和令人讨厌的工作，比如说，驾驶星系战斗机，或者在危险的香料矿中劳作。事实上，即便“星球大战”的机器人技术很先进，但是它们似乎不能做人类能做的所有事情。当绝地武士欧比旺·肯诺比（Obi-Wan Kenobi）参观同事委托制造的克隆人军队（他们后来很快就变成了冲锋队）时，他被告知，它们“比机器人优越得多，能够独立思考和行动”。到目前为止，一切都还让人放心。

然而，由于星系政治体系内的不公平，人类也要工作。后来成为达斯·维德（Darth Vader）的绝地武士阿纳金·天行者（Anakin Skywalker）情感上伤痕累累，他在系列电影中第一次出现时就是塔图因星球上的一名奴隶。阿纳金的儿子卢克（Luke）虽然不是奴隶，但靠从大气中采集湿气为生，生活相对贫困，而星系中心的人们却生活奢华。如有必要，人类会为微薄的薪水工作以勉强度日。这可能会把他们带向黑暗面。更糟的是，它可能会促使好奇的人们发问，是什么力量导致了这种财富分配不均，进而把他们变成最可怕的生物：经济学家。

*本文所引的研究可见www.economist.com/starwars15 ■



Global inflation

Low and behold

Another year of low prices will create strains in the world economy

ECONOMISTS don't forecast because they know, said J.K. Galbraith; they forecast because they're asked. A question that is increasingly put to them is whether inflation, which has been remarkably quiescent for years, will spring a surprise in 2016. After all, the debt troubles that have weighed down rich economies since 2007 are fading; labour markets in America, Britain and Germany are increasingly tight; housing markets are gathering steam; and the Federal Reserve has just raised interest rates for the first time in almost a decade.

Inflation in America and Europe should indeed pick up from its present, near-zero state as the big declines in energy prices at the turn of 2015 drop out of the headline rate. But a glut in the supply of crude means that oil prices are falling again. If debt is receding as a problem in rich countries, it looms larger in emerging markets, where overcapacity brought on by binge-borrowing exerts a downward force on prices. There is inflation in commodity-exporting countries, such as Brazil, whose currencies have been trashed. But global inflation is a tug-of-war between bottlenecks in parts of the rich world and imported deflation from emerging markets, and the enduring fall or stagnation of prices looks set to dominate for a while yet. Indeed, this "lowflation" means that three aspects of the world economy are worth watching in 2016.

Start with Saudi Arabia. The falling price of crude is in part a consequence of its commitment (reiterated by OPEC ministers on December 4th) to produce at full tilt. The idea is to flush out the weaker producers in America's shale-oil industry and elsewhere. This is proving a costly gambit. Saudi Arabia needs a barrel of oil to fetch around \$85 to finance public

spending and around \$60 to keep its current account in balance. Yet the oil price recently fell below \$36, to an 11-year low, before rebounding a little. America has sustained oil production of above 9m barrels a day, despite a sharp fall in the number of oil rigs, suggesting that shale firms are becoming more efficient.

Last week Saudi Arabia said that it would cut local subsidies on petrol, electricity and water in order to chip away at a budget deficit that reached 367 billion riyals (\$98 billion), or 15% of GDP, in 2015. The Saudis are burning through their (ample) foreign-exchange reserves to pay for imports while maintaining the riyal's peg with the dollar. But the cost of this strategy has already forced two other oil exporters, Kazakhstan and, more recently, Azerbaijan, to abandon their dollar pegs. The public finances of other big oil producers, such as Russia and Nigeria, are also under pressure. No wonder a devaluation of the riyal this year is a favoured tail-risk for currency forecasters.

A second place to watch is China. A construction boom has left it with a mountain of debt and excess capacity in some industries—notably steel, whose falling global price has claimed jobs in Europe's industry and led to growing complaints of Chinese dumping. Factory-gate prices have fallen in China for 45 consecutive months. Further fiscal and monetary stimulus should help to boost demand, but will also hinder the management of China's exchange rate, which is already under pressure from an outflow of capital.

As with the riyal, the yuan has just about kept pace with the dollar's ascent over the past two years, leaving it looking expensive. Beijing has signalled that it wants to benchmark the yuan against a basket of currencies, and some forecasters expect a gradual decline in its value against the dollar in 2016. But there is an understandable fear that the yuan may slip anchor, potentially touching off a round of devaluations in Asia.

A third outcome from continued lowflation will be increasingly lopsided economies in the rich world, particularly in America, where recovery is more advanced than in Europe. If productivity stays as weak as it has been recently, unemployment is likely to fall still further. At the same time, slow growth in emerging markets is likely to keep downward pressure on commodity prices and on their currencies. A strong dollar has already driven a wedge between the performance of America's manufacturing and service industries. Further appreciation would make it harder for the Federal Reserve to push through more increases in interest rates.

| *Strong on jobs, weak on prices*

All this would make for a strangely configured economy by the end of the year. An unemployment rate of 4%, a Fed Funds rate below 1%, an overvalued dollar, a strong housing market and inflation below the Fed's target of 2% is a plausible, if very odd, mix, which could portend either a sudden burst of inflation or enduringly feeble demand. An honest economist will admit the uncertainties in any forecast. But another year of lowflation will surely tax policymakers. ■



全球通胀

低迷，小心

商品价格再一年走低将对世界经济构成压力

约翰·肯尼斯·加尔布雷斯 (J.K. Galbraith) 说过，经济学家做出预测并非因为他们洞悉先机，而是因为被人发问。目前越来越多人问他们的一个问题是，沉寂多年的通胀水平是否会在2016年惊喜反弹？毕竟，2007年以来拖累发达经济体的债务问题正在消退；美国、英国、德国的劳动力市场日渐紧张；房地产市场正在积攒力量；美联储刚刚加息，为近十年来首次。

2014年与2015年之交，能源价格大幅下跌，随着这一因素对整体通胀率的影响减弱，美国及欧洲的通胀确实应该从目前近乎零的水平回升。但原油的供过于求意味着油价还会继续下跌。如果说富裕国家的债务问题正在消减，新兴市场的债务则日显严重，疯狂借贷导致产能过剩，继而对商品价格造成下行压力。巴西这样的大宗商品出口国存在通胀，其货币已经大幅贬值。但全球通胀是一场拔河战，一边是富裕世界部分地区的瓶颈问题，另一边是来自新兴市场的输入性通缩，如今看来，价格势必还将持续下跌或停滞一段时间。的确，这番“低通胀”意味着在2016年，世界经济的三个方面值得留意。

先看沙特阿拉伯。原油价格的下跌与其承诺全力生产石油（欧佩克部长们在12月4日重申了这一点）不无关系。这样做是为了淘汰掉美国页岩油业及其他地区的弱势生产者。事实证明这一策略代价高昂。沙特阿拉伯需要将油价保持在每桶85美元左右才能平衡公共财政支出，若要保持经常帐户收支平衡，油价也需要保持在每桶60美元左右。但石油价格最近跌至11年来的低位，每桶不到36美元，之后轻微反弹。在美国，虽然石油钻井数量大幅减少，但仍保持每天超过900万桶的产量，表明页岩油企业正变得越来越高效。

上周，沙特阿拉伯表示将削减对汽油、电力及用水的补贴，以期削减2015

年高达3670亿里亚尔（980亿美元）、占GDP的15%的财政赤字。沙特大量消耗其（充足的）外汇储备来支付进口，同时保持里亚尔与美元的汇率挂钩。但这一策略的代价已先后迫使哈萨克斯坦及阿塞拜疆这两个石油出口国放弃本国货币与美元汇率的挂钩。其他石油出口大国，如俄罗斯和尼日利亚，其公共财政也面临压力。难怪汇率走势预测大多认为今年出现的尾端风险可能是里亚尔的贬值。

第二要关注的是中国。建设热潮导致某些行业债台高筑、产能过剩，特别是钢铁行业。全球钢铁价格的下跌已令欧洲业内工人失业，导致怨声载道，指责中国倾销。在中国，工业品出厂价已连续45个月下跌。进一步的财政及货币刺激应该有助于提振需求，但也将阻碍中国的汇率管理，而资本外流已经对人民币汇率造成压力。

与里亚尔一样，在过去两年里，人民币大致与美元升势同步，汇率看上去已处于高位。北京已经表示希望以一篮子货币为基准为人民币定价，而部分专家预测2016年人民币兑美元汇率将逐步下跌。但也有合理的担忧，即人民币也许会一跌不可收拾，这可能在亚洲触发一轮货币贬值。

持续低通胀的第三个后果将是富裕世界经济体的发展愈加失衡，尤其是在先于欧洲复苏的美国。假如生产力仍像最近一样持续偏低，失业率可能会进一步下降。同时，新兴市场增长迟缓很可能对大宗商品价格及这些国家的货币汇率产生下行压力。美元强势已令美国制造业和服务业的表现分化，进一步升值将令美联储难以再次推动加息。

| 就业强，价格弱

所有这一切会使经济在年底前形成怪异的格局。失业率为4%，美联储基金利率低于1%，美元汇率过高，房地产市场兴旺，通胀低于美联储所定的2%目标——如此奇怪非常的混合体完全有可能出现，这也许预示着通胀将突然爆发或需求持续疲软。诚实的经济学家会承认，任何预测都存在不确定性。然而又一年低通胀则肯定是对决策者的一大考验。■



Companies' investment plans

From diggers to data centres

Computers, research and software will be the big-ticket items in 2016

THERE have been three great waves of corporate investment in the past two decades. First came the dotcom splurge of 1997-2001, when cash was poured into building mobile-phone networks and the internet's backbone. Then there was the emerging-market frenzy of 2003-10. Western firms threw about \$2 trillion into factories and other facilities in places like China and India. In 2005-13 there was a craze for commodities, partly driven by insatiable Chinese demand. Global energy and metals firms spent \$6 trillion digging in the Australian outback and drilling for oil in North Dakota and deep beneath Brazil's coastal waters.

The dotcom boom turned to bust, emerging markets are now in poor shape and commodity prices have slumped in the past year (costing some firms' bosses their jobs—see previous article). So where are companies looking to invest now? A new study by Hugo Scott-Gall, of Goldman Sachs, a bank, crunches the numbers for capital investment at more than 2,500 firms worldwide, forecasting how things will look in 2017 compared with 2014. It finds a startling divergence across industries (see chart 1).

Energy, mining and chemicals firms are expected to slash their capital-investment budgets by 20-50%. Property firms are cutting back too, in part reflecting the end of China's building boom. This has a knock-on effect on those capital-goods firms that supply equipment to these industries. For example, Caterpillar, which makes diggers used by mining and construction firms, expects its capital investment in 2016 to be half the level of 2012.

In contrast, internet, software and other tech firms are on a high, with their

budgets expected to expand by a quarter or more. Though some tech firms have gone asset-light, renting their processing power and data storage in the online “cloud”, others—including cloud-providers themselves—are splurging on hardware. In 2016 the combined capital spending of Google and Apple will be \$24 billion, almost equal to Exxon’s \$28 billion budget.

Measured in dollars, the overall picture is of a 15% fall in corporate capital spending by 2017. Allowing for the greenback’s big rise since 2014, the fall will be just 5% or so in local-currency terms. And the figures exclude research-and-development (R&D) spending. That is rising quickly. America’s national accounts, for example, show an economy-wide decline in investment in physical plant being offset by a rise in R&D and software spending.

However you slice the numbers, growth in capital investment is unusually concentrated. Of the industries that Goldman studied, 22 are forecast to have shrinking budgets in dollar terms and 12 are expected to grow. The top 20 spenders on R&D—firms such as Samsung, Roche, Novartis and Microsoft—account for 25% of worldwide R&D spending by listed firms, according to Bloomberg, an information provider. The corporate world seems mostly destined to stagnation, with only a few hotspots of investment and growth.

So investors might hope that an elite of investment-intensive, technology-based firms will conquer new markets and increase profits faster than all others. That is certainly what Silicon Valley’s boosters think will happen. They cheer each time tech firms unveil some new area of expansion—smart watches, driverless cars, virtual-reality goggles, delivery drones.

Yet history suggests that whenever there is a near-unanimous view on what to invest in, disaster follows as firms in those industries lose their spending discipline. The shares of Western firms exposed to energy and

emerging markets have lagged the S&P 500 index by over 50% in the past two years. In 2016 it should become clearer whether the present funnelling of investment into tech-based industries reflects a step change in the way the economy works, or is just a symptom of a stagnant climate in which pockets of opportunity are hyped beyond their true potential. ■



企业投资计划

从挖掘机到数据中心

计算机、科研、软件将是2016年的大额支出项目

过去20年里，企业投资掀起过三次大潮。先是1997年至2001年的互联网泡沫时期，大量资金涌入移动电话网及互联网骨干网的建设中。然后是2003年至2010年的新兴市场狂热期。西方企业向中国和印度等地的工厂及其他设施大量砸钱，投资约两万亿美元。2005年至2013年则掀起了大宗商品热潮，部分源于中国庞大需求的推动。全球能源及金属企业投入六万亿美元分别在澳大利亚内陆地区开采资源，在美国北达科他州及巴西近海的海底钻探石油。

互联网泡沫最终破裂，新兴市场如今状况不佳，大宗商品价格则在过去一年一落千丈（已致使部分公司老板下台）。那么，企业现在都往何处投资？由高盛银行的雨果·斯科特-高尔（Hugo Scott-Gall）做的一项新研究分析了全球2500多家企业的资本投资数字，对2017年的情况（相比2014年）作出预测。研究发现，各行业呈现惊人的差别（见图表1）。

据估计，能源、矿业、化工企业预计将削减20%至50%的资本投资预算。房地产企业也在缩减投资，部分反映了中国的建筑热潮已经终结。向这些行业供应设备的资本品企业也受到连锁影响。比如，采矿及建筑用挖掘机的生产商卡特彼勒（Caterpillar）在2016年的资本投资额预计仅为2012年的一半。

相比之下，互联网、软件及其他科技公司投资热情高涨，预算估计将扩大四分之一或更多。虽然部分科技公司已转向轻资产模式，向在线“云”租用数据处理及存储能力，但其他科技公司则在硬件设备上大肆投资，包括云供应商本身。2016年，谷歌和苹果的资本支出加起来将达到240亿美元，几乎相当于埃克森美孚280亿美元的预算。

以美元计算，截至2017年，企业资本支出估计将总体下跌15%。如果剔除

2014年以来美元大幅升值的因素，以当地货币计算，资本支出跌幅将仅为5%左右。而且这些数字未包含目前正迅速上升的研发支出。例如，美国国民核算数据显示，研发和软件上的投资增长抵消了整体经济实体工厂投资的下滑。

无论怎样解析这些数字，资本投资的增长都异常集中。高盛研究的行业中，有22个预计会缩减投资预算（以美元计算），有12个行业则有望增加投资。据资讯提供商彭博的数据，包括三星、罗氏、诺华、微软在内，研发预算最高的20家企业占了全球上市公司研发支出的25%。企业界似乎大多注定陷入停滞，只有少数几个投资及增长热点。

所以，投资者也许希望有一批以科技为本的投资密集型精英企业能征服新市场，比其他所有公司都更快地提高利润。硅谷的支持者深信这绝对会实现。每当科技企业拓展至新领域，推出诸如智能手表、无人驾驶汽车、虚拟现实眼镜、快递无人机等产品时，他们都会欢呼雀跃。

但历史经验表明，每当人们普遍看好某个投资领域时，那些行业的企业往往会不再遵守投资纪律，导致灾难性收场。过去两年，受能源业及新兴市场影响的西方企业的股价一直落后于标普500指数50%还多。目前大量投资涌向科技产业的现象究竟是反映了经济运行方式的一大跃变，还是经济停滞的又一症状——机遇的潜力被大肆吹嘘而名不副实？答案在2016年应该会更加清晰。 ■



Free exchange

Exit, pursued by bear

The Fed has at last raised rates. What happens next?

IT IS more than three weeks since the Federal Reserve raised interest rates for the first time in over nine years, and the world has not (yet) ended. But it is too soon to celebrate. Several central banks have tried to lift rates in recent years after long spells near zero, only to be forced to reverse course and cut them again (see chart). The outcome of America's rate rise, whatever it may be, will help economists understand why zero exerts such a powerful gravitational pull.

Recessions strike when too many people wish to save and too few to spend. Central banks try to escape the doldrums by slashing interest rates, encouraging people to loosen their grip on their money. It is hard to lower rates much below zero, however, since people and businesses would begin to swap bank deposits for cash or other assets. So during a really nasty shock, economists agree, rates cannot go low enough to revive demand.

There is significant disagreement, however, on why economies become stuck in this quagmire for long periods. There are three main explanations. The Fed maintains that the problem stems from central-bank paralysis, either self-induced or politically imposed. That prevents the use of unconventional monetary policies such as quantitative easing—the printing of money to buy bonds. The intention of QE is to buy enough long-dated debt to lower long-term borrowing rates, thereby getting around the interest-rate floor. Once QE has generated a speedy enough recovery, senior officials at the Fed argue, there is no reason not to raise rates as in normal times.

If the Fed is right, 2016 will be a rosy year for the American economy. The

central bank expects growth to accelerate and unemployment to keep falling even as it lifts rates to 1.5% or so by the end of the year. Yet markets reckon that is wildly optimistic, and that rates will remain below 1%. That is where the other two explanations come in.

The first is the “liquidity trap”, an idea which dates back to the 1930s and was dusted off when Japan sank into deflation in the late 1990s. Its proponents argue that central banks are very nearly helpless once rates drop to zero. Not even QE is much use, since banks are not short of money to lend, but of sound borrowers to lend to.

Advocates of this theory see only two routes out of the trap. The government can soak up excess savings by borrowing heavily itself and then spending to boost demand. Or the central bank can promise to tolerate much higher inflation when, in the distant future, the economy returns to health. The promise of higher-than-normal inflation in future, if believed, reduces the real, or inflation-adjusted, interest rate in the present, since money used to repay loans will be worth less than the money borrowed. Expectations of higher future inflation therefore provide the stuck economy with the sub-zero interest rates needed to escape the rut.

Governments pursued both these policies in the 1930s to escape the Depression. But when they reversed course prematurely, as America’s did in 1937, the economy suffered a nasty and immediate relapse. The liquidity-trap explanation suggests the Fed’s rate rise was ill-advised. The American economy, after all, is far from perky: it is growing much more slowly than the pre-crisis trend; inflation is barely above zero; and expectations of inflation are close to their lowest levels of the recovery. If this view is correct, the Fed will be forced by tumbling growth and inflation to reverse course in short order, or face a new recession.

| *Stuck in a glut*

There is a third version of events, however. This narrative, which counts Larry Summers, a former treasury secretary, among its main proponents, suggests that the problem is a global glut of savings relative to attractive investment options. This glut of capital has steadily and relentlessly pushed real interest rates around the world towards zero.

The savings-investment mismatch has several causes. Dampened expectations for long-run growth, thanks to everything from ageing to reductions in capital spending enabled by new technology, are squeezing investment. At the same time soaring inequality, which concentrates income in the hands of people who tend to save, along with a hunger for safe assets in a world of massive and volatile capital flows, boosts saving. The result is a shortfall in global demand that sucks ever more of the world economy into the zero-rate trap.

Economies with the biggest piles of savings relative to investment—such as China and the euro area—export their excess capital abroad, and as a consequence run large current-account surpluses. Those surpluses drain demand from healthier economies, as consumers' spending is redirected abroad. Low rates reduce central banks' capacity to offset this drag, and the long-run nature of the problem means that promises to let inflation run wild in the future are less credible than ever.

This trap is an especially difficult one to escape. Fixing the global imbalance between savings and investment requires broad action right across the world economy: increased immigration to countries with ageing populations, dramatic reforms to stagnant economies and heavy borrowing by creditworthy governments. Short of that, the only options are sticking plasters, such as currency depreciation, which alleviates the domestic problem while worsening the pressure on other countries, or capital controls designed to restore monetary independence by keeping the tides

of global capital at bay.

If this story is the right one, the outcome of the Fed's first rises will seem unremarkable. Growth will weaken slightly and inflation will linger near zero, forcing the Fed to abandon plans for higher rates. Yet the implications for the global economy will be grave. In the absence of radical, co-ordinated stimulus or restrictions on the free flow of capital, ever more of the world will be drawn, indefinitely, into the zero-rate trap. ■



自由交流

退场，熊市追逼

美联储终于加息了。然后呢？

美联储九年多来首次加息，至今已超过三个星期，世界仍未崩塌。但要庆祝还为时过早。在利率长期接近零的情况下，多国央行近年来都曾试图加息，但最后又被迫调头再次减息（见图表）。无论美国这次加息的结果如何，都将有助于经济学家了解为何零利率能产生如此强大的引力。

当存钱的人太多，而愿意消费的人太少，经济衰退随之来袭。为避免停滞，各国央行会大幅降低利率，鼓励人们放手消费。然而，想将利率下调至零以下很多就很困难了，因为个人及企业会开始把银行存款换成现金或其他资产。所以，经济学家一致认为，面对真正严峻的冲击，利率再低也不足以重振需求。

至于经济体为何长期深陷这一泥潭，则众说纷纭。主要有三个解释。美联储坚持认为，问题源于央行职能瘫痪，这可能是自身之过，也可能是由政治因素造成。央行因而难以推行量化宽松（印钞用以购买债券）这样的非常规货币政策。量化宽松政策的目的是要充分购入远期债券，降低长期借贷利率，从而规避零利率。美联储的高级官员称，一旦量化宽松政策能使经济足够快速地恢复，没有理由不如常加息。

假如美联储是对的，那么2016年美国将迎来美好年景。美联储预期，即便在年底前利率提高至1.5%左右，增长依然会加速，失业率还会持续下降。但市场人士认为这过分乐观，而且认为利率将保持在1%以下。其他两个解释正是由此而生。

一是“流动性陷阱”，这种说法最早可追溯至上世纪30年代，在90年代末日本陷入通缩时被老调重提。赞成该说法的人认为，一旦利率降至零，央行基本束手无策。即便量化宽松政策也作用不大，因为银行缺的不是用以放贷的资金，而是稳健的借款人。

这一理论的支持者认为要走出陷阱只有两条路。政府可通过大举借债来吸收银行多余的存款，然后用于支出，刺激需求。或者，央行可以承诺，在遥远的未来当经济恢复健康时，将容忍高得多的通胀率。假如人们相信这一未来的承诺，目前实际（考虑通胀因素后的）利率会因而下降，因为用于还贷的资金价值将低于当初借来的钱。所以，未来更高的通胀预期会为停滞不前的经济提供走出泥沼所需的负利率。

各国政府在上世纪30年代曾采用这两种政策逃离萧条。但由于过早改弦易辙，经济随即重陷困境，美国在1937年就是如此。“流动性陷阱”的解释表明，美联储加息是不明智的。美国经济毕竟远未重拾强健活力：目前增长速度远低于金融危机前的趋势；通胀只是略高于零；通胀预期仅接近最低复苏水平。如果这一观点正确，短期内，美联储将由于增长及通胀的急剧下降而被迫改变策略，不然将面临新一轮衰退。

| 陷于饱和

然而，事情还有第三种解释。美国前财政部长拉里·萨默斯（Larry Summers）也是其主要支持者。这一理论认为，问题是，相对于有吸引力的投资选择，全球储蓄过剩。资本过剩稳步而坚决地把全球各地的实际利率推向零。

储蓄与投资的错配有多个原因。在人口老龄化以及新技术导致资本支出减少等种种因素的影响下，长期增长预期低迷，令投资受压。同时，不平等加剧，收入集中到倾向储蓄的人群手中，而且在资本流动规模巨大且变化无常的世界中，他们渴求稳健的资产，这令储蓄进一步增长。结果全球需求动力不足，令世界经济进一步深陷零利率陷阱。

储蓄相对于投资而言最为充裕的经济体（如中国和欧元区）会向国外输出过剩的资本，结果令经常帐户出现庞大盈余。这些盈余会使较健康经济体的需求流失，因为其消费者支出转向国外。低利率降低了央行抵消这一作用的能力，而且问题的长期性意味着，未来任由通胀高企的承诺比以往更不可信。

这一陷阱尤其难以逃脱。解决全球储蓄和投资之间的失衡问题，需要在世界经济范围内采取广泛行动：人口老龄化国家需接收更多移民，停滞不前的经济体需推行大幅改革，信誉良好的政府需大量举债。倘若缺乏这些行动，仅有的选择都是治标不治本的方法，例如货币贬值虽能缓解国内问题，但会加重对其他国家的压力，又如资本管制是通过控制全球资本流动来恢复货币政策的独立性。

假如本文所述无误，美联储首次加息的效果似乎不值一提。增长将略有减弱，通胀将在接近零的水平徘徊，迫使美联储放弃再次加息的计划。然而，这对全球经济的影响将是严峻的。资本自由流动如果缺乏协调一致的根本性方案来刺激或限制，全球更多经济体将无限期地陷入零利率的陷阱。■



South-East Asian integration

More hat than cattle

A seamless regional economic bloc is just around the corner—as always

GRANDIOSE statements from the Association of South-East Asian Nations (ASEAN) are the region's Christmas crackers: they appear at regular intervals, create a commotion but contain little of substance. In November the leaders of the club's ten members declared that the ASEAN Economic Community (AEC)—a single market around which goods, services, capital and “skilled labour” are supposed to flow freely—would come into being on December 31st. So will South-East Asia's 622m people wake up in a new world in 2016, or will the AEC prove another paper crown?

The answer probably lies somewhere in the middle. For one thing, much of the work towards economic integration has been done: by ASEAN's reckoning, 79.5% of the measures the AEC involves have already been implemented. ASEAN already attracts large amounts of foreign investment, and its leaders have been talking up integration and regionalism since the organisation was founded in 1967. So the AEC represents less a radical change than an attempt to accelerate existing trends.

But anyone hoping that ASEAN is about to turn into an Asian version of the European Union will be disappointed. European integration is fundamentally a political project with an inward focus, argues Jayant Menon of the Asian Development Bank, which has led to a mushrooming of institutions. The AEC, in contrast, is an economic project, with almost no institutional heft—just a small secretariat—devoted to “outward-oriented regionalism”. It is designed to make the region an easier and more attractive place for foreign companies to do business and thus to boost trade and investment.

Those missions are helped by ASEAN's economic dynamism. Between 2007 and 2014 regional GDP doubled, from \$1.3 trillion to \$2.6 trillion, and GDP per person grew from \$2,343 to \$4,135. Total internal and external trade grew from \$1.6 trillion to \$2.5 trillion, and foreign direct investment rose from \$85 billion to \$136 billion. Viewed as a single economy, ASEAN is the world's seventh-largest and Asia's third-largest, behind China and Japan. And while China and Japan are ageing rapidly, ASEAN remains young, with more than half its population under 30. China's slowdown has taken its toll on the region—particularly on commodity exporters such as Malaysia and Indonesia—but its young workforce, improving infrastructure and rising incomes leave it poised for strong future growth.

Behind those aggregate figures, though, lie vast differences, not all of which are conducive to economic integration. Vietnam and Laos are communist dictatorships; Brunei an absolute monarchy; the Philippines and Indonesia rowdy democracies. Singapore was founded as a trading entrepot in 1819; Indonesia has a history of protectionism. Perhaps inevitably, the commitment of such a diverse bunch to regional integration, and the pooling of sovereignty it implies, is not as strong as ASEAN's triumphant statements suggest. There is no mechanism to enforce the group's many agreements and treaties. Regional banking systems and capital markets remain unintegrated. Tariffs may vanish, but non-tariff barriers pop up in their place. Members continue to set their own intellectual-property, land-use and immigration policies.

The rules regarding the free movement of "skilled labour" provide a good illustration of the AEC's limitations. Under its mutual-recognition arrangements (MRAs), certain professional qualifications from any member are deemed valid in all the others, allowing holders of them to work throughout the region. But the AEC's MRAs cover only eight professions, accounting for just 1.5% of ASEAN's total workforce. Moreover, even in these fields, other domestic regulations inhibit foreign workers.

Nursing, for instance, is among the eight professions subject to an MRA, but to work in Thailand nurses still must pass a qualifying exam in Thai. As Mr Menon points out, this is short-sighted: English-speaking Filipino nurses would be a boon to Thailand's burgeoning medical-tourism sector.

Knitting South-East Asia together economically sounds appealing, but the political will to make it happen is hard to find. For the moment, ASEAN seems more focused on the letter than the spirit of regional integration. ■



东南亚一体化

盛名之下，其实难副

一个无缝融合的区域经济体指日可待，一如既往

来自东南亚国家联盟（东盟，ASEAN）的宏大声明是该区域里的圣诞爆竹：定期出现，引发一阵骚动，但内里空空。11月，该联盟十个成员国的领导人宣布将于12月31日成立东盟经济共同体（AEC）——一个货物、服务、资本和“熟练劳动力”能够自由流动的单一市场。那么，东南亚的6.22亿人民一觉醒来后会发现2016年是个崭新的世界吗？抑或东盟经济共同体会被证明是又一顶纸皇冠？

答案也许介于两者之间。首先，经济一体化的很多工作已经完成：据东盟估算，与东盟经济共同体相关的措施中，79.5%已经实施。东盟已经吸引了大量外国投资，而其领导人自1967年该联盟成立以来就一直在谈论一体化和区域主义。因此，东盟经济共同体所体现的更多是加快已有趋势的努力，而非彻底的变革。

但是，指望东盟能成为亚洲版欧盟的人将会失望。亚洲开发银行的贾杨·梅农（Jayant Menon）认为，欧洲一体化究其根本是聚焦内部的政治工程，进程中成立了大量机构。相比之下，东盟经济共同体则是一个经济计划，几乎没有什么重要的行政机构，只有一个小小的秘书处，致力于“外向型的区域主义”。它的目的是让这一区域更适宜外国公司做生意、对它们更具吸引力，从而促进贸易和投资。

支持这些使命的是东盟的经济活力。从2007年到2014年，该区域的GDP翻了一番，从1.3万亿美元增至2.6万亿美元，人均GDP由2343美元增至4135美元。区内外贸易总额由1.6万亿美元增至2.5万亿美元，外国直接投资由850亿美元增至1360亿美元。作为单个经济体，东盟位列全球第七，亚洲第三，仅次于中国和日本。而且中国和日本正迅速老龄化，东盟则依然年轻，30岁以下人口超过半数。中国经济减速已经给这一区域带来了损失，尤其是对马来西亚和印度尼西亚等大宗商品出口国，但这一地区的年轻劳

动力、不断提升的基础设施和收入增长为它未来的强劲增长奠定了基础。

不过，这些合计的数字之下是各国间的巨大差异，而并非所有差异都有助于经济一体化。越南和老挝是共产主义专政独裁，文莱是君主专制政体，菲律宾和印尼是喧闹的民主制。1819年新加坡作为一个贸易中心成立，而印尼有贸易保护主义的历史。或许无可避免，如此多种多样的群体对区域一体化的决心、以及由此而来的主权集中，并没有东盟恢弘的声明所表现得那么强烈。也并没有一个机制去执行这一集团的许多协议和条约。区域银行系统和资本市场仍然没有整合。关税可能会取消，但是非关税壁垒正取而代之。成员国仍在各自设定知识产权、土地使用和移民方面的政策。

涉及“熟练劳动力”自由流动的法规充分显现了东盟经济共同体的局限性。根据互认协议（mutual-recognition arrangements，MRA），任何成员国颁发的某些专业资质在所有其他成员国均视为有效，持有这些资质的人可以在整个区域工作。但是东盟经济共同体的互认协议只覆盖了八种职业，仅占东盟整体劳动力的1.5%。而且即便在这些领域，其他国内法规也对外来劳工设置了障碍。例如，护理是一项互认协议列出的八种职业之一，但是在泰国工作的护士还必须通过该国的一项资格考试。正如梅农所指出的，这一做法目光短浅，因为会说英语的菲律宾护士对泰国增长迅猛的医疗旅游业将大有裨益。

从经济上将东南亚紧密结合听起来十分诱人，但很难找到实现这一目标的政治意愿。就目前而言，东盟似乎更关注区域一体化的字面意义，而非其精神实质。■



The Big Mac index

After the dips

Big currency devaluations are not boosting exports as much as they used to

MIGHT “Made in Russia” labels become common? If currency depreciation alone could boost exports, then yes. According to our latest Big Mac index, the Russian rouble is one of the cheapest currencies around, 69% undervalued against the dollar. The index compares the cost of the famous burger at McDonalds outlets in different countries by converting local prices into dollars using market exchange rates (as of January 6th, see chart 1). It is based on the idea that in the long-run, exchange rates ought to adjust so that one dollar buys the same amount everywhere. If a burger looks like a bargain in one currency, that currency could be undervalued.

Americans hunting for cut-price burgers abroad are spoilt for choice: the index shows most currencies to be cheap relative to the greenback. This is partly owing to the Federal Reserve’s decision to raise interest rates when the central banks of the euro zone and Japan are loosening monetary policy. The euro is 19% undervalued against the dollar, according to the index, and the yen 37%. Another force weakening many currencies, including the rouble, has been the ongoing slump in commodity prices since mid-2014. Shrinking demand from China and a glut of supply have sapped the value of exports from Australia, Brazil and Canada, among other places, causing their currencies to wilt, too. By the index, they are respectively 24%, 32% and 16% undervalued. If commodity prices continue to fall, they could slide even further.

These large currency devaluations can hurt, by raising the price of imports and spurring inflation. But although devaluations may not be pleasant, they are meant to be nutritious. Pricier imports should encourage consumers to switch towards domestic products and stimulate local

production. A cheaper currency should also boost growth by spurring exports.

Between 1980 and 2014, according to an analysis of 60 economies by the IMF, a 10% depreciation relative to the currencies of trading partners boosted net exports by 1.5% of GDP over the long term, on average. Most of the improvement came within the first year.

But devaluations do not seem to have provided quite the same boost recently. Japan is the best example. The yen has been depreciating rapidly. A Big Mac was 20% cheaper in Japan than in America in 2013; now it is 37% cheaper. Yet export volumes have barely budged (see chart 2). This is a surprise: the IMF calculates that Japanese exports are around 20% lower than it would have expected, given how the yen has weakened. Devaluations in other countries, including South Africa and Turkey, have also disappointed.

A global contraction of trade in dollar terms may be obscuring devaluation's benefits. Although exports from countries with weakening currencies may look limp, many of them are still securing a bigger slice of the shrinking pie. The collapse in commodity prices is also masking some signs of life. Take Brazil, where the volume of exports rose by 10% in 2015 even as their value plunged by 22%. Some of that is caused by commodity exporters compensating for falling revenue by selling ever more minerals and oil. But not all of it. In Australia, for instance, exports of goods other than raw materials jumped by around 6% in mid-2015, according to the Commonwealth Bank of Australia.

But there are also signs that "Dutch disease" has taken a toll on the capacity of commodity-producing countries to ramp up other exports. When prices were high, capital flowed in, pushing up their currencies and thus making their other exports less competitive. Labour and investment flowed mainly

to commodity firms. That has left other industries too weak to pick up the slack now that these once-soaring currencies have fallen back to earth.

Russia is a good example. Non-energy exporters appear to be struggling despite the rouble's plunge. Over the first half of 2015, as the volume of energy exports surged, non-energy exports fell, according to Birgit Hansl of the World Bank. She points out that it is not enough to have a price change: "First you have to produce something that someone wants to buy." The rouble's weakness is an opportunity for industries that already export, such as chemicals and fertiliser. But boosting other exports requires investment in new production, which takes time.

Both the IMF and the World Bank have highlighted another possible explanation for the weak performance of exports in countries with falling currencies: the prevalence of global supply chains. Globalisation has turned lots of countries into way-stations in the manufacture of individual products. Components are imported, augmented and re-exported. This means that much of what a country gains through a devaluation in terms of the competitiveness of its exports, it loses through pricier imports. The IMF thinks this accounts for much of the sluggishness of Japan's exports; the World Bank argues that it explains about 40% of the diminished impact of devaluations globally. That leaves many manufacturing economies in a pickle. ■



巨无霸指数

下跌之后

货币大幅贬值未能像过去那样提振出口

“俄国制造”的标签会变得常见吗？如果单单本币贬值就能提振出口，那么答案是肯定的。根据我们最新的巨无霸指数，俄罗斯卢布目前是最廉价的货币之一，兑美元汇率被低估69%。巨无霸指数比较不同国家麦当劳店铺出售的这款著名汉堡包的价格，使用市场汇率（1月6日即期汇率，见图表1）将本地价格转换成美元。该指数基于一个假设：长期而言，汇率应该会自动调整，使得一美元在所有地方都可以买到等量的商品。如果某种货币在买汉堡包时好像是在拣便宜货，那么这种货币就可能被低估了。

在国外找廉价汉堡包的美国人有太多选择。我们的指数显示大部分货币相对美元都变便宜了。原因之一是美联储在欧元区和日本放宽货币政策之时决定加息。根据我们的指数，欧元兑美元汇率被低估了19%，日元被低估了37%。另一个导致卢布等诸多货币贬值的作用力是自2014年中以来大宗商品价格的持续大跌。中国需求缩减加之供给过剩削弱了澳大利亚、巴西、加拿大等国的大宗商品出口价格，也导致其货币疲软。巨无霸指数显示，这三个国家的货币目前分别被低估24%、32%和16%。如果大宗商品价格继续下跌，这些货币可能还会进一步贬值。

货币大幅贬值可能造成损害，因为它会导致进口价格上升，刺激通货膨胀。但是，尽管贬值可能令人不悦，但它们本应有其益处。更昂贵的进口应该会鼓励消费者转而购买国产商品，从而刺激本国生产。货币贬值应该还会刺激出口从而促进增长。

国际货币基金组织对60个经济体的一项分析显示，1980年到2014年间，本币兑交易伙伴货币贬值10%长期会令净出口平均增长GDP的1.5%。这种增长大部分发生在贬值后的第一年。

然而，最近的货币贬值似乎并未带来同样的效应。日本是最好的例子。日

元已迅速贬值：2013年在日本买一个巨无霸汉堡比在美国买便宜20%，如今便宜了37%。尽管如此，该国的出口量却几无变化（见图表2），这令人吃惊。据国际货币基金组织估算，和日元贬值原本预期会带来的出口量相比，其实际出口量约少了20%。南非和土耳其等国货币的贬值同样未能如预期般提振出口。

以美元计价的全球贸易萎缩可能使得贬值带来的益处并不明显。尽管本币贬值的国家看起来可能出口疲软，但它们中有许多仍然抢占了这块缩小的大饼中更大的一块。大宗商品价格大跌也掩盖了一些生机。以巴西为例，该国出口量在2015年上升了10%，尽管其出口额大跌22%。其中部分原因是大宗商品出口商为补偿收入的下跌而出售了更多矿产和石油。但这并非全部原因。例如在澳大利亚，根据澳洲联邦银行的数据，原材料以外的商品出口在2015年中上升了6%左右。

但也有迹象显示“荷兰病”损害了大宗商品生产国增加其他商品出口的能力。此前大宗商品价格高时，国外资金涌入，推高了本国货币价格，结果使得其他商品的出口价格竞争力被削弱。人力和投资主要流向了大宗商品企业。这导致其他行业过于疲软，当曾经飙高的货币大跌时，它们无力恢复景气。

俄罗斯就是个好例子。尽管卢布大跌，非能源类出口商看来正在苦苦挣扎。世界银行的比吉特·汉斯尔（Birgit Hansl）说，2015年上半年，随着该国能源出口量大增，非能源类出口下跌。她指出仅仅价格变动还不够：“你首先得生产出有人想买的东西。”卢布疲软对那些已经在出口商品的产业来说是个机会，比如化学制品和肥料制造业。但提振其他行业的出口需要投资于新的产能，而这需要时间。

国际货币基金组织和世界银行都强调，本币下跌的国家出口不振可能另有原因：全球供应链的普及。全球化已使得许多国家变成单个商品制造链上的一个环节。它们进口部件，将其加工后再出口。这意味着一个国家虽然通过货币贬值在出口竞争力上获益，却被更昂贵的进口所抵消。国际货币基金组织相信这是日本出口低迷的主因。而世界银行则认为，全球范围内

货币贬值对出口的影响减少有四成都缘于此。这令许多制造业经济体陷入困境。■



Chinese acquisitions abroad

Better than barbarians

Rich-world firms are warming to the idea of being Chinese-owned

DESPITE the anaemic state of the global economy, companies from mainland China are investing abroad like never before. Chinese firms closed overseas deals worth \$61 billion last year, according to a new analysis by the Rhodium Group, a consulting firm. This was up by 16% on 2014, and is the highest level on record. What is more, these firms are not all chasing natural resources such as oil and copper, as in the past.

On January 12th Dalian Wanda, a Chinese property and entertainment conglomerate, confirmed its long-rumoured purchase of Legendary Entertainment for about \$3.5 billion. The acquisition of the American film studio behind “Jurassic World”, “The Dark Knight” and other blockbusters fulfils the dream of Wang Jianlin, Wanda’s boss, of becoming a global movie mogul. The same day, news surfaced that Beijing Kunlun Tech, a Chinese online-games firm, has acquired a majority stake in Grindr, an American social network for gay men, for about \$93m.

However, perhaps the most intriguing Chinese foreign purchase of the week is the acquisition by a state-owned chemicals firm of an obscure German maker of machinery to process rubber and plastic. China National Chemical Corp, more commonly known as ChemChina, bought KraussMaffei for about \$1 billion.

ChemChina itself rose from obscurity thanks in large part to Ren Jianxin, its chairman. Three decades ago he borrowed 10,000 yuan (less than \$2,000 at today’s rates) to start a solvents factory. In the following years, he forged the ChemChina empire by taking under his wing more than 100 distressed state-owned chemical plants across the country, with the

government retaining ownership. He minimised lay-offs by shifting workers to one of the group's sidelines, Malan Noodle, a restaurant chain. He professionalised management by bringing in outside consultants. Even a foreign chemicals boss who insists that "90% of ChemChina's assets are rubbish" grudgingly praises Mr Ren's vision and management style.

ChemChina is now emerging as the most dynamic globaliser among China's state enterprises. Already, it has a string of foreign acquisitions under its belt (see table). Most notable among these is its \$7.7 billion deal last year to buy Pirelli, an Italian tyre maker, which will be completed shortly. That was the largest Chinese purchase yet seen in Italy, and the KraussMaffei deal will be the biggest foray by a mainland Chinese firm into Germany. ChemChina is also in a bidding war with Monsanto, an American agribusiness firm, for control of Syngenta, a big Swiss rival. If ChemChina prevails with its latest reported bid for 70% of Syngenta, valuing it at \$44 billion, it will be the biggest Chinese foreign acquisition yet.

Why are Chinese firms so keen to go abroad? Some pundits suspect that the firms' bosses, afraid of getting caught up in President Xi Jinping's anti-corruption purge, are parking assets abroad. Yet there are easier and quieter ways to get yuan through China's porous currency controls. Anyway, some of the firms buying abroad, such as ChemChina, are owned by the state itself. Others think investment opportunities are drying up on the mainland. But even if Chinese growth is only 5-6% rather than the reported rate of around 7%, it would still be stronger than in the rich countries where Chinese firms are buying.

The main reason for Chinese firms' buying spree is to get the brands, technologies and talent they lack, to capitalise on future waves of growth at home. That is not new in itself; what has changed is the warmth of the welcome they get. In the past, ruthless mainland firms, gobbling up resources firms, caused a backlash in the countries they entered. Today's

Chinese globalisers, says Klaus Meyer of the China Europe International Business School, are more sophisticated and hands-off with their acquisitions.

“ChemChina could be a good owner” of Syngenta, agrees Jeremy Redenius of Sanford C. Bernstein, a research firm, pointing to the success of its earlier acquisition of Adama, an Israeli firm. Some rich-world firms may now find Chinese ownership more attractive than suffering the rules of Western stockmarkets or the meddling of private-equity firms. The marauders from the Middle Kingdom may be more welcome than the barbarians at the gate. ■



中国海外并购 好过野蛮人

富裕国家企业正调整心态，向中资收购敞开怀抱

尽管全球经济疲软，中国内地企业的海外投资活动却空前活跃。据咨询公司荣鼎集团（Rhodium Group）新发表的分析，中国企业去年完成的海外交易总值达610亿美元，比2014年上升了16%，达历史新高。而且与以往不同，这些企业并非一味追逐石油和铜矿等自然资源。

1月12日，中国地产及娱乐集团大连万达宣布将以约35亿美元收购传奇影业（Legendary Entertainment），这一传闻已久的交易终于尘埃落定。把制作过《侏罗纪世界》及《黑暗骑士》等大片的美国电影制作公司收归囊中，万达老板王健林实现了成为全球电影大亨的夙愿。同日，另一并购新闻浮出水面，中国网游公司北京昆仑万维科技股份有限公司以约9300万美元购入美国同性恋社交网络Grindr的多数股权。

然而，上周中国海外并购行动中最耐人寻味的一宗也许是一家化工国企收购了德国一家不知名的橡胶塑料加工设备厂商。中国化工集团（通常简称中国化工）以约十亿美元收购了德国化工机械企业克劳斯玛菲（KraussMaffei）。

中国化工能崛起于微末之中，主要归功于其董事长任建新。30年前，他贷款一万元（按今天的汇率计算不到2000美元）创立了一家溶剂厂。之后那些年，他在全国各地相继接管100多家经营不善的国有化工企业，打造了中国化工的帝国版图，但仍保持国有性质。为尽量减少裁员，他把员工安置到集团的副业之一——“马兰拉面”餐饮连锁店工作。他通过引进外部顾问来实现专业化管理。连坚称“中国化工的资产中90%是垃圾”的一家外国化工企业老板也不得不称赞任建新的远见及管理风格。

中国化工如今已成为全球化经营做得最有声有色的中国国企。目前，集团的海外并购行动已硕果累累（见表格）。其中最瞩目的是去年以77亿美元

收购意大利轮胎制造商倍耐力（Pirelli），交易在短期内将完成交割。那是意大利有史以来最大规模的中资收购，而收购克劳斯玛菲则是中国内地公司进军德国的最大交易。中国化工还与美国一家农业综合企业孟山都（Monsanto）竞标争夺对瑞士大型对手公司先正达（Syngenta）的控制权。据最新报道，中化投标收购先正达70%的股权，估值为440亿美元，假如成功中标，这将是迄今最大的海外并购。

中国企业为何如此热衷走向海外？部分专家怀疑，这些企业的老板们担心卷入习近平的反腐整肃行动而逐步把资产转移到海外。然而，要突破中国漏洞颇多的外汇管制体系转移人民币，有更简单低调的方法。而且，一些在国外进行并购的企业本身就属国有，中国化工就是其中之一。也有人认为原因是中国内地的投资机会日渐枯竭。但即使中国的增长率并非官方所公布的约7%，而是仅有5%至6%，也仍好于中国企业并购对象所在的那些发达国家。

中国企业海外并购热的主要原因是想获取自身所缺乏的品牌、技术和人才，以把握国内未来增长浪潮。这种做法本身并不新鲜，反倒是它们在海外所受到的欢迎程度发生了变化。过去，在海外粗暴吞并资源企业的大陆厂商在其进入的国家激起了抵制情绪。如今，中欧国际工商学院的麦克罗（Klaus Meyer）表示，中国的全球化企业变得更加成熟老练，对收购对象也更少干预。

研究公司桑福德伯恩斯坦公司（Sanford C. Bernstein）的杰里米·雷德尼厄斯（Jeremy Redenius）对此表示认同。他说，对先正达而言，“中国化工可能是个好买家”。他也提到中国化工之前收购以色列公司Adama的成功先例。富裕国家的一些公司现在或许觉得，与其受西方股市规则的限制或私募股权投资公司的干预，中资收购更具吸引力。来自中央王国的强盗也许比“门口的野蛮人”更受欢迎。■



Free exchange

Fight or flight

China's leaders face a menu of unappealing exchange-rate options

THE past six months have been hard on the reputations of China's economic managers. Their attempts to bring troublesome stockmarkets to heel border on slapstick. The uncertain handling of the country's exchange rate, on the other hand, is no laughing matter. Unexpected wobbles in the value of China's currency roil global markets. Yet no exchange-rate policy offers a sure and safe route forward.

Some see a resemblance in China's predicament to the Asian financial crisis of the late 1990s. Then, fast-growing countries like Indonesia, South Korea and Thailand faced outflows of capital as investor sentiment flipped from bullish to bearish. Governments were forced to abandon currency pegs as their foreign-exchange reserves dwindled. Massive depreciations led to financial havoc, as asset prices tumbled and these countries' enormous debts ballooned in dollar terms. Painful recessions ensued.

The lessons of the Asian crisis were not lost on China's leaders, however. During its great boom, in the 2000s, China maintained tight capital controls, permitting foreign direct investment while eschewing "hot money". The People's Bank of China (PBOC) intervened heavily in foreign-exchange markets to keep the yuan cheap, building up \$4 trillion in reserves in the process. Where the crisis countries of the 1990s ran persistent trade deficits, China kept its current account in surplus; thus adding to, rather than draining from, its foreign-exchange reserves.

Despite these prophylactics China now faces its own financial crunch. Its reserves are down by almost \$700 billion from their peak, thanks to capital flight and sinking asset values. Determined money has long seeped out of

China's stockade; signs of a bigger leak emerged in the latter half of 2015. In December alone reserves fell by more than \$100 billion. Capital slipped abroad at an annualised pace of \$1 trillion in the second half of 2015. In the third quarter, China's outward foreign-direct investment rose from \$29 billion to \$32 billion while inward investment fell sharply, from \$71 billion to \$39 billion; at \$7 billion, the net flow of inward investment was the lowest since 2000.

An anti-corruption drive, slowing growth and rising American interest rates are all partly to blame. Once begun, however, capital flight can be hard to control. Chinese citizens can move a maximum of \$50,000 abroad each year. If just 5% of the population used its quota, China's reserves would evaporate. The authorities are desperate to prevent such an outcome, and the severe tightening of domestic credit conditions it would entail, but there is no painless way to do so.

Many economists reckon China will allow the yuan to fall. After all, the currency has appreciated by 20% against a broad range of currencies since 2012, thanks to rising wages and a peg to the strengthening dollar. Yet a sinking yuan poses threats. Roughly \$1 trillion of China's accumulated debts are denominated in dollars. That is small beer next to \$28 trillion in total Chinese debt. But because Chinese firms are so highly leveraged, even a small rise in the cost of servicing dollar-denominated debts could force some into asset sales or bankruptcy. That, in turn, would encourage more capital outflows, depressing the yuan's value still further.

The economy could expect only a modest boost to exports for its trouble. Since much of the material that goes into Chinese exports is itself imported, devaluation does not boost exports that much. It also squeezes the purchasing power of Chinese consumers and thus slows the rebalancing of its economy from investment to consumption, while irking America and encouraging competitive devaluations elsewhere.

Alternatively, China could hold the yuan's value steady. The big depreciations of the late 1990s were done out of necessity rather than by choice, after all. Investors fleeing from Thailand, for instance, converted their baht to dollars on their way out. When the government ran short of greenbacks, it had no option but to repay investors with many fewer dollars per baht. Yet China still has \$3.3 trillion of hard currency in reserve.

Stability poses its own problems, however. If China resists depreciation and capital outflows continue, the erosion of reserves could puncture the PBOC's air of invulnerability, leading to faster capital leakage. A commitment to a strong yuan could also constrain China's monetary policy. Cuts to interest rates tend to diminish a currency's value. Any attempt to maintain it under such circumstances hastens the depletion of reserves.

Why not strengthen capital controls, in that case? In 1998 Malaysia imposed controls on fleeing investors and outperformed some other crisis-hit economies, such as Indonesia. The government is cracking down on the underground financiers in Macau and banks in Hong Kong that help sneak Chinese cash past the controls. If ordinary citizens began moving savings abroad in greater numbers, China could reduce the limit on foreign transfers. Yet backtracking on planned reforms would be a huge embarrassment for China's leaders, who have laboured long and hard to raise the yuan's status internationally. It would also deter foreign investors, worsening the short-run foreign-exchange picture and long-run growth prospects.

| *Faith no more*

Ample reserves, capital controls, a trade surplus and a determinedly interventionist state mean that China is a long way from a full-fledged crisis. Neither is all the apparent capital flight as worrying as it might appear: purchases of foreign securities by Chinese corporates may look like

a stampede for the exits, but can serve to hedge firms with foreign-currency debts against depreciation. But there is good reason for nervousness, in China and elsewhere. All the countries afflicted by the Asian crisis combined accounted for a much smaller share of global output in 1998 than China does now. And China seems not to have absorbed the most important lesson of that crisis: that confidence matters. ■



自由交流

战斗还是跑路

中国领导人在外汇政策上没什么有吸引力的选择

过去六个月是对中国经济管理层声誉的一大挑战。他们尝试驯服麻烦不断的股市，表现近乎一场闹剧。另一方面，他们对本国汇率的处理拿捏不定，也让人无法一笑置之。人民币币值出人意料的波动扰乱了全球市场，然而并没有哪种汇率政策可以提供确定又安全的前行路线。

一些人认为中国的窘境和上世纪90年代末的亚洲金融危机相似。当时，印度尼西亚、韩国和泰国等经济成长迅速的国家因投资者情绪从看涨反转为看跌而面对资本外流。随着外汇储备缩减，政府被迫放弃了联系汇率制。本币大规模的贬值引发了金融浩劫，资产价格暴跌，这些国家以美元计价的巨额债务激增。痛苦的衰退接踵而至。

不过，中国的领导人并没有忘记亚洲危机的教训。本世纪初，当中国迅猛发展之时，中国保持严格的资本管制，允许外国直接投资但避免“热钱”。中国人民银行大力干预外汇市场以让人民币保持在低位，过程中积累起4万亿美元的外汇储备。上世纪90年代陷入危机的各国当时处于持续的贸易逆差，而中国则保持了其经常账户盈余，因此增加而非消耗了其外汇储备。

尽管有这些预防手段，中国如今正面对自己的金融危机。由于资本外逃和资产价值缩水，外汇储备相比峰值时减少了近7千亿美元。看空中国的热钱早已从中国的围栏里渗出，而2015年下半年出现了更大规模的资本外流迹象。单单12月份，外汇储备减少了一千多亿美元。2015年下半年资本以1万亿美元的年化速度流向国外。在第三季度，中国对外直接投资从290亿美元上升到320亿美元，而外来投资则从710亿美元急剧下跌到390亿美元。外来投资净增长70亿美元，跌至2000年以来新低。

反腐运动、经济放缓、美国加息都是其中原因。但资本外逃一旦启动，就

很难控制。中国公民每年最多可将5万美元转移到国外，只需5%的人口使用这一配额，中国的外汇储备就将蒸发殆尽。中国官方竭力防范这样的后果以及可能催生的国内信贷严重紧缩，然而并无坦途可走。

许多经济学家估计中国会让人民币进一步贬值。毕竟，自2012年以来，得益于工资上升以及与走强的美元挂钩，人民币对一揽子货币已经升值了20%。但是，下跌的人民币构成了威胁。中国积累的债务中有约1万亿美元的债务是以美元计价，相比28万亿美元的债务总额这只是一小部分，但因为中国企业的杠杆很高，在偿还美元计价债务时，只要还贷成本稍微上升都可能迫使部分企业出售资产甚至导致破产。这反过来会促使更多的资本外流，进一步打压人民币币值。

人民币贬值并不会给出口带来很大的提升。由于中国出口商品的大部分组件本身是从国外进口，人民币贬值不会提振出口太多。贬值还压缩了中国消费者的购买力，令该国从投资到消费的经济再平衡过程变慢，同时还惹恼美国，也会触发其他各国竞争性的货币贬值。

中国的一个替代方案是让人民币维持稳定。毕竟，上世纪90年代末发生的大幅贬值是迫不得已。比如，投资者将资本撤离泰国时将泰铢兑换成美元，当泰国政府美元储备不足时，它别无选择，只得减少兑换给投资者的的美元数量。但是，中国目前仍有3.3万亿美元的硬通货储备。

但本币维稳有其自身问题。如果中国抗拒贬值而资本外流继续，那么外汇储备遭侵蚀可能会让中国人民银行刀枪不入的形象受损，从而加快资本外流。坚持保持人民币坚挺还可能束缚中国的货币政策，因为降息往往会减少一种货币的价值。在此类环境下任何尝试保持币值稳定的做法都会加快外汇储备的枯竭。

那么为何不加强资本管制呢？1998年马来西亚对撤离的投资者实施管控，其表现因而好过其他遭金融危机打击的经济体，比如印度尼西亚。中国政府正在严打那些帮助中国资金突破管控的澳门地下钱庄和香港的银行。如果普通公民开始将大笔储蓄转移到国外，中国可以降低外汇汇出的限额。

但是，就已经做出的改革计划走回头路会让中国的领导人极为难堪，毕竟长期以来他们都在大费周章地提升人民币的国际地位。这也会吓退外国投资者，使短期外汇交易状况和长期经济增长前景恶化。

| 信心缺失

充足的储备、资金管控、贸易顺差，以及坚定不移地做出干预意味着中国距离一次全面的危机还很遥远。显而易见的资本外逃也不像看上去那么令人担忧。中国企业购买外国证券看似是踩踏式外逃，但也可能会帮助那些有外币债务的公司对冲本币贬值的风险。不过，中国和其他地区的人们都仍有很好的理由感到紧张。1998年所有因亚洲金融危机受损的国家加在一起对全球产出所做的贡献相比中国目前的占比要小得多。而中国似乎并没有汲取这场危机最重要的一则教训：信心很重要。■



American economic history

G force

Why economic growth soared in America in the early 20th century, and why it won't be soaring again any time soon

ON JANUARY 20th those who see themselves as the global elite gather in the Alpine resort town of Davos to contemplate the “fourth industrial revolution”, the theme chosen by Klaus Schwab, the ringmaster of the circus known as the World Economic Forum. This revolution will be bigger than anything the world has seen before, he says. It will be a tsunami compared with previous squalls. It will be more disruptive. It will be more interconnected; indeed, the revolution will take place “inside a complex ecosystem”. Not only will it change what people do, it will change who they are.

Anybody who is tempted by this argument should read Robert Gordon's magnificent new book. An American economist who teaches at Northwestern University, Mr Gordon has long been famous in academic circles for advancing three iconoclastic arguments. The first is that the internet revolution is hyped. The second is that the best way to appreciate the extent of the hype is to look at the decades after the civil war, when America was transformed by inventions such as the motor car and electricity. The third is that the golden age of American growth may be over.

In “The Rise and Fall of American Growth” Mr Gordon presents his case for a general audience—and he does so with great style and panache, supporting his argument with vivid examples as well as econometric data, while keeping a watchful eye on what economic change means for ordinary Americans. Even if history changes direction, and Mr Gordon's rise-and-fall thesis proves to be wrong, this book will survive as a superb reconstruction of material life in America in the heyday of industrial capitalism.

The technological revolutions of the late 19th century transformed the world. The life that Americans led before that is unrecognisable. Their idea of speed was defined by horses. The rhythm of their days was dictated by the rise and fall of the sun. The most basic daily tasks—getting water for a bath or washing clothes—were back-breaking chores. As Mr Gordon shows, a succession of revolutions transformed every aspect of life. The invention of electricity brought light in the evenings. The invention of the telephone killed distance. The invention of what General Electric called “electric servants” liberated women from domestic slavery. The speed of change was also remarkable. In the 30 years from 1870 to 1900 railway companies added 20 miles of track each day. By the turn of the century, Sears Roebuck, a mail-order company that was founded in 1893, was fulfilling 100,000 orders a day from a catalogue of 1,162 pages. The price of cars plummeted by 63% between 1912 and 1930, while the proportion of American households that had access to a car increased from just over 2% to 89.8%.

America quickly pulled ahead of the rest of the world in almost every new technology—a locomotive to Europe’s snail, as Andrew Carnegie put it. In 1900 Americans had four times as many telephones per person as the British, six times as many as the Germans and 20 times as many as the French. Almost one-sixth of the world’s railway traffic passed through a single American city, Chicago. Thirty years later Americans owned more than 78% of the world’s motor cars. It took the French until 1948 to have the same access to cars and electricity that America had in 1912.

The Great Depression did a little to slow America’s momentum. But the private sector continued to innovate. By some measures, the 1930s were the most productive decade in terms of the numbers of inventions and patents granted relative to the size of the economy. Franklin Roosevelt’s government invested in productive capacity with the Tennessee Valley Authority and the Hoover Dam.

The second world war demonstrated the astonishing power of America's production machine. After 1945 America consolidated its global pre-eminence by constructing a new global order, with the Marshall Plan and the Bretton Woods institutions, and by pouring money into higher education. The 1950s and 1960s were a golden age of prosperity in which even people with no more than a high-school education could enjoy a steady job, a house in the suburbs and a safe retirement.

But Mr Gordon's tone grows gloomy when he turns to the 1970s. Economic turbulence increased as well-known American companies were shaken by foreign competition, particularly from Japan, and as fuel prices surged thanks to the OPEC oil-price rise. Economic inequality surged as the rich pulled ahead of the rest. Productivity growth fell: having reached an average of 2.82% a year between 1920 and 1970, output per hour between 1970 and 2014 grew by an annual rate of no more than 1.62%. America today faces powerful headwinds: an ageing population, rising health-care and education costs, soaring inequality and festering social ills.

What chance does the country have of restoring its lost dynamism? Mr Gordon has no time for the techno-Utopians who think that the information revolution will rescue America from such "secular stagnation". His attitude to the IT revolution is much the same as that of Peter Thiel, a venture capitalist, who famously said: "We wanted flying cars but instead we got 140 characters." America has already harvested the fruits of the IT revolution. The growth rate increased each year in the decade after 1994, but the spurt did not last and it has since fallen back since.

Now Mr Gordon thinks that Moore's law is beginning to fade and the new economy is turning into a mirage. He can be forgiven for giving such short shrift to Davos types who have no sense of history: driverless cars will change the world less than the invention of cars in the first place. He is also surely right that America faces unusually heavy challenges in future.

But he goes too far in downplaying the current IT revolution. Where the first half of the book is brilliant, the second can be frustrating. Mr Gordon understates how IT has transformed people's lives and he has little to say about the extent to which artificial intelligence will intensify this. He also fails to come to terms with the extent to which, thanks to 3D printing and the internet of things, the information revolution is spreading from the virtual world to the physical world. Mr Gordon may be right that the IT revolution will not restore economic growth rates to the level America once enjoyed. Only time will tell. But he is definitely wrong to underplay the extent to which the revolution is changing every aspect of our daily lives. ■



美国经济史

重力加速度

为何美国经济在20世纪早期迅猛增长，而如今短期内不会再次飙升

1月20日，那些自视为全球精英的人物齐聚阿尔卑斯山的度假胜地达沃斯，探讨“第四次工业革命”。这一主题由克劳斯·施瓦布（Klaus Schwab）选定，他是这个被称作“世界经济论坛”的马戏团的领班。他说，这场革命会比世界上以往任何革命都更宏大。如果之前的革命是狂风，它就是海啸。它会更具颠覆性。它会更加互联互通。实际上，这场革命将在“一个复杂的生态系统中”开展。它不仅会改变人们的做法，也将改变人的性质。

受了这番言论蛊惑的人应当去读一读罗伯特·高登（Robert Gordon）精彩的新著。这位美国经济学家在西北大学任教，他在学术圈里以提出反主流的三个观点而久负盛名。其一是互联网革命被炒作夸大。其二是要评鉴炒作的程度，最好是看看内战之后几十年的情况，其间美国因为汽车和电力之类的发明而转变。其三是美国经济增长的黄金时代可能已经结束了。

在《美国经济增长的起伏》（The Rise and Fall of American Growth）一书中，高登向广大读者提出了他的论据。他文风出众、挥洒自如，为自己的观点提供了生动的例证和详实的计量经济学数据，且始终密切关注经济变革对于普通美国人的意义。即便历史转向，高登关于经济兴衰的论述被证明是错误的，本书也将作为对工业资本主义鼎盛时期美国物质生活的超凡再现而留存于世。

19世纪后期的一系列科技革命改变了世界。在此之前美国人的生活已无从辨认。他们对于速度的概念曾经由马匹来定义。日出而作，日落而息。每天最基本的任务都是让人筋疲力尽的杂务，例如取水洗澡或是洗衣。正如高登所展示的，一系列革命改变了生活的方方面面。电力的发明为黑夜带来了光明。电话的发明化距离为无形。被通用电气称作“电动仆人”的发明

将妇女从家务苦役中解放出来。变革的速度也引人注目。从1870年到1900年的30年中，铁路公司每天新建20英里的轨道。到了20世纪初，1893年成立的邮购公司西尔斯·罗巴克（Sears Roebuck）每天完成10万个订单，商品目录长达1162页。从1912年到1930年，汽车的价格猛降了63%，而美国拥有汽车的家庭比例从略超过2%增至89.8%。

在几乎每样新科技上美国都迅速领先于其他国家，恰如安德鲁·卡内基（Andrew Carnegie）所言，美国是机车，欧洲是蜗牛。1900年，美国人均电话数量是英国的4倍、德国的6倍、法国的20倍。世界上几乎六分之一的铁路交通都通过一个美国城市——芝加哥。30年后，美国人拥有世界上超过78%的汽车。法国人使用汽车和电力的水平直到1948年才与美国在1912年的情况相当。

大萧条稍稍减缓了美国的增长势头，但私营部门仍在创新。按某些衡量标准，相对于经济规模而言，20世纪30年代成为发明和专利数量最高产的十年。罗斯福政府投入生产能力，成立了田纳西河流域管理局（Tennessee Valley Authority），修建了胡佛水坝。

第二次世界大战展现了美国这架生产机器惊人的能力。1945年之后，美国通过马歇尔计划和布雷顿森林体系建立了新的全球秩序，大量投资高等教育，以此巩固了它的全球领先地位。20世纪50年代和60年代是繁荣的黄金时代，当时即便是高中及以下学历的人也能找到稳定的工作，在市郊买栋房子，安安稳稳地退休。

但是写到20世纪70年代，高登的笔调变得忧伤起来。在与外国尤其是日本公司的竞争中，知名美国公司的地位被撼动，加之欧佩克提高石油价格导致燃油价格飙升，经济动荡加剧。经济不平等的程度急剧上升，富人的财富遥遥领先。生产率增长下降：每小时产出在1920年到1970年间平均每年增长2.82%，但在1970年至2014年间每年增长不超过1.62%。今天的美国面临着强劲的逆风：人口不断老化、医疗和教育成本不断上涨、不平等程度飙升、社会弊病不断恶化。

美国还有没有机会重新恢复逝去的活力？高登没时间应和那些科技空想家，他们认为信息革命将把美国从所谓的“长期经济停滞”中解救出来。他对于IT革命的态度和风险资本家彼得·泰尔（Peter Thiel）大致相同，泰尔曾说过一句名言：“我们曾经想要会飞的汽车，结果却得到140个字符。”美国已经收获了IT革命的果实。1994年后的十年里增长率每年都上升，但未能持久，之后回落至今。

现在高登认为摩尔定律（Moore's law）开始失效，新经济正成为海市蜃楼。他对达沃斯会议上那些没有历史观的人嗤之以鼻，这种态度情有可原：就改变世界的程度而言，无人驾驶汽车比不上最初汽车的发明。他认为美国未来面临着异常严峻的挑战，这也非常正确。

但在贬低当代IT革命上，他太过火了。本书前半部分堪称精彩，但后半部分让人沮丧。高登低估了IT给人们的生活带来的转变，而对于人工智能将会如何加强这一转变，他几乎未置一词。他也没能接受这样的事实，即随着3D打印和物联网的出现，信息革命正从虚拟空间拓展到真实世界。高登认为IT革命无法让美国的经济增长率恢复到曾经的水平，这一点可能是对的。只有时间会证明一切。但他低估了信息革命对我们生活方方面面的改变程度，这绝对是错的。 ■



China's labour market

Shocks and absorbers

Unemployment is rising, but is not always visible

THE crane that looms over Sainty Marine's shipyard on the lower reaches of the Yangzi river had been motionless for weeks when a worker climbed it late last year. The struggling company had stopped getting orders and, rather than deal with the headache of laying off its employees, it simply stopped paying them. The man on the crane threatened to jump to get the attention of local officials, coming down only when they promised to help him. Other workers took a somewhat safer, though (in a country where strikes are illegal) no less provocative measure to demand their missing wages: they marched out and blockaded a nearby highway.

That Sainty Marine workers have resorted to such actions is perhaps not surprising. The global shipping industry is depressed, plagued by oversupply at a time when slowing trade means demand for new ships is shrinking. Chinese firms that rushed to expand are now gasping. Sainty Marine, which overextended itself by buying another shipbuilder, is veering towards bankruptcy. Withholding wages is a common tactic for Chinese companies in trouble; in Yizheng, the gritty town that is home to Sainty Marine's shipyard, the local government has published statements admonishing employers for doing so.

Many workers at other hard-hit companies, especially in heavy industry, are facing similar frustrations. The China Labour Bulletin, a watchdog group based in Hong Kong, recorded 2,774 strikes and worker protests nationwide in 2015, double the 1,379 posted in 2014. Police arrested four labour activists two weeks ago in the southern province of Guangdong, China's manufacturing heartland—a sign of the authorities' unease over the growing protests.

Although the swooning stockmarket and falling currency have captured global attention in recent days, the effect of slowing growth on employment is a more sensitive problem for the government. The Communist Party has always treated markets and, by extension, investors with a certain disregard. Workers are different: the steady improvement in their living standards over the past three decades has helped to legitimise the party's rule.

How worried should it be? The stresses have made only a small dent so far in overall employment figures, at least in the official telling. The jobless rate crept up to 5.2% at the end of September from 5.1% at the start of last year, according to the latest government survey of 31 big cities.

Manufacturing firms are clearly cutting jobs: the employment index in the closely watched Caixin survey of the sector dipped to 47.3 in December—its 26th consecutive month below 50, the threshold marking a contraction. But for services, a bigger share of the economy than manufacturing, Caixin's employment index hit 51.3 in December, above last year's low of 50.1 in August. That points to an expansion.

However, the employment data are flattered by two uniquely Chinese shock-absorbers. First, the *hukou* system of household registration means that some 270m migrant workers who have gone to cities for jobs do not enjoy a permanent right to live in them, let alone collect unemployment insurance there. When they lose their jobs, they are expected to return to their original homes, often in the countryside, and do not count as unemployed. In 2008, at the height of the global financial crisis, tens of millions of migrants simply went back to rural areas, tilling fields or scrabbling for meagre pay in villages. There has been no similar exodus this time, but the countryside remains a safety valve that can help to absorb the unemployed.

The other buffer is one of the things hobbling the economy in the first

place: state-owned enterprises (SOEs). Private firms are better run and more profitable, but SOEs, with their political backing, have far easier access to finance and dominate a series of restricted sectors, from energy to transport. These privileges carry with them political duties, including an obligation to help maintain social stability by refraining from laying off workers. With the army planning to cut some 300,000 positions as part of a modernisation plan, the government reminded SOEs last month that they are required to reserve 5% of vacancies for demobilised soldiers.

In a working paper last year, analysts at the International Monetary Fund noted signs of “increased labour hoarding in overcapacity sectors”, helping to suppress unemployment at the cost of weaker productivity. But even SOEs do not have infinite resources. Loss-making companies with little prospect of turning round their performance are starting to shed workers. Longmay Mining, the largest SOE in the northern province of Heilongjiang, said in September that it would cut up to 100,000 jobs, nearly half its workforce.

China’s economy should, in theory, be able to accommodate many of the unemployed. The working-age population peaked in 2012, so all else being equal, there is less competition for jobs. At the same time, the economy’s tilt towards the services sector, which is more labour-intensive than industry, generates jobs even as growth slows. Services probably accounted for more than half of China’s GDP last year for the first time in decades, and their share is growing: in nominal terms, service output grew by 11.6% year-on-year in the first nine months of 2015, whereas manufacturing grew by just 1.2%.

The central bank estimates that as long as the service sector’s share of GDP increased by one percentage point in 2015 (in fact, it did better), the economy could have slowed by nearly half a percentage point and yet still generated the same number of new jobs as it did in 2014. This helps to

explain why employment centres around the country still report a shortage of workers: an average of 1.09 vacancies for every applicant (see chart). For those hoping to be hired by accounting firms or restaurants, opportunities are plentiful.

The problem for shipbuilders and coalminers is that many of the service jobs are destined for younger people with more education, and the jobs they can get, whether as janitors or cooks, often pay less well than their current work. The government has promised to provide retraining for those who lose jobs in industry, but that can only help so much. “Most of these guys can’t just go from making a living by their brawn to making a living by their brains,” says a recruiter at the human-resources centre in Yizheng.

For the employees of Sainty Marine, the question of what their next job might be is not the most pressing one. They have been showing up to work without getting paid. Mr Wang, 45, a welder, has a note signed by a manager stating that he is owed several months’ salary, money that he needs to pay back relatives who lent him cash to build a house. He joined the group blocking the highway, but that achieved nothing. He has tried to corner his bosses, but that also got him nowhere. Lately, he says, he has been looking at the crane, sizing it up for a climb. ■



中国劳动力市场 冲击与减震器

失业率在上升，但不一定看得到

吊机耸立在长江下游舜天船舶公司的船厂内，自去年底有工人爬上去过后已经好几周没动静了。这家经营维艰的公司已经再没有订单，它选择直接停发工资，而不去直面裁员的难题。那个爬吊机的工人威胁要从上面跳下来，以此寻求当地官员的关注，直到他们承诺帮忙讨薪，他才下来。其他工人则采取了更安全些但同样挑衅的方式（在这个国家，罢工被视为非法行动）来追讨欠薪：他们游行抗议并围堵了附近的一条公路。

舜天船舶的工人会诉诸这类行动也许并不出奇。如今，贸易放缓，对新船的需求萎缩，供过于求令全球航运业陷入低迷。过去匆忙扩张的中国公司如今被压得喘不过气来。舜天船舶早前因收购了另一家造船企业而扩张过度，现在正走向破产。中国企业陷入危机时常常会选择克扣工资。舜天船厂位于工业城市仪征，当地政府已发表声明谴责雇主克扣工人工资的行为。

在其他深受打击的企业里，尤其是在重工业，许多工人也为类似的问题所困扰。总部设在香港的舆论监督组织“中国劳工通讯”（China Labour Bulletin）记录的数据显示，在2015年全国发生了2774次罢工及工人抗议事件，相比2014年的1379次翻了一番。在中国制造业的中心地带、南部省份广东，警方两周前逮捕了四名劳工运动人士，显示当局对抗议行动日渐增长感到不安。

尽管股市动荡及货币贬值在最近几天受到全球关注，但对中国政府而言，经济增长放缓对就业的影响是更敏感的问题。共产党一直对市场带有某种程度的漠视，推而广之，对投资者也是如此。对工人则不同：过去30年来工人生活水平的稳步提升进一步巩固了共产党的合法统治地位。

情况有多让人担心？经济压力对整体就业数字的影响至今相当轻微，至少

官方数据如此显示。据政府对31个大城市做的最新调查，失业率在去年初为5.1%，到9月底缓慢上升至5.2%。制造企业明显在裁减职位：财新对该行业的调查受到密切关注，其中就业指数在12月跌至47.3——连续第26个月低于50（标志行业收缩的临界点）。但在服务业这一在整体经济中占比大于制造业的领域，财新的就业指数在去年12月达到51.3，高于8月时50.1的低位，这意味着该行业有所扩张。

然而，由于中国具有两个独特的减震机制，这些数据实际上存在水分。首先，户口登记制度意味着约有2.7亿农民工奔赴城市打工却无权永久居住其中，更遑论在那里领取失业保险。如果失业，他们会如预料般返回通常在农村的原居住地，因而不被算作失业者。2008年金融危机最严重时，数千万民工径直返乡务农，或在村里干活赚取微薄的酬劳。这次没有出现类似的返乡大潮，但农村依然是个安全阀，有助吸收失业人员。

另一缓冲机制是原本就对经济造成牵绊的因素之一：国有企业。虽然私营企业经营得更好，盈利也更多，但国有企业的政治后盾意味着融资更加容易，并在从能源到交通等一系列限制性行业中占据主导。而这些特权也附着着政治任务，包括避免裁员来维护社会稳定的义务。作为部队现代化计划的一部分，军方将裁员约30万，政府上月提醒国有企业必须预留5%的空缺岗位供复员士兵就业。

国际货币基金组织的分析师在去年的份工作文件指出，有迹象显示“产能过剩行业囤积劳动力的情况加剧”，这有助于抑制失业率，代价是生产力下降。但即便是国有企业，其资源也并非用之不竭。扭亏希望渺茫的亏损企业已经开始裁员。北部省份黑龙江最大的一家国企龙煤矿业去年9月表示将削减多达10万个职位，占其员工总数的近一半。

理论上，中国的经济可以吸纳众多失业者。中国的劳动年龄人口在2012年达至顶峰，所以其他条件不变的前提下，就业竞争将减少。同时，中国经济开始向服务业倾斜，而服务业比工业更为劳动密集，即使增长放缓，也能创造就业机会。去年，服务业大约占到中国GDP的一半以上，是几十年来的第一次，同时其份额还在不断扩大：按名义价值计算，服务业产出在

2015年前九个月同比增长11.6%，而制造业仅增长了1.2%。

央行估计，只要服务业的GDP占比在2015年提升一个百分点（实际表现更好），即便经济放缓将近0.5个百分点，仍然能够创造一样多的新职位，与2014年的数字相当。这可以解释为何全国各地的就业中心仍显示劳工短缺：平均每个求职者就有1.09个空缺虚位以待（见图表）。有意应聘会计师事务所或餐馆的求职者更有大量机会。

造船和煤矿工人面对的问题是，许多服务性工作只需要受教育程度更高的年轻人，而他们能得到的职位，无论是门卫还是厨师，薪酬往往远低于目前的工作。政府承诺向失业产业工人提供再培训，但能帮的也仅此而已。“这些工人大多无法从以体力维生变成以脑力维生。”仪征人力资源中心一位招聘人员说道。

对舜天船舶的员工而言，下一份工作做什么也许还不是最迫切的问题。他们已经有一段时间上班工作却拿不到报酬。45岁的王先生是一名焊工，他拿着一位经理签名的欠条，上面显示他已经被拖欠了数月的工资，而他需要这些钱来归还亲戚借他盖房子的钱。他加入了那群围堵公路的工人，但一无所获。他试过拦截老板，也无甚帮助。他说，最近自己在打量那台吊机，考虑要不要也爬爬看。 ■



Human exoskeletons

Full metal jacket

From the battlefield via the factory floor to the orthopaedic clinic, artificial bones and muscles worn outside the body are providing help and protection

SOLDIERS kitted up in expectation of their first taste of combat often reflect on how much of their bodies a bulletproof jacket and helmet do not cover. About 81%, it turns out. More armour than this would be impractically heavy. Indeed, many soldiers already carry at least 50kg of kit and supplies, which is more than double what America's Army Science Board advises as the limit if damage to a soldier's skeleton and musculature is to be avoided.

The answer, many suggest, is a second, external skeleton, complete with artificial muscles, that would let its wearer carry far more weight without strain. Such exoskeletons, moreover, are no longer the stuff of science fiction. Interest in their uses, both on and off the battlefield, is growing.

One of the most advanced is the Kinetic Operations Suit (KOS) made by Revision Military, a firm in Vermont. For a soldier this triples his armour-protection while adding little burden to his movement. An artificial articulated spine transfers most of the weight of the suit's helmet (which fully encases the wearer's head) to armour on his shoulders. The weight of the armour protecting his torso is similarly transferred to his hips and legs through another section of artificial spine. All this reduces strain on his neck and lower back, the natural skeleton's weakest links. His legs must still bear the extra weight, however. To assist with this, the KOS uses titanium-aluminium shafts which are strapped, along with armour, to his lower limbs. Electric motors, taking their cue from accelerometers and other sensors embedded in the suit, move these shafts in step with the way the soldier moves his legs.

According to Brian Dowling, a former special-forces soldier in the American army who works for Revision Military, the system is both nimble enough and robust, enough to help its wearer run, fully laden, across uneven terrain. The armies of several countries, America's included, are now evaluating such claims.

A second military exoskeleton, more ambitious even than KOS, is being developed by the special forces themselves. This project's contractors include many of the most famous names of America's defence establishment, such as General Dynamics, Lockheed Martin and Raytheon. Intriguingly, they also include Legacy Effects, the firm that designed the exoskeletons which feature in the "Iron Man" science-fiction films. The device these firms have come up with is called the Tactical Assault Light Operator Suit, a name crafted to yield the acronym TALOS, the ancient Greek name of a mythical animated bronze statue.

TALOS will weigh twice as much as the soldier inside it. The components contributing to this weight will, however, make it bullet- and shrapnel-proof. They will also offer its wearer a cooling system; a set of sensors that monitor his physiology; and superhuman strength. The result, according to General Joseph Votel, head of the Special Operations Command, will be "peerless tactical capability".

If, of course, it works. That is not certain. To start with, the actuators that operate TALOS will need to become more agile. Replicating the movements of the shoulder joint, the human body's most mobile, remains particularly difficult. The device will also need far more power than portable batteries can provide. General Atomics, another of the military-industrial complex's usual suspects, has proposed designing a small internal-combustion engine to run the whole thing. But such engines are noisy, which could alert the enemy. Also, soldiers might, quite reasonably, be reluctant to wear a tank of petrol into battle.

| *Power down*

A prototype of TALOS should be available by 2018, though a battle-ready version is at least a decade away. And even Revision Military's more modest system will probably not be fit for combat for several years. In the meantime, though, the world's armed forces are looking at the idea of unpowered exoskeletons.

Australia's Department of Defence, to take one example, has designed a skeleton that diverts much of the weight of a backpack, or of armour designed to protect the torso, directly to its wearer's boots. Two steel cables—encased in flexible tubes which are, in turn, held in place by loops in the wearer's trousers—run directly from the backpack or armour to the soles of the boots. It is these cables that transmit the load. The tubes stop them buckling, letting them support their burden while retaining sufficient flexibility for the wearer to walk or run unhindered. The system is a prototype. But two other unpowered exoskeletons, one developed by Lockheed Martin and the other by BAE Systems, a British defence giant, are already in use—not for combat, but for industry.

A worker holding a rivet gun or other similarly heavy tool may have to set it down to shake out his arms and recover his strength so often that he is resting nearly half the time he is on a job. To help, Lockheed Martin has designed FORTIS, a 17.5kg unpowered exoskeleton now being tried out by the American navy and also by nearly a dozen manufacturing companies. FORTIS's articulated aluminium frame supports a gimbaled arm (see picture). One end of this arm, in front of the worker, is attached to the tool being used. The other end, behind him, carries an appropriate counterweight. Whether he is standing or kneeling to do the job in question, the combined weight of both tool and counterweight is transferred to the ground through the exoskeleton rather than through his bones. The tool itself thus seems weightless, and the worker does not so much wield as guide it. And, because that tool is attached to the

exoskeleton, rather than being carried in the worker's hands, this arrangement also prevents injuries caused by dropped tools.

Both FORTIS and BAE's competing system, the Orthotic Load Assistance Device, boost productivity by about 50%, reckons Dana Ellis of the National Centre for Manufacturing Sciences. This industry body, based in Ann Arbor, Michigan, is helping both manufacturers and America's Department of Defence adopt the technology. At American naval shipyards, FORTIS lets two workers do more with a grinder than the three-man team they have replaced, says Trish Aelker, exoskeletons boss at Lockheed Martin. At the end of their shift, she adds, workers are no longer so fatigued that they routinely "go home and crash on the couch".

Carmakers are interested, too. Earlier this year Audi and Daimler, along with three other firms that prefer to remain anonymous, began testing a device called the Chairless Chair, made by Noonee, a Swiss firm. The Chairless Chair is a padded titanium exoskeleton that a worker straps to his buttocks, thighs and calves. Internal hydraulics allow its configuration to be locked at the push of a button, holding the wearer in a sitting position until he tries to stand up. Doing so automatically disengages the lock, permitting him to rise. The device weighs less than 4kg, so someone wearing it does not feel encumbered when standing or walking around. But, the button pushed, it lets him crouch comfortably inside the frame of a half-built car in order to add to its structure. According to Tanja Schembera-Kneifel, who runs Audi's tests of the product, by reducing workers' musculoskeletal problems, the Chairless Chair has also reduced absenteeism. Audi plans to deploy the device widely.

Other partial exoskeletons are in the works. One, the Personal Lift Assist Device, designed by Mohammad Abdoli-Eramaki of Ryerson University in Toronto, is also being tested by carmakers. Dr Abdoli-Eramaki's invention involves a sheathed spring that runs down the spine. When the wearer

bends to grasp and lift something, the spring stretches, reducing the effort required to stop gravity pulling his body to the floor. Then, when he stands up, the spring contracts, pulling on his torso enough to reduce by more than 15% the effort his muscles have to use to lift him.

Another partial skeleton, unveiled earlier this year by researchers at Carnegie Mellon University, in Pittsburgh, is called the Walking Assist Clutch. It is worn around the ankle and the calf, and uses a short elastic cord to reduce the work required of the muscles that pull on the Achilles' tendon of one foot while the other is in the air. As the cord stretches, it stores energy which, a moment later, is released to tug the heel up, helping that foot push off the ground. According to its inventor, Steven Collins, the Walking Assist Clutch decreases the effort involved in walking around by 7%. For someone like an infantryman, that would be a valuable gain.

| *Step up*

In the end, though, the future of exoskeletons probably does lie with powered versions. The European Union, for example, is putting €15m (\$17m) into a transnational project to develop a system called Robo-Mate. This is an exoskeleton with upper- and lower-arm motors that reduces the perceived weight of an object by 90%. Trials begin in 2016. One of the guinea pigs is Fiat, another carmaker (whose chairman, John Elkann, sits on the board of *The Economist's* parent company). The second is INDRA, a French firm whose business is the even-more-labour-intensive one of dismantling and recycling vehicles.

Nor is Robo-Mate alone. Power Loader from Activelink, a subsidiary of Panasonic, a Japanese company; Hal from Cyberdyne, another Japanese firm; and the Body Extender from Percro, a robotics laboratory at the Scuola Superiore Sant'Anna in Pisa, Italy, are all in development, too. They may do more than make existing workers safer and more productive. Carmen Constantinescu, Robo-Mate's project manager at the Fraunhofer Institute

campus in Stuttgart, Germany, observes that they will also redefine who can become a worker. By abolishing the strength advantage enjoyed by men, exoskeletons will open up to women jobs that many now find too strenuous. They will also help older men, who might otherwise have to give up work.

The group whose lives may be changed most by powered exoskeletons, though, are paraplegics. Both ReWalk Robotics, an Israeli firm, and Parker Hannifin, of Cleveland, Ohio, make devices that consist of an artificial pelvic girdle sporting two powered, jointed, limb-like appendages that strap to the wearer's legs. Combined with a pair of walking sticks attached to his forearms, these let a user walk for hours at a time before the batteries run out. They can even permit him to climb a flight of stairs.

ReWalk's device has been available in Europe since 2012, and in America since 2014. Parker Hannifin's was approved for use in Europe in November, and American approval is expected soon. Exoskeletons, then, come in many guises. Some may help on the field of battle. But sometimes, conquering a staircase will be enough. ■



人类外骨骼

全金属外壳

从战场，车间，到骨科诊所，穿戴式人造骨骼及肌肉正为人们带来帮助与保护

士兵全副武装期待初尝战场滋味时，总会想一想自己身上有多少地方尚未被防弹衣和头盔覆盖。事实上，这样的面积约为81%。添加更多的护甲将会过于沉重而不可行。实际上许多士兵已背负至少50公斤的装备和给养，是美国陆军科学委员会（America's Army Science Board）建议上限的两倍还多，这一限制是为了避免损伤士兵的骨骼和肌肉。

许多人建议，解决的方法是打造配有人造肌肉的另一套外部骨架，能让佩戴者毫不费力地背负起重得多的装备。而这样的外骨骼已不再是科幻小说的素材，人们在战场内外使用它们的兴趣日渐浓厚。

其中一款最先进的产品是由佛蒙特州的Revision Military公司制造的“动力作业套装”（Kinetic Operations Suit，简称KOS）。该产品令士兵得到三倍的盔甲保护而不会对其行动增添多少负担。人造关节脊柱把装备头盔（完全覆盖穿戴者的头部）的大部分重量转移到肩膀的护甲上。同样，保护躯干的护甲也通过人造脊柱的另一部分把重量转移到臀部和腿部。所有这些减轻了对颈部和下背部的压力，这两处是自然骨骼中最薄弱的环节。但士兵的腿部仍须承受额外的重量。为帮助解决这一问题，KOS将钛铝合金传动装置绑到士兵的下肢上，配合盔甲使用。电动马达接收到加速度计等内置传感器的指示后，带动这些传动装置与士兵的双腿同步移动。

据如今在Revision Military公司工作的美军前特种部队士兵布莱恩·道林（Brian Dowling）所说，该系统够轻便也够结实，可帮助穿戴者在全副武装之下奔跑于崎岖地形之上。包括美国在内的多国军方正在评估这样的宣传。

比KOS更具野心的另一款军用外骨骼正由特种部队自行开发。该项目的承包商包括美国很多名头最响的防务公司，如通用动力（General

Dynamics）、洛克希德马丁（Lockheed Martin）和雷神（Raytheon）。有趣的是，其中还包括了好莱坞特效公司Legacy Effects，它为《钢铁侠》系列科幻电影设计了其中引人注目的外骨骼。这些公司联手构思的产品名为“战术突击轻型作业套装”（Tactical Assault Light Operator Suit），这个名字构思精巧，其缩写TALOS正是古希腊神话中青铜巨人塔罗斯的名字。

TALOS的重量将是穿戴它的士兵体重的两倍。部件虽重，却可令整套装备防御子弹和弹片。它还为穿戴者提供降温系统、一组监控其生理指标的传感器，以及超人般的力量。据美国特种作战司令部司令约瑟夫·沃特尔（Joseph Votel）将军所说，结果将是“举世无双的战术能力”。

当然，前提是它能发挥效用，而这还不确定。首先，TALOS的致动器需要变得更灵活。要复制人体最灵活的肩关节的动作仍旧特别困难。另外，该装置耗电量大，便携电池远远不能满足。常被视为军事工业集团一员的通用原子（General Atomics）提议设计一款小型内燃机来驱动整套装备。但这类发动机噪音大，容易暴露目标。此外，士兵们也不愿“戴”着一箱汽油上战场，这很好理解。

| 无动力装置

TALOS的原型机应该可在2018年前推出，但能投入作战的版本至少要等上十年。就连Revision Military那套较简易的装备也未必能在几年内用于作战。不过，与此同时，各国军队正在研究无动力外骨骼的构想。

例如澳洲国防部设计的一款外骨架，可将背包或保护躯干的防具的大部分重量直接转移到穿戴者的靴子上。两条钢索直接把背包或护甲和靴底连接起来，钢索外面包裹挠性管，穿过裤子上的环圈加以固定。正是这些钢索起到了传输负载的作用。外裹软管可防止钢索弯曲，使其在承受重负的同时保持足够的灵活性，让佩戴者可以自如行走或奔跑。该系统仍处于原型阶段。但另外两款分别由洛克希德马丁公司和英国防务巨头BAE系统公司（BAE Systems）开发的无动力外骨骼已投入使用——用于工业生产而非军事用途。

工人拿着铆钉枪或其他类似的重型工具作业时，往往需要经常放下工具，甩甩手臂恢复力量，算起来，可能近一半的工作时间要用于休息。为解决这一问题，洛克希德马丁公司设计出一款重17.5公斤的无动力外骨骼，名为FORTIS。美国海军及十多家制造企业正在试用该系统。FORTIS的铰接式铝制框架撑起一个万向臂（见图）。工人身前的万向臂一端与其使用的工具相连接。工人身后的另一端附有相应的配重。无论工人是以站姿还是跪姿操作，工具及配重的总重量会通过外骨骼而非其自身骨骼被转移到地面上。工具本身因此显得毫无重量，工人无须费力举起工具，只要引导工具进行操作。而且，由于工具是与外骨骼相连，而非由工人手持，也可防止工具掉落造成损伤。

FORTIS和BAE系统公司研制的竞争产品“矫形负重辅助装置”（Orthotic Load Assistance Device）都可令生产力提高约50%，美国国家制造科学中心（National Centre for Manufacturing Sciences）的达纳·埃利斯（Dana Ellis）估计。该中心的总部位于美国密歇根州的安阿伯市（Ann Arbor），正在帮助制造商及美国国防部采用这样的技术。在美国的海军造船厂，工人利用FORTIS系统操作磨机，两人完成的工作量要比以往三人还多，洛克希德马丁公司的外骨骼项目负责人崔西·埃尔克（Trish Aelker）说。她补充道，工人下班后不像以前那样累得“一回家就瘫倒在沙发上”。

汽车制造商也感兴趣。今年早些时候，奥迪、戴姆勒和其他三家不愿公开名字的汽车厂商已开始试验由瑞士公司Noonee制造的名为“隐形椅”（Chairless Chair）的装置。这是套在工人臀部及大小腿上带有软垫的一组钛合金外骨骼。只需按下按钮，其内部的液压装置便可锁定其构型，让穿戴者保持坐姿，如果他试图站起来，装置会自动解锁。该装置重量不到四公斤，穿戴者在站立或行走时不会感动笨重不便。而只需按下按钮，工人便可以舒服地蹲坐在半完工的车架内进行加工作业。在奥迪负责测试这一产品的塔尼亚·斯坎贝拉-内费尔（Tanja Schembera-Kneifel）表示，隐形椅有助工人减少肌肉骨骼劳损，缺勤率也因而降低。奥迪计划广泛应用这一装置。

其他局部外骨骼产品也在研发中。其中一款是多伦多瑞尔森大学（Ryerson University）的穆罕默德·阿卜杜力-埃拉玛吉（Mohammad Abdoli-Eramaki）设计的“个人抬举辅具”（Personal Lift Assist Device），也正由汽车制造商测试。这一发明包含一组带护套的弹簧，沿脊椎分布。穿戴者弯腰抓取并提起物件时，弹簧伸长，减少身体抗衡地心引力所需的力量。而要站起来时，弹簧收缩，有助拉起躯干，让身体站直所需的肌肉力量可减低超过15%。

另一款局部外骨骼是今年早前在匹兹堡亮相的“助行脚套”（Walking Assist Clutch），由卡内基梅隆大学（Carnegie Mellon University）的研究人员研发。该产品穿戴在脚踝及小腿上，利用一根弹性短绳减少在一只脚悬空时另一只脚的肌肉拉动跟腱所费的力气。短绳在拉伸时储存能量，随后释放用于拉抬脚跟，帮助那只脚推离地面。其发明者史蒂芬·柯林斯（Steven Collins）表示，“助行脚套”可让步行省力约7%。对于步兵等人群，这将是宝贵的助力。

| 快步前行

但最终，外骨骼的未来也许还是要看有动力版本的开发。比如，欧盟正向一个跨国项目投入1500万欧元（1700万美元），研发名为Robo-Mate的系统。该产品是一套配备上臂及前臂电动机的外骨骼，能减少物体90%的感知重量。试验于2016年开始。另一家汽车制造商菲亚特（其董事长约翰·埃尔坎[John Elkann]是《经济学人》母公司董事会成员）是参加试验的厂商之一。另外还有主营车辆拆解及回收的法国公司INDRA，其业务更是属于劳动密集型。

Robo-Mate也并非独苗。正在研发中的设备还有日本松下子公司Activelink的“强力装卸器”（Power Loader）、另一家日本公司Cyberdyne开发的“混合辅助肢体”（HAL）、意大利比萨市的圣安娜高等学校（Scuola Superiore Sant'Anna）的机器人实验室Percro开发的“身体扩展器”（Body Extender）。这些器材的作用也许还不止于帮助工人更安全高效地作业。在德国弗劳恩霍夫研究所（Fraunhofer Institute）斯图加特校区负责Robo-Mate研发项目的卡门·康斯坦丁内斯库（Carmen

Constantinescu) 观察到，这些产品还将重新定义胜任工人的资格。外骨骼器械消除了男性的体力优势，使得女性有机会从事如今觉得费力的工作。它们也会帮到那些原本不得不放弃工作的年长男性。

然而，生活因动力外骨骼而改观最多的可能是截瘫患者。以色列公司“ReWalk机器人”（ReWalk Robotics）和美国俄亥俄州克利夫兰的派克汉尼汾公司（Parker Hannifin）生产的装置都包含一个人造骨盆，它带动固定在腿上的两条电动义肢。加上附在两条前臂上的一对拐杖，整套设备能让穿戴者在电池耗尽之前一次步行好几个小时。他们甚至可以靠这套装置上楼梯。

ReWalk生产的器械自2012年开始已在欧洲上市，2014年起开始打入美国市场。派克汉尼汾公司的产品去年11月获批在欧洲使用，在美国获批也指日可待。以后，外骨骼会有多种形式，有些可助人战场争胜，但有时候，帮人征服一段楼梯也就足够了。■



Schumpeter

Toy story

What the fad for the non-hovering hoverboard tells us about business

THAT was quick. A couple of months ago hoverboards were the next big thing. Today they are a bad joke. It turns out that they sometimes burst into flames, pitch their riders onto the floor and otherwise cause mayhem. In his boxing career, Mike Tyson was knocked out only five times. A YouTube video shows him felled by a hoverboard in a matter of seconds.

This is more than a story of a short-lived fad. It is a parable of business life under what Jeremy Corbyn, the hard-left leader of the British Labour Party, would probably call “late capitalism”. “This is the modern economy in a nutshell,” says Josh Horwitz on *Quartz*, a news website: “viral trends, massive manufacturing hubs, IP disputes, weak regulation, immensely powerful businesses, and global ripple effects.” The big question is whether it is a prophecy as well as a parable: a growing number of analysts think that 2016 will be the year in which the new economy falls back to earth.

The hoverboard craze exemplifies three facets of modern business. The first is its propensity to blur the boundaries between fantasy and reality. Many modern high-tech devices started life in science fiction: think of “Star Trek” characters consulting clever hand-held devices and talking to their computers. Elon Musk wants to shoot people across California in vacuum-sealed tubes. Jeff Bezos wants to deliver packages by drone. Hoverboards themselves were introduced to the world by Hollywood in “Back to the Future Part II”.

One problem with hoverboards is that they don’t blur the line between fantasy and reality far enough. Rather than hovering above the ground, they trundle along it on a couple of wheels (although someone has now

invented one that really hovers). Hoverboard entrepreneurs dealt with this problem by pulling another rabbit from the fantasist's hat—pretending that hoverboarding is part of the celebrity lifestyle. The trick was to put the product in the right places—at the MTV awards ceremony and under the feet of Justin Bieber. The fad gained momentum as the B-list celebs followed the A-listers, and the wannabes aped the B-listers. Kendall Jenner, a reality-TV starlet, posted a video of herself on one. More than a million people “liked” it on Instagram. Wiz Khalifa, a rapper, was stopped and handcuffed for riding on one in Los Angeles airport. A Filipino priest sang to his congregation while gliding around on one.

The craze for hoverboards also exemplifies the agility of modern business, from the prowess of China's manufacturing cluster in Shenzhen to the reach of e-commerce platforms in both China (Alibaba) and America (Amazon). China's manufacturers have a long record of churning out cheap knock-offs at high speed. But they are more efficient than ever thanks to the arrival of internet platforms. Alibaba allows Chinese manufacturers to place bulk orders for components and lets wholesalers place bulk orders for finished products. Amazon completes the picture by allowing Western consumers to have their hoverboards delivered rapidly with just the click of a mouse.

And the hoverboard fad points to a third characteristic: the difficulty of regulating a global supply chain that starts with a fantasy, ends with an Amazon package and takes in a bustling Chinese assembly plant in the middle. Everything in the product's supply chain emphasised speed over competence. Britain's National Trading Standards agency found that 15,000 of the 17,000 hoverboards it examined were unsafe because of problems with their plugs, cabling, chargers, batteries or cut-off switches. It is frustratingly hard to hold the various producers of the gadgets accountable for these problems: manufacturers subcontract as much as they can and internet retailers are often simply electronic shopfronts with no influence

over product quality. The regulation of hoverboards was complicated further by a legal battle between three separate entrepreneurs over who has the rights to them. Even so, this still does not explain why retailers in the United States were able to sell the products apparently without even rudimentary health-and-safety tests.

| *Hovering on the edge of legality*

The problem may have solved itself: so many hoverboards have burst into flames that Amazon has either dramatically restricted the number of models it sells, as in America, or banned them entirely, in the case of Britain. Several Chinese firms have stopped producing them. But, for a remarkable number of new-economy businesses, the regulatory problem remains unresolved.

Many tech startups have tended to adopt the same approach as the hoverboard industry—exploiting legal grey areas on the ground that, if they build enough momentum, legislators and judges will simply adjust the law to take into account new commercial realities. That is a big bet: many of today's biggest firms are like hoverboard riders heading for bumpy ground. Uber may be forced to reclassify its drivers as employees rather than contractors, rendering it liable for millions of dollars in back pay and upending its business model. Airbnb may be forced to abide by the health-and-safety and licensing rules that apply to hotels.

The threat of adverse regulation animates the question of whether the hoverboard fiasco is a prophecy as well as a parable. Silicon Valley has long displayed some of the classic characteristics of a bubble: companies vying to build the most eye-catching headquarters and CEOs competing to produce the most extravagant ideas to “change the world”. There are growing signs that private valuations of tech “unicorns” will not hold up when they are subjected to the rigours of the public market. Some unicorns have shied away from going public at the last moment and others such as

Good Technology, a mobile-device security firm, have sold themselves at lower valuations than they had hoped. If regulators alter the landscape further, 2016 might be the year that such firms follow the hoverboard and go up in a puff of smoke. ■



熊彼特

玩具总动员

非悬浮的悬浮滑板风行一时所带来的商业启示

这一切来去匆匆。几个月前，悬浮滑板还是未来的一大热门。如今，它已沦为笑柄。事实表明，这些滑板有时会突然自燃，又会把骑它的人甩在地上，或者造成其他的伤害。拳王泰森在其拳击生涯中只有五次被击倒，而YouTube视频显示他在几秒钟内就从一块悬浮滑板上栽倒下来。

这不仅是潮流的昙花一现，还是一则关于商业生活的寓言，英国工党激进左翼领袖杰里米·科尔宾（Jeremy Corbyn）可能会称之为“晚期资本主义”。“这是现代经济的一个缩影，”财经新闻网站 *Quartz* 的约什·霍维茨（Josh Horwitz）说，“病毒式传播的潮流、大规模的制造中心、知识产权纠纷、软弱的监管、无比强大的企业，以及全球连锁反应。”一大问题是，在寓言之外，这会否也是一条预言：越来越多分析师认为，2016年将是新经济回归现实之年。

悬浮滑板的风潮凸显了现代商业的三张面孔。其一是它倾向于模糊幻想与现实之间的界限。许多现代高科技设备的原型均来自科幻小说：比如《星际迷航》里的人物会向手里的智能设备求教，并与电脑对话。伊隆·马斯克（Elon Musk）想用真空密封管道发射人们横穿加州。杰夫·贝索斯（Jeff Bezos）想用无人机快递包裹。悬浮滑板的概念最初出现在好莱坞电影《回到未来II》里。

悬浮滑板存在的一个问题是未能充分模糊现实与幻想的界线。这些滑板得靠几个轮子在地上滚动，而非真的悬浮在地面之上（虽然现在有人已经发明出了能真正悬浮的产品）。悬浮滑板企业家于是玩起另一套把戏来处理这一问题——假装悬浮滑板是名人生活方式的一部分。诀窍是在适当的地方植入产品——在MTV颁奖典礼上、在贾斯汀·比伯（Justin Bieber）的脚下。随着二线明星追随一线大腕，崇拜者又模仿二流明星，悬浮滑板的热潮势如燎原。电视真人秀新星肯达尔·詹娜（Kendall Jenner）贴出自

已踩悬浮滑板的视频，吸引超过一百万人在Instagram上点“赞”。说唱歌手维兹·卡利法（Wiz Khalifa）在洛杉矶机场踩悬浮滑板时遭拦截并被戴上手铐带走。一位菲律宾神父踩着悬浮滑板对信众唱歌。

悬浮滑板的热潮也体现了现代企业动作之敏捷，从中国深圳强大制造集群的超凡实力，到中国（阿里巴巴）和美国（亚马逊）电子商务平台的覆盖范围，均可为例证。长期以来，中国制造商以高速批量产出廉价仿造品著称。随着互联网平台的出现，他们变得更为高效。阿里巴巴使得中国制造商可批量订购组件，也令批发商能够大量订购制成品。亚马逊完成最后一块拼图，让西方顾客只需点击鼠标，悬浮滑板便迅速送货上门。

悬浮滑板热还指明了现代经济的第三个特点：全球供应链（始于幻想，终于亚马逊的发货包裹，中间则是中国热火朝天的组装工厂）的监管难度。产品供应链的各环节强调速度更甚于质量。英国国家贸易标准署

（National Trading Standards agency）发现，经其检验的17000台悬浮滑板中有15000台有安全隐患，问题出现在插头、电线、充电器、电池或断路开关上。要让各环节的生产商为这些问题负责，艰难程度让人沮丧：制造商把生产工序尽可能分包，而网络零售商往往只是电子产品门店，对产品质量毫无影响力。三位企业家为悬浮滑板的知识产权而展开的法律争夺战令此产品的监管问题变得愈加复杂。即便如此，也解释不了为何美国的零售商可以出售这些显然未经基本健康和安全的测试的产品。

| 悬浮于合法边缘

问题或许会自行解决：太多悬浮滑板发生了自燃，亚马逊已经大幅缩减在售型号（例如在美国）或者完全停售（比如在英国）。多家中国企业已停止生产这些产品。但是，对于为数众多的新经济企业而言，监管问题仍未解决。

许多科技创业公司都倾向采用与悬浮滑板业类似的手法——利用法律的灰色地带，认为只要行业发展壮大，立法者和法官就只好调整法律以适应新的商业现实。这是一场豪赌：今天许多最大的企业就像脚踩悬浮滑板的人们那样奔向颠簸的前路。优步或许会被迫把旗下司机重新定位为雇员，而

非承包人，因而必须补发数百万美元的工资，其商业模式也会被颠覆。Airbnb或许将被迫接受适用于酒店的卫生安全及牌照规章。

在寓言之外，悬浮滑板的惨败是否还是一则预言？监管收紧的威胁更突显了这一疑问。硅谷一直展现着泡沫经济的典型特征：公司争相打造最抢眼的总部，CEO们竞相抛出要“改变世界”的宏大想法。越来越多的迹象表明，高科技“独角兽”公司的私募估值在公开市场的严格审核下将难以保持。部分独角兽在最后关头撤回上市计划，还有一些以低于预期的价格售出，如移动设备安全技术公司Good Technology。假如监管机构进一步改变规则格局，这些公司也许会在2016年步悬浮滑板的后尘，最终烟消云散。 ■



The battery era

A plug for the battery

Virtual reality and artificial intelligence are not the only technologies to get excited about

IT IS more than two-and-a-half centuries since Benjamin Franklin grouped a number of electrically charged Leyden jars together and, using a military term, called them a “battery”. It is 25 years since Sony released a commercial version of the rechargeable lithium-ion battery, which now sits snugly in countless smartphones, laptops and other devices. In an era of robots and drones, artificial intelligence and virtual reality, the lithium-ion battery lacks futuristic glamour. Its deficiencies are quotidian and clear: witness the scrum of people around charging stations at airports. Yet few areas of technology promise as great an impact in as short a time.

Increasingly, lithium-ion batteries are vaulting out of pockets into power tools, vehicles, homes and even power stations. Carmakers in America, China and Japan are rushing to secure supplies of lithium to prepare for a more electric future. Such is the scramble, that the metal, used in small quantities in each battery cell, today is one of the world’s only hot commodities. The price of lithium carbonate imported to China more than doubled in the last two months of 2015.

Until now, the limits on the use of batteries have been storage capacity, cost and recharging times. But large-scale production is overcoming these hurdles. The head-turner at January’s Detroit motor show was not a car but a battery—that of the 2017 Chevrolet Bolt, which General Motors’ boss, Mary Barra, said had “cracked the code” of combining long range with an affordable price. Tesla, an electric-car maker, is promising to start mass production of lithium-ion batteries this year in a giant “gigafactory” in Nevada. BYD, a Chinese rival, is hot on its heels. In ten months last year

Chinese firms sold more electric vehicles than Tesla has since 2008. A further emphasis on batteries is a big part of China's 2016-20 five-year plan.

| *Rising power*

Electric cars are not the only source of demand. Batteries are also playing an increasingly important role in providing cleaner power on and off electricity grids. In South Africa, Australia, Germany and America, Tesla this year will start selling a \$3,000 Powerwall for homeowners to store the solar energy from their roofs. Utilities are going even further. They are installing millions of lithium-ion battery cells into power plants to regulate supply at times of peak demand, and when it fluctuates because of intermittent wind and solar energy. California has ordered its electricity firms to offer 1.3 gigawatts (GW) of non-hydroelectric storage capacity within five years. That compares with total American power generation of more than 1,000GW, but is still more than double the 0.5GW of batteries plugged into grids around the world today. In 2016 a solar plant equipped with batteries will be installed in Hawaii, promising power after sunset at prices cheaper than diesel.

There is still a long way to go. As yet lithium-ion batteries do not have the capacity to store grid-scale power for more than a few hours. Costs are still too high; and the recent price spike in lithium will encourage researchers beavering away on other types of battery. Yet the more cells that are made, the more understanding and performance improve. Rising demand and higher prices will eventually also generate more lithium supply. Increasingly, lithium is becoming to batteries what silicon is to semiconductors—prevalent, even among worthy alternatives. In one form or another, the lithium-ion battery is the technology of our time. ■



电池时代

插上电池

让人兴奋的技术并非只有虚拟现实和人工智能

本杰明·富兰克林（Benjamin Franklin）把几个带电的莱顿瓶连接起来，并以军事术语命名它们为“电池”，迄今已超过两个半世纪。自索尼发布商用可充电锂离子电池以来，已过去了25年。如今，锂离子电池被应用于无数智能手机、笔记本电脑和其他设备之中。在一个机器人、无人机、人工智能和虚拟现实技术的时代，锂离子电池缺少未来主义的魅力。其缺陷司空见惯、清楚明白：机场手机充电站旁拥挤的人群便是明证。然而，很少有技术领域会像锂离子电池那样有望在很短的时间内产生巨大的影响。

锂离子电池正日益离开人们的口袋，应用于电动工具、汽车、住宅乃至发电站。美国、中国和日本的汽车制造商正争相确保获得足够多的锂供应，为更电动化的未来做准备。争夺如此激烈，令这种在每块电池中少量使用的金属如今成为了世界上少数走俏的大宗商品之一。2015年最后两个月里，中国进口的碳酸锂价格增长了一倍多。

迄今为止，电池的使用受限于容量、成本和充电时间。但是，大规模生产正在克服这些障碍。1月在底特律车展上备受瞩目的不是某款汽车，而是一种电池——2017款雪佛兰Bolt上使用的电池。通用汽车公司的老板玛丽·博拉（Mary Barra）表示，这款汽车已经“破解了”融合超长续航里程和亲民价格的“密码”。今年，电动汽车制造商特斯拉（Tesla）有望在内华达州巨大的电池工厂“gigafactory”开始大规模生产锂离子电池。中国对手比亚迪则紧随其后。去年中国公司十个月的电动汽车销量就超过了特斯拉自2008年以来的总销量。进一步发展电池产业是中国2016年至2020年五年规划中的重头戏。

| 电力提升

电动汽车并非需求的唯一来源。在提供更清洁的并网和离网电力方面，电池也扮演着越来越重要的角色。特斯拉今年将开始在南非、澳大利亚、德

国和美国向房主出售定价3000美元、用于储存屋顶太阳能的家用蓄电池Powerwall。电力公司更进一步，正为发电厂安装数以百万计的锂离子电池，以求在需求高峰时段以及间歇性的风能和太阳能供电波动之际调节电力供应。美国加利福尼亚州已下令其电力公司在五年之内提供1.3吉瓦的非水电蓄电能力。虽然相较之下，全美的发电总量超过1000吉瓦，但加州的这一数字仍比目前接入全球电网的总电池储能（0.5吉瓦）多了超过一倍。2016年，一家配备电池的太阳能发电厂将在夏威夷投入使用，有望以低于柴油发电的价格在日落后供电。

前路依然漫长。目前，锂离子电池尚没有能力提供数小时以上的电网级储能。成本还是太高，而且近期锂价格的突然上升将促使研究人员辛勤研发其他类型的电池。然而，生产的电池越多，对它的理解就越深，性能也会提高。不断上升的需求和更高的价格最终也将使锂供应增加。锂对于电池的重要性正日益等同于硅对于半导体的重要性——即便存在一堆有价值的替代品，也仍被普遍使用。以这样或那样的形式，锂离子电池都是代表我们这个时代的技术。■



Rare metals

Unobtainiums

They are obscure, yet essential. Why rare metals make the world go round

LIKE this reviewer, many parents will have given their children electric toothbrushes for Christmas, hoping that the sensors that buzz after two minutes will keep them brushing longer than their flimsy elbow grease. Both generations may, however, be ignorant of the fact that in that time the toothbrushes produce more than 62,000 strokes; that the power to generate such motion comes from tiny magnets using three rare metals, neodymium, dysprosium and boron; and that some of these metals are so coveted that in 2010 they were at the centre of a dangerous rift between China and Japan.

In all, an electric toothbrush is made of 35 metals. The journey they take to children's gums may involve China, the Democratic Republic of Congo, Chile, Russia, South Korea, Indonesia, Turkey and other countries too. They are rare, says David Abraham in "The Elements of Power", a thought-provoking book that follows the trail of these elements, not because they are necessarily scarce or hard to extract. It is because they are used in tiny yet essential quantities—like yeast in a pizza.

In terms of amounts consumed, these metals pale compared with base metals such as aluminium and copper. But, as the book argues, they are no less transformative—and possibly just as valuable—as oil and coal. That is a bold claim, but the author backs it up convincingly. Using vivid detail, he injects life and purpose into the story of elements that are so light, strong, heat-resistant and elusive that an American general in the 1950s quipped that they should be called "unobtainium".

Indium, part of an iPhone's screen, is an "invisible link...between the phone

and your finger”. Just a pinch of niobium, a soft, granite-grey metal mined mostly in Brazil, greatly strengthens a tonne of steel used in bridges and pipelines. Lithium is so light that it has become essential for rechargeable car-batteries. Dysprosium, as well as making an electric toothbrush whirr, helps power wind turbines. Military technology depends on numerous rare metals. Tungsten, for instance, is crucial for armour-piercing bullets. America’s forthcoming F-35 fighter planes are “flying periodic tables”, Mr Abraham writes.

As with oil, those who can secure the resources have access to immense power. The problem, the book laments, is that China, Japan and South Korea are more keenly aware of the strategic importance of rare metals than Western countries, including the United States.

Yet it is not just the rare metals that the book explores. As Mr Abraham follows their extraction, he finds geologists, refiners, traders, smugglers and boffins whose stories add to the intrigue of this shadowy trade. Deals are done in backrooms by likeable mavericks. One, a New Yorker called Noah Lehrman, is described as “likely the only person in history to perform at the Jewish Grateful DeadFest and advise the US Congress on resource security”.

“The Elements of Power” turns out to be a critic as well as an advocate of the rare-metals trade. One concern is what the author calls the “long tailpipe” of pollution left in the wake of mining and refining, notwithstanding the role of minor metals in creating greener products.

Supplies are also a worry. In 2010 a Chinese trawler rammed Japanese coastguard vessels in waters near islands called the Senkakus in Japanese and the Diaoyu in Chinese (their ownership is disputed by both countries). After the Chinese captain was detained, supplies of rare metals from the mainland to Japan suspiciously dried up. Though China never

acknowledged an export ban, the incident caused rare-metal prices to spike, and unsettled manufacturers around the world. Though Japan quickly released the captain, repercussions of the affair pop up through the book.

Mr Abraham would have done well to use more such central narratives—the story, perhaps, of dysprosium, which has one of the most fascinating and fragile supply chains. Yet he persuasively explains the danger of underestimating a business that, by one estimate, generates \$4 billion of revenues a year and also plays a critical role in systems worth about \$4 trillion. China, which develops more rare metals than any other country, understands the calculus. The West, his book suggests, does not. ■



稀有金属

“难得素”

它们不起眼，但很关键。为何稀有金属不可或缺

和本文作者一样，许多家长会在圣诞节送孩子电动牙刷，希望这种在两分钟后还嗡嗡作响的感应器会让力气有限的小孩刷牙刷得更久些。不过，我们这两代人大概都不会注意到，在那一刻，牙刷产生的振动超过6.2万次，而驱动如此频繁运动的是使用了三种稀有金属——钕、镒和硼——的微小磁石。我们大概也不会注意到，一些稀有金属是如此珍贵，在2010年它们甚至成了中日两国一次危险纷争的核心内容。

一支电动牙刷共由35种金属制成。在它们最终抵达孩子的口腔前，一支牙刷的诞生可能要经过中国、刚果、智利、俄罗斯、韩国、印度尼西亚、土耳其等国家。《动力的元素》（The Elements of Power）这本颇具启发性的著作追踪了这类金属的踪迹。作者戴维·亚伯拉罕（David Abraham）说，它们很少见，并不一定是因为它们稀有或难以萃取，而是因为它们被使用的量很微小，却发挥了至关重要的作用——就像披萨里的酵母。

说到用量，这些金属较之铝和铜等贱金属相形见绌。然而本书指出，它们的改造能力并不比石油和煤炭差，且可能具有同等的价值。这是一个大胆的论断，但作者的论证令人信服。他使用了生动的细节给这些元素的故事注入生气和意义。这些金属非常轻、坚固、耐热，又难以获得，以致上世纪50年代一名美国将军打趣说，它们应该被叫做“难得素”（unobtainium）。

iPhone屏幕上含有的铟是“手机和你的手指间……看不见的连接”。一小撮铟（主要从巴西开采的柔软、呈花岗岩灰色的金属）就能极大地加固在桥梁和管道中使用的一吨钢材。锂非常之轻，因而已成为可充电汽车电池的关键成分。镒除了让一支电动牙刷转动外，也为风力涡轮发电机提供驱动力。军事技术有赖于众多的稀有金属，比如，钨是穿甲弹的关键成分。美国即将面世的F-35战机是“飞行的元素周期表”，亚伯拉罕写道。

同石油一样，那些能获得这些资源的人将获得巨大的影响力。问题是，本书叹息道，中国、日本和韩国要比包括美国在内的西方国家更深切地意识到稀有金属的战略重要性。

不过，本书要探索的不止稀有金属本身。在亚伯拉罕追踪它们被提炼的过程中，他发现地质学家、精炼商、贸易商、走私贩和科研人员的故事为这一隐秘的行业更增添了神秘莫测的色彩。交易由可爱的标新立异者私下完成。其中之一是纽约居民挪亚·莱尔曼（Noah Lehrman），书中描述他“可能是历史上唯一一个在犹太死之华音乐节（Jewish Grateful DeadFest）上表演，却同时向美国国会忠告资源安全的人”。

《动力元素》一书提倡却也批评稀有金属交易。作者的一个关注点是采矿和提炼过程中留下的“长尾气管”污染，尽管稀有金属也在创造更加绿色的产品。

供给是另一个担忧。2010年一艘中国渔船和日本巡逻船在钓鱼岛（日语称尖阁群岛，两国对这些岛屿的主权有争议）附近海域相撞。在中方船长被扣留后，从中国大陆出口到日本的稀有金属供应颇为可疑地中断了。虽然中国从未承认实施出口禁令，但该事件导致稀有金属价格飙升，并令世界各地的制造商都坐立不安。虽然日本很快释放了那名船长，但该事件的余波在整本书中不断浮现。

如果使用更多这类核心叙事，亚伯拉罕可以写得很精彩，比如写一番有关镱的故事，因为这种稀有金属具有最有趣也最为脆弱的供应链。但是，他很有说服力地解释了低估稀有金属这一产业的危险。一项估计称，这一行业每年产生40亿美元的收入，并且在一个价值约4万亿美元的产业体系中扮演着关键的角色。中国开发的稀有金属比其他任何国家都多，它深谙这其中的算术。然而，亚伯拉罕的书显示，西方国家却没能如此。■



Free exchange

Automation angst

Three new papers examine fears that machines will put humans out of work

AS FAR back as the Industrial Revolution there have been periodic panics about the impact of automation. Handloom weavers' resistance to new machines earned them a pejorative name—Luddites—that has become a byword for all those who try in vain to stop technological progress. Such anxieties resurfaced in America in the early 1960s, thanks to the rapid automation of agriculture, even though the economy was booming. They are even more prevalent in the rich world now, as advances in information technology (IT) threaten jobs that previously seemed invulnerable to automation. Whether the anxiety is any more justified this time round is the subject of three new papers* in the *Journal of Economic Perspectives*.

Angst about automation typically focuses on the substitution effect, whereby jobs once done by people are taken over by machines—the fate of the Luddites. The current fear is that ever more versatile robots will substitute for labour on a scale never seen before. However, previous experience shows that focusing on substitution shows only part of the picture. According to David Autor, an economist at MIT and author of one of the papers, those with a gloomy view of automation are disregarding the many jobs that come into being thanks to the existence of whizz-bang new machines. Only that, he argues, can explain why the share of America's population in work rose during the 20th century despite dazzling technological advances, or why the drop in agricultural employment, from 40% of the workforce to 2%, did not lead to mass unemployment.

Between 1980 and 2010, Mr Autor points out, the number of bank clerks in America actually increased despite the rapid spread of the cashpoint. That was because the IT revolution not only enabled machines to dispense cash;

it also allowed clerks to work out what extra financial products customers might be interested in and process applications for them. The new jobs that technology makes possible, Mr Autor argues, more than compensate for those lost through substitution. It is just easier to identify the disappearing but familiar occupations than it is to foresee the new ones created in their stead.

Modern techno-pessimists argue that the ground is shifting because so many more jobs can now be handed over to machines. Another of the three papers suggests that advances in machine intelligence may be revolutionary rather than evolutionary. Gill Pratt, an expert on robotics, highlights two techniques that could cause such a breakthrough. One is “cloud robotics”, in which robots learn from one another, leading to a rapid growth in competence. The second is “deep learning”, in which robots process vast amounts of data to expand their capabilities, forming associations that can be generalised. Enhancing these two approaches are some more general trends, such as the exponential growth in the availability and capacity of wireless internet access, data storage and computational power.

If this potential were to be realised, robots could march off the production lines where they carry out specific tasks and take over a far more diverse set of roles in large parts of the economy, including manual occupations. One much touted example would be driverless vehicles, which could endanger the livelihoods of legions of taxi drivers and couriers. Moreover, suggests Mr Pratt, the advances could be so rapid that unlike previous waves of automation robots might displace a much bigger share of the workforce in a much shorter time.

One way to think about the impact of technology is by categorising the tasks involved in any job between cognitive and manual on the one hand, and routine and non-routine on the other hand. It is occupations in

administration and middle management, which involve cognitive but routine tasks, that have been the most vulnerable to automation so far. By contrast, employees whose work is cognitive but not routine have largely gained from technological change, since it enables them to process and present information more readily. Likewise, many forms of manual employment have proved difficult to computerise, and have thus been largely unaffected.

This explains a pattern that has become common in the labour markets of advanced economies in recent decades, whereby there has been growth in employment at both the top and the bottom of the spectrum but a hollowing-out in the middle. But Mr Pratt's work suggests that this comforting resilience may not last, as machines begin to take on both previously manual jobs (thanks to advances in automation) and non-routine ones (courtesy of improvements in artificial intelligence).

| *This time is the same*

Mr Autor argues that many jobs still require a mixture of skills, flexibility and judgment; they draw upon "tacit" knowledge that is a very long way from being codified or performed by robots. Moreover, automation is likely to be circumscribed, he argues, as politicians fret about wider social consequences. Most important of all, even if they do destroy as many jobs as pessimists imagine, many other as yet unimagined ones that cannot be done by robots are likely to be created.

The difficulty of foreseeing the jobs of the future is a theme of the third paper, by a trio of economic historians, on the history of automation angst. In 1930, for example, John Maynard Keynes published a famous essay that predicted that the grandchildren of his generation would scarcely have to work at all. Keynes regarded that as a sign of progress, whereas many today fear such an outcome. Current predictions of the obliteration of jobs may be as far off the mark as his hopelessly rosy view.

* Studies cited in this article can be found at www.economist.com/automation15 ■



自由交流

自动化焦虑症

三篇新论文审视了机器将让人类无工可做的担忧

早在工业革命时期，人们对于自动化的影响就有着周期性的恐慌。抗拒使用新机器的手摇织布机织工为自己博得一个带贬义的名称：卢德派。这个词已成了绰号，专指那些徒劳地试图阻止技术进步的人。20世纪60年代早期，尽管经济蓬勃发展，但因为农业迅速自动化，这样的忧虑在美国再度浮现。随着信息技术的进步，之前看似不会受自动化影响的工作也面临威胁，现在类似的担忧在富裕世界甚至更为普遍。这一轮的焦虑是否更有道理正是《经济视角期刊》（*Journal of Economic Perspectives*）三篇新论文的主题。

自动化焦虑症通常关注的是替代效应，曾经由人做的工作被机器所取代，即卢德派的命运。目前的担忧是用途越来越广泛的机器人将以前所未有的规模取代劳动者。不过，以前的经验表明关注替代效应只是管中窥豹。麻省理工学院的经济学家、其中一篇论文的作者大卫·奥特尔（David Autor）说，那些对自动化持悲观态度的人忽视了一点，很多工作之所以产生，正是得益于高效的新机器的出现。他认为只有这一点才能解释为什么20世纪尽管科技进步令人眼花缭乱，美国就业人口比重仍然上升，也能解释为什么农业就业人口占劳动力的比例从40%降至2%，但并未导致普遍失业。

奥特尔指出，1980年到2010年间，尽管自动柜员机迅速普及，美国银行的职员数量实际上有所增长。这是因为信息技术革命不仅能让机器出钞；也让职员知道客户可能对什么额外的金融产品感兴趣，进而为他们办理申请。奥特尔认为，科技带来的新岗位并不止于补偿那些因替代而失去的工作。人们只是更容易看到一些熟悉的职业渐渐消失，不易预见被创造出来替代它们的新行当。

现代科技悲观主义者称形势正在转变，因为现在如此之多的工作都能由机

器完成。三篇论文中另一篇认为机器智能的进步可能是革命性的而非渐进式的。机器人学专家吉尔·普拉特（Gill Pratt）强调有两种技术可能带来这样的突破。一是“云机器人学”，机器人互相学习，能力将迅速增强。二是“深度学习”，机器人通过处理海量数据来扩展他们的能力，形成可以归纳的关联。改进这两种方法是更普遍的趋势，例如无线上网服务的覆盖和速度、数据存储以及计算能力的指数级增长。

如果这一潜能得以实现，机器人就能从执行具体任务的生产线上大批进入经济的更多领域，扮演更为多样化的角色，包括需要手工灵巧的职业。被大力吹捧的一个例子就是无人驾驶汽车，它可能威胁到大批出租车司机和快递员的生计。而且，普拉特指出，不同于之前的自动化浪潮，这些进步可能非常迅猛，机器人可能在短得多的时间内取代比例大得多的劳动者。

考量科技影响力的方式之一是将任何工作中包含的任务分类，一方面按认知和手工划分，另一方面按常规和非常规划分。行政管理和中层管理类职业包含着认知性的常规任务，到目前为止是最容易被自动化取代的。相反，从事认知性非常规工作的雇员则从科技进步中获益良多，因为科技让他们更容易处理和呈现信息。同样，许多种手工工作已证明很难用计算机处理，因此基本上不受影响。

这解释了近几十年来在发达经济体的劳动力市场上已成为普遍现象的一种模式，即顶端和底部的就业有增长，而中间呈现空心化。但普拉特的论文表明这一令人欣慰的韧性可能无法持久，因为机器开始承担之前手工工作（因为自动化的进步）以及非常规的工作（因为人工智能的改进）。

| 一如既往

奥特尔提出，很多工作仍然需要多种技能、灵活性和判断能力，它们利用的是“隐性”知识，机器人要编码或执行还有很长的路要走。而且他认为，自动化可能会被限制，因为政客们担心会带来更广泛的社会影响。最重要的是，即便如悲观主义者所想，它们摧毁了很多工作，许多别的、意想不到的、机器人无法做到的工作可能被创造出来。

第三篇文章的主题是预见未来工作的困难之处，作者是三位经济历史学家，研究的是自动化焦虑症的历史。例如1930年，凯恩斯发表了一篇著名文章，预言他的孙辈一代将几乎无工可做。凯恩斯认为这是进步的标志，但现在很多人害怕这一结果。目前对于工作将被消除的预言可能跟凯恩斯绝望的乐观看法一样不靠谱。

本文中引用的研究可参见www.economist.com/automation15 ■



Free exchange

Part-time palaver

Turning freelancers for firms like Uber into employees would not necessarily improve their lot

WHAT is an employee? Judges in several American courts are grappling with just this question. Most notably, some drivers for Uber, an app-based taxi service, are suing to have themselves declared employees, rather than independent contractors, in a bid to gain more rights. With technology making it ever easier to farm out small tasks, and freelancing on the rise, the traditional definition of employment may eventually break down. Yet the importance of the “employee” label—and the benefits that come with it—is often overstated.

Historically, the challenge for economists has been to explain employment rather than contracting. Firms with employees use plans and hierarchies to get things done; those who use contractors rely on markets and prices instead. In 1937 Ronald Coase, an economist, argued that this comes down to transaction costs. For instance, it is difficult to contract on output when it is tough to judge quality (as with, say, a spreadsheet). When transaction costs are high, it may be better to replace contractors with employees, who are paid for their input rather than outputs.

A corollary to Coase’s theory is that when transaction costs are low, there is no need for a firm. Industries in which tasks can be neatly divided and where output is easily tracked, such as building, haulage and logging, contractors have been prevalent for decades. In 2009, the year Uber was founded, 88% of taxi drivers were already contractors.

Contracting, then, is not new. But campaigners for workers’ rights worry about the use of contractors in the rapidly growing app economy. Often,

governments and companies provide benefits exclusively to employees. Are contractors missing out?

The main benefits associated with employment fall into three broad categories: public pensions, health care, and unemployment insurance. In the case of pensions, governments usually levy payroll taxes on firms in proportion to their workforce, and use the proceeds to support pensioners. Hire a worker as a contractor, and firms need not pay the levy; in America the self-employed must instead pay it themselves. Workers' advocates claim this means contractors face higher tax rates than employees.

However, conventional economics says the burden of a tax cannot be altered just by changing which party writes the cheque. America's Congressional Budget Office considers payroll taxes part of a worker's tax burden, even though employers pay them. Were Uber forced to pay social-security contributions instead of its drivers, it would presumably offset this extra cost by reducing the share of each fare that goes to drivers. Their take-home pay would remain the same. This argument cuts both ways: if it does not matter who pays, firms may as well cough up (though businesses may legitimately worry about the associated administrative costs of paying contributions).

Then there is health care, which is often tied to jobs in America. Again, there is no free lunch for workers when employers foot the bill. Numerous studies have found that the more firms pay for health insurance, the less they pay in wages. For instance, in 1994 Jonathan Gruber of MIT found that when some states began insisting on better coverage for childbirth, married 20- to 40-year-old women—whose insurance costs rose most on average—took an offsetting hit to their pay.

The third main benefit, support for the jobless, relies on the label "employee" by definition. Temporary and part-time work muddies the rules

on eligibility. In many countries those working more than a certain number of hours a week cannot claim benefits. That creates a sharp incentive for on-demand workers to limit their hours to remain eligible. In New York, for instance, weekly benefits are reduced by 25% for every day on which any work is performed.

Elsewhere, eligibility depends on the circumstances in which the employee left his previous job: if he quit voluntarily, the government may not pay anything. In a world of flexible hours, this can open up tricky questions. If a worker signs up for a job with irregular hours, but then quits when his shifts change in an intolerable way, many American states will not pay any benefits.

Fortunately, there is a relatively simple fix: make welfare payments contingent only on income, rather than circumstances. Benefits can be withdrawn gradually as income increases, perhaps at a rate comparable to income tax. That would encourage jobhunters to take on piecemeal work in the gig economy.

| *Pushing on a string*

If compulsory benefits are offset by lower wages, why should Uber's drivers care how they are labelled? Accepted economic wisdom provides one possible answer: wages are "sticky", or hard to cut in cash terms. If it takes time for pay to fall in real terms, workers who win more benefits in court would be better off for a short while. Workers may also recognise that there is one benefit attached to employee status—a minimum wage—that cannot be offset by lower pay.

Is that an argument for a minimum wage for contractors? Opponents point to its distorting effect on incentives. Workers would look to boost hours rather than output, requiring firms to monitor their effort closely. In Uber's case, a driver could stay in a quiet area, take few passengers and still make

money. What might tip the balance the other way is if firms have too much bargaining power over their workers. This should not apply to a traditional contractor, such as a plumber, who works for lots of clients. But were apps to dominate a whole market—as some suspect Uber eventually might—then contractors may feel outgunned. If that happens, they will need more protection. ■



自由交流

兼职问题，小题大做

为优步等公司效力的自由职业者如果成为常规雇员，福祉未必会改善

何谓“雇员”？美国多个法庭的法官正纠结于这一问题。尤其受到关注的是，打车应用公司优步（Uber）的一些司机正提出诉讼以争取更多权利，要求公司认定其为雇员，而非独立承包人。随着科技进步，小任务的外包协作变得愈加容易，而自由职业者不断增多，“雇用”的传统定义或许终将瓦解。然而，“雇员”这个标签及其附带福利的重要性往往被夸大了。

一直以来，经济学家的难题在于诠释“雇用”，而非“承包”。拥有雇员的公司运用计划和层级结构来完成任务，使用承包人的公司则依赖市场及价格。1937年，经济学家罗纳德·科斯（Ronald Coase）指出，一切取决于交易成本。例如，在难以判断质量的情况下（比如评判一份电子表格），按产出来外包任务有其困难。当交易成本变得高昂，以雇员取代外包商也许是更好的做法，毕竟雇员的薪酬是按其投入而非产出计算的。

从科斯的理论可得到一个推论：当交易成本走低，公司就没有存在的必要了。在建筑、运输及伐木这类可以清楚分拆任务、简便衡量产出的行业，几十年来都流行承包经营。2009年，优步成立，而当时88%的出租车司机就已经是承包人了。

如此说来，“承包”并非新鲜事物。但劳工权利的社运人士担忧快速增长的应用经济对承包人的使用。通常情况下，政府和企业只对雇员提供福利。承包人是否错失了这些？

雇员的主要福利可分为三大类：公共养老金、医疗保险和失业保险。在养老金的问题上，政府通常对公司按员工比例征收养老保险，所得资金用于养老支出。把业务外包，公司则无须为承包人缴纳养老保险。在美国，自雇人士必须自掏腰包来缴纳养老保险中由公司承担的部分。劳工维权人士称，这意味着承包人比一般雇员要面对更高的税率。

然而，传统经济学认为，税务负担不会仅因支付方的改变而转移。美国国会预算办公室视养老保险为劳动者的税务负担，即便税金是由雇主支付。假如优步被迫替司机缴纳社保，公司想必会通过减少给司机的车资分成来抵消这一额外成本，司机们最终拿回家的钱还是一样的。反之亦然：既然谁付税款都一样，公司或许还是会勉强掏出这笔钱来（虽然企业可能会担心因缴税而产生的行政成本，这也是合理的）。

然后是医疗保险的问题。在美国，医保往往和工作捆绑。同样，虽然是雇主买单，但对员工而言，天下没有免费的午餐。无数研究发现，公司在员工医疗保险上支出越多，工资支出就越少。比如，麻省理工学院的乔纳森·格鲁伯（Jonathan Gruber）在1994年的研究发现，当一些州开始坚持要求企业为员工提供更好的生育保险后，20到40岁已婚女性的保费平均上涨最高，但工资收入相应下降，两相抵消。

第三个主要福利是失业救济。顾名思义，它离不开“雇员”这一标签。临时和兼职工作给失业救济资格的规定造成了困扰。在许多国家，人们每周工作超过一定时数则不能领取失业救济，从事按需工作的劳动者因而有强烈的动机来限制自己的工时以确保能申领到福利。例如，在纽约，每工作一天，无论活多活少，本周可领取的失业救济金就减少25%。

在其他地方，失业救济资格取决于之前离职的具体情况：如果是主动辞职，政府也许就不会给予任何救济。在弹性工作时间的世界，这会引发棘手问题。假如劳动者接下一份不定时的的工作，后来因为工作时间的改变令其无法接受而辞职，美国许多州将不对其支付任何失业救济。

幸运的是，有一个相对简单的解决方法：以收入作为发放救济的唯一准绳，而非离职情况。福利可随劳动者收入的增加而逐步减少，可采用与所得税变化相当的累进率进行。这将鼓励求职者加入零工经济，提供零散劳务。

| 适得其反

如果强制性的福利会被工资的降低所抵消，为何优步司机仍在乎能否被贴

上雇员的标签？经济学传统的智慧提供了一个可能的答案：工资具有“粘性”，或者说，难以削减。既然实际工资的下降须待时日，在法庭上赢得更多福利的劳动者在短期内日子会更宽裕。他们或许也意识到雇员地位连带的另一好处——最低工资，这无法被降薪所抵消。

这是否说明要为承包人设立最低工资？反对者指出，这将扭曲激励机制。劳动者会希望增加工作时数，而非注重产出，这使得公司需要密切监控其工作。以优步为例，司机可以呆在非繁忙区域，只接载几个乘客，依然能赚钱。而可能让天平向另一端倾斜的情形是公司的议价能力远高于劳动者。传统承包人不存在这个问题，比如为众多客户服务的水管工。但若应用程序在将来支配了整个市场（有人认为优步最终可能如此），承包人也许会成为弱者。假如出现这种情况，他们将需要更多的保护。■



Retail banking

Cracking the vault

The grip banks have over their customers is weakening

A FEW dollars spent at Starbucks, a monthly mortgage payment, a Netflix fee, Starbucks again: bank-account statements are not exactly exciting stuff. But there is gold hidden in this by-product of our financial lives, or so many budding technology firms believe. A host of startups crave access to the data and are pitching services, from budgeting apps to cheaper loans, to those who open their books to them. Yet banks worry that co-operating is the first step towards losing the lucrative grip they have on their customers.

Squeezing insights out of a bank statement is hardly at the cutting edge of big data. Years of salary payments confirm stable employment; bounced cheques hint at carelessness; regular green fees suggest an interest in golf. Banks implicitly use balance and income information when making loan decisions. That has typically given them a leg up over such rivals as consumer-lending companies, which have to base offers of credit on less detailed information.

Add the fact that switching bank accounts is seen as a chore, and incumbents are in effect shielded from competition. But three things have changed in recent years. The first is the plethora of “fintech” competitors trying to take on banks. The second is internet banking, which has given nearly everyone access to reams of their own financial information in handy digital form. The third is regulation, which is swinging in favour of the upstarts by forcing banks to share the data generated by all those trips to the coffee shop.

Data are already seeping out of banks’ digital vaults and, in the process, giving a sense of why such leaks are damaging. A slew of firms, such as

Mint in America, offer to aggregate the data from customers' various bank accounts, credit-card statements and retirement-savings plans in a single place. This gives customers a comprehensive view of their finances. Because these firms have a startup's focus on being easy and appealing to use, their apps make most banks' mobile offerings look clunky.

Worse, banks' efforts to sell multiple products to current-account holders are being undercut by the financial aggregators, which pitch financial products to customers using the data they have accumulated. "If we see you are paying 4% on your mortgage and there is a product in the market that would let you pay 2%, we think you will want to know about it," says Joan Burkovic of Bankin', a French aggregator. Your bank would rather you didn't.

Among the keenest potential users of personal bank data are peer-to-peer lenders, platforms that match those wanting to borrow money with those wanting to lend it. The likes of Zopa in Britain and Lending Club in America boast about their algorithms' ability to sift good credit risks from bad ones. But the computer programs are only as good as the data fed into them. Information from credit bureaus is useful but limited. "Bank-account information is probably the most valuable data source for underwriting credit that isn't in widespread use," says Martin Kissinger from Lendable, a peer-to-peer firm.

Not only the balance and cashflow are interesting; individual transactions can be revealing, too. How much a small business pays in taxes, say, can give insight into its profitability months before it files its accounts, says Anil Stocker of MarketInvoice, a lending platform. Payments to and from directors, or refunds to customers, can also help gauge its financial health.

Banks are understandably hesitant to send their customers' information to potential competitors, even with the customer's consent. In America banks

have long allowed customers to download their data to compile tax returns; that capability is now being jerry-rigged to feed into other services (Mint belongs to Intuit, a purveyor of tax software). Regulators compel British banks to allow customers to download data in a standard-format spreadsheet.

If banks are not willing or obliged to share, there are services that will retrieve current-account data without the bank's approval. These startups ask customers to share their online banking passwords, in order to log into their accounts and copy and paste page upon page of online statements. Such "scraping" happens in a legal grey area. Banks moan about their terms of service being breached. British regulators frown upon it, for security reasons, making life difficult for would-be Mints; American regulators are said to be unhappy as well. Services such as Yodlee, a Californian outfit, offer to scrape or download bank records, whichever is least inconvenient.

Online lending platforms are wary of scraping: customers are understandably reluctant to hand over their passwords. Only people turned away for credit elsewhere (often for a reason) are likely to do so. Instead, aggregators often make do with data which are patchy or delayed. The likes of Zopa and Lending Club, for example, merely ask for smartphone snapshots of bank statements—a retrograde step, by fintech's standards, and one that limits the insights they can gather.

Policymakers in Europe have concluded that forcing banks to share data at consumers' request will yield big benefits for the banking public. Earlier this month the European Union adopted a directive on payment services, which will in effect force banks to impart data to third parties in a convenient format. Customers will also be able to authorise fintech firms to make payments from their bank accounts.

Banks say publicly they are open to the idea of more competition. Some are

starting to release data more readily. But many fear they are fighting fintech with one hand tied behind their backs. Startups operate with the privacy mores of the technology sector; consumers opt in to their products, and so expect to be bombarded with ads. Banks are more like utilities, trusted to safeguard information rather than use it. When ING, a Dutch bank, last year mulled offering advertisers the opportunity to pitch to its customers based on their spending data, an outcry forced a quick reversal.

Having seen consumers desert their branches, banks now worry that customers will desert their apps and websites, too. Bosses glimpse a future where customers use banks merely as a utility, depositing their money there but using unregulated startups to manage it. Smoother data-sharing would make that a reality. It is a prospect that should indeed frighten bankers as much as it delights their customers. ■



零售银行业务

撬开金库

银行对其客户的控制力正在削弱

在星巴克花了几美元，上月房贷还款，Netflix月费，又是星巴克.....银行账单不是什么让人兴奋的东西，但这个伴随我们的金融生活出现的副产品却暗藏金矿，至少很多新兴科技公司这么认为。一大批创业公司渴望能获取这些数据，正在向对它们公开账单的客户推销从预算应用到低息贷款的各种服务。但银行却在担心，从这类合作开始，它们将渐渐失去对客户的掌控，而这种掌控给它们带来了丰厚的收益。

从银行账单解读出有见地的信息算不上是大数据中的前沿技术。年年有工资入账可以证明工作稳定，出现拒付退回的支票说明做事不细心，而经常支付果岭费则表明对高尔夫感兴趣。毋需明说，银行在审批贷款时会查阅客户的存款余额及收入状况。这一点往往使得银行在与消费信贷公司这样的对手竞争时占据优势，因为这些公司在提供贷款时没有那么详细的信息可做依据。

再说，改换银行账户被视为一件麻烦事，银行因此得以免于竞争。但近几年出现了三个变化：一是众多“金融科技”公司试图与银行一争高低；二是网络银行业务让几乎所有客户都能以电子形式便捷地查看自己大量的财务信息；三是监管正朝着有利新贵们的方向转变，迫使银行共享那些诸如去咖啡店消费而产生的数据。

数据已经从银行的“数字金库”中渗漏出来，也让人体会到这样的信息泄漏为何具有破坏性。众多公司（如美国的Mint）可将客户在数家银行的账户、信用卡账单及退休金计划等所有数据聚合到一起，让客户对自己的财务状况有全面的了解。因为这些公司都像其他创业公司那样专注于让自己的应用变得简单易用又吸引人，相形之下，大多数银行的移动服务显得笨拙而繁琐。

更糟糕的是，银行想要将多种产品兜售给活期存款账户持有人，却受到金融信息聚合公司低价竞争的冲击。那些公司利用所汇总的数据将金融产品推销给客户。法国信息聚合商Bankin'公司的琼·博克维奇（Joan Burkovic）说：“如果我们看到你支付的按揭利率是4%，而市面上有一款产品只要你付2%的利率，我们认为你一定想了解这款产品。”当然，你的银行可不希望你这么做。

最热切期望使用个人银行数据的包括撮合借贷双方的P2P网络借贷平台。英国的Zopa与美国的Lending Club这类公司都夸耀自己的算法能甄别信贷风险的高低。然而，计算机程序能有多大的用处取决于输入数据的质量。征信机构提供的信息虽然有用，但内容有限。P2P公司Lendable的马丁·基辛格（Martin Kissinger）指出：“在审批用途比较具体的贷款时，银行账户信息可能是最有价值的数据来源。”

不只帐户余额和现金流很有趣，从一笔笔交易中也能看出端倪。比如，网络借贷平台MarketInvoice的阿尼尔·斯托克（Anil Stocker）说，通过一家小企业纳税的情况就能洞悉其盈利状况，而且可以在它制作好报表的几个月前就能得知。研究董事们的往来账目或是给客户的退款也可以帮助判断公司的财务状况。

即使客户授权同意，银行也不太情愿将客户的信息拱手送给自己潜在的竞争对手，这可以理解。长期以来，美国的银行都允许客户下载自己的信息以便填写报税表，现在这一功能正被直接用于向其他服务提供数据（如前面提及的Mint就是税务软件供货商Intuit旗下的公司）。监管机构强制要求英国银行允许客户以标准格式的表格下载数据。

如果银行不愿意或者不被迫共享数据的话，还有一些服务可以不经银行同意就能获取账户信息。这些创业公司让客户与其共享自己网上银行的密码，这样便可登录他们的账户，然后逐页复制、粘贴账单。这种“挖取”信息的做法是否合法尚难以界定。银行抱怨这样做违反了服务条款。而英国监管机构出于安全原因对此也并不支持，使得那些即将发展成又一家Mint的公司日子不好过。据称美国的监管机构对此也有不满。有的公司（如美

国加州的Yodlee) 提供银行记录获取服务, 要么挖取要么下载, 哪种做法最不费力就用哪种。

网络借贷平台会慎用挖取这种做法, 因为客户不大愿意提供密码, 这很正常。只有那些在其他地方申请贷款遭拒的客户才可能愿意提供密码, 而拒绝往往有其理由。因此, 信息聚合公司时常勉强使用零散或延迟的数据。比如, 像Zopa和Lending Club之类的公司只要求提供用智能手机拍摄的银行账单图片。按照金融技术标准看, 这是种倒退, 而且也限制了数据分析的深度。

欧洲的政策制定者断定, 迫使银行在消费者的要求下共享数据会给其他使用银行服务的大众带来很大的益处。本月早些时候, 欧盟正式通过了一项支付服务规定, 实际上就是迫使银行以便利的方式向第三方公开数据。客户也能够授权给金融科技公司从其账户里支付款项。

在公开场合, 银行表示对更多竞争的理念持开放态度, 有些银行已开始更主动地提供数据。但很多银行担心, 他们是一只手被绑到背后来和那些金融科技公司竞争。创业公司采用科技领域里的隐私观念来运营, 消费者主动选择使用他们的产品, 因此见到铺天盖地的广告也不会奇怪。银行却更像是公用事业机构, 受托来保护而非运用这些信息。去年荷兰银行ING集团打算允许广告商根据其客户的消费信息来向他们推销产品, 结果招致强烈抗议, 最后不得不迅速取消。

银行目睹了消费者不再光顾其支行, 现在又担心客户还会弃用银行的应用及网站。银行老板们隐约感到, 未来客户只会把银行当成公用事业机构, 在其中存钱, 却由不受监管的创业公司来管理其财富。更加通畅的数据共享会推动这成为现实。如此前景会令客户兴奋不已, 同时也着实会让银行业人士惶恐不安。■



Schumpeter

Digital Taylorism

A modern version of “scientific management” threatens to dehumanise the workplace

FREDERICK TAYLOR was the most influential management guru of the early 20th century. His “Principles of Scientific Management” was the first management blockbuster. His fans included Henry Ford, who applied many of his ideas in his giant River Rouge car plant, and Vladimir Lenin, who regarded scientific management as one of the building blocks of socialism. Taylor’s appeal lay in his promise that management could be made into a science, and workers into cogs in an industrial machine. The best way to boost productivity, he argued, was to embrace three rules: break complex jobs down into simple ones; measure everything that workers do; and link pay to performance, giving bonuses to high-achievers and sacking sluggards.

Scientific management provoked a backlash. Aldous Huxley satirised it in “Brave New World” (1932), as did Charlie Chaplin in “Modern Times” (1936). A rival school of managers argued that workers are more productive if you treat them as human beings. But a recent article about Amazon in the *New York Times* suggests that Taylorism is thriving. The article claimed that the internet retailer uses classic Taylorist techniques to achieve efficiency: workers are constantly measured and those who fail to hit the numbers are ruthlessly eliminated, personal tragedies notwithstanding. Amazon’s boss, Jeff Bezos, insisted that he did not recognise the company portrayed in the piece. Nevertheless, it provoked quite a reaction: the article attracted more than 5,800 online comments, a record for a *Times* article, and a remarkable number of commenters claimed that their employers had adopted similar policies. Far from being an outlier, it would seem that Amazon is the embodiment of a new trend, digital Taylorism.

This new version of Taylor's theory starts with his three basic principles of good management but supercharges them with digital technology and applies them to a much wider range of employees—not just Taylor's industrial workers but also service workers, knowledge workers and managers themselves. In Taylor's world, managers were the lords of creation. In the digital world they are mere widgets in the giant corporate computer.

Technology allows the division of labour to be applied to a much wider range of jobs: companies such as Upwork (formerly oDesk) are making a business out of slicing clerical work into routine tasks and then outsourcing them to freelancers. Technology also allows time-and-motion studies to be carried to new levels. Several firms, including Workday and Salesforce, produce peer-review software that turns performance assessments from an annual ritual into a never-ending trial. Alex Pentland of the Massachusetts Institute of Technology has invented a "sociometric" badge, worn around the neck, that measures such things as your tone of voice, gestures and propensity to talk or listen. Turner Construction is using drones to monitor progress on a sports stadium it is building in California. Motorola makes terminals that strap to warehouse workers' arms to help them do their jobs more efficiently—but could also be used to keep tabs on them.

As stopwatch management continues to conquer new territory, so too does pay for performance. The more firms depend on the brainpower of their employees, the more they are seeking to reward their finest minds with high salaries and stock options. "A great lathe operator commands several times the wage of an average lathe operator," Bill Gates points out, "but a great writer of software code is worth 10,000 times the price of an average software writer." Many firms, including Amazon, apply the same Darwinian logic to their worst performers as well, in a process known as "rank and yank": workers are regularly ranked by productivity and the weakest are

culled.

The reaction to the *Times* piece shows that digital Taylorism is just as unpopular as its stopwatch-based predecessor. Critics make some powerful points. “Gobbetising” knowledge jobs limits a worker’s ability to use his expertise creatively, they argue. Measuring everything robs jobs of their pleasure. Pushing people to their limits institutionalises “burn and churn”. Constant peer-reviews encourage back-stabbing. Indeed, some firms that graded their staff, including Microsoft, General Electric and Accenture, concluded that it is counter-productive, and dropped it.

| *The meatware fights back*

The march of technology can cut both ways. The rise of smart machines may make Taylorism irrelevant in the long term: why turn workers into machines when machines can do ever more? The proliferation of websites such as Glassdoor, which let employees review their workplaces, may mean that firms which treat their workers as mere “meatware” lose the war for the sort of talent that cannot be mechanised. And Mr Pentland’s sociometric badges have produced some counter-intuitive results: for example, in a study of 80 employees in a Bank of America call centre, he found that the most successful teams were the ones that spent more time doing what their managers presumably didn’t want them to do: chatting with each other.

Even so, digital Taylorism looks set to be a more powerful force than its analogue predecessor. The prominent technology firms that set the tone for much of the business world are embracing it. Google, which hires a few thousand people a year from up to 3m applicants, constantly ranks its employees on a five-point scale. Investors seem to like Taylorism: Amazon’s share price ticked upwards after the *Times*’s exposé. The onward march of technology is producing ever more sophisticated ways of measuring and monitoring human resources. And Taylorist managers are mixing the sweet with the bitter: Amazon’s “Amabots”, as they call

themselves, seem happy to put up with micromanagement if they get a nice bonus at the end of the year. The most basic axiom of management is “what gets measured gets managed”. So the more the technology of measurement advances, the more we hand power to Frederick Taylor’s successors. ■



熊彼特

数字泰勒主义

现代版的“科学管理”可能会让职场丧失人性

弗雷德里克·泰勒（Frederick Taylor）是20世纪初最具影响力的管理学大师。他的《科学管理原理》是管理学的第一部畅销书。他的拥趸包括亨利·福特和列宁。福特将泰勒的许多理念应用到自己巨大的胭脂河汽车工厂中，列宁则把科学管理视为社会主义建设的一块基石。泰勒的吸引力在于他让人看到管理可以成为一门科学，而工人可以成为工业机器上的齿轮。他认为，提高生产率的最佳方式是运用三条准则：将复杂的工作分解成简单的；衡量工人的每项工作；将薪酬与绩效挂钩，给高产者发奖金，解雇偷懒的工人。

“科学管理”激起了人们强烈的抵制情绪。阿道司·赫胥黎在《美丽新世界》（1932）一书中以及卓别林在电影《摩登时代》（1936）中都对其大加讽刺。反对派的管理者认为，如果将工人当成人来对待，他们的生产率会更高。但是最近《纽约时报》上一篇文章关于亚马逊的文章表明泰勒主义正大行其道。这篇文章称这家互联网零售商正使用经典的泰勒式管理来达到高效：员工不断被量化，未达标者被无情淘汰，即使导致个人悲剧也在所不惜。亚马逊的老板杰夫·贝佐斯（Jeff Bezos）坚称他不认同文章所描述的公司形象。不过该文引起了很大的反响：吸引了5800多条在线评论，创下《纽约时报》文章的评论记录。有相当数量的评论者称他们的雇主也采取过类似的政策。如此看来，亚马逊远非异类，而是象征着新一轮风潮，即数字泰勒主义。

泰勒理论的新版本源自他良好管理的三个基本原则，但数字技术令其更强大，且员工覆盖面更广，不仅是泰勒时代的产业工人，还有服务行业员工、知识型员工和管理者本身。在泰勒的世界里，管理者即是造物主，而在数字世界，他们只不过是巨大的企业计算机上的小工具。

技术令更多的工作岗位实现了分工：类似Upwork（前身叫oDesk）这样的

公司所做的正是将文员的工作分解为常规任务，再分包给自由职业者。技术还让工时和动作研究达到新的水平。有几家公司，包括Workday和Salesforce，开发出同事互评软件，把每年一次的绩效评估变成了无休止的考验。麻省理工学院的亚历克斯·潘特兰（Alex Pentland）发明了一个戴在脖子上的“社交计量器”徽章，能测量你的语调、手势、倾向于说话还是倾听等各类举止。特纳建筑公司（Turner Construction）采用无人机监控公司在加州建造体育场的进度。摩托罗拉生产出绑在仓库工人手臂上的终端，帮助他们提升工作效率，但同时也可以用来监视他们。

越来越多的领域被秒表管控，也同样受绩效工资支配。公司越依赖雇员的聪明才智，就越想要以高工资和期权奖励他们最优秀的头脑。盖茨曾说过：“一名优秀的车床工可以拿到几倍于普通车床工的工资，但一个卓越的软件程序员的价值是普通程序员的一万倍。”在被称为“排名和淘汰”的过程中，包括亚马逊在内的许多公司将进化论逻辑用于表现最差的员工：定期按生产力给雇员评级，把最差的砍掉。

《纽约时报》文章引起的反响表明，数字泰勒主义就像它那个以秒表为基础的前身一样不受欢迎。批评家提出了一些有力的观点。他们认为，将知识型工作“碎片化”限制了员工创造性地发挥才能。一切都要考核则剥夺了工作的快乐。把人推向极限使得“吃不消，换工作”成为制度。频繁的同事互评助长了暗箭伤人的习气。其实，有些曾实行员工排名的公司，包括微软、通用电气和埃森哲（Accenture）发现这一做法适得其反，最终弃之不用。

| 肉件在回击

科技进步是双刃剑。长远而言，智能机器的发展可能令泰勒主义变得不合时宜：如果机器能做更多，何苦要将员工变成机器？在Glassdoor网站上，员工可以评论自己的工作场所，这类网站的激增可能意味着在寻求无法被机械化的人才时，那些单纯将雇员视为“肉件”的公司会一败涂地。潘特兰的社交测量器已经产生了一些出乎意料的结果：例如，在调研美国银行一家呼叫中心的80名雇员时，他发现最成功的团队在一件事上比其他团队花费了更多时间：聊天。而这想必不是经理希望他们做的事。

尽管如此，数字泰勒主义看来必将成为比其前身更为强大的一股力量。卓越的科技公司欣然接受数字泰勒主义，而它们为大部分商业世界定下了基调。谷歌每年从300万应聘者中雇用几千人，它不断以五分制为员工评级。投资者们似乎也偏爱泰勒主义：被《纽约时报》曝光后，亚马逊的股价有所上扬。技术的进步正在产生越来越复杂精妙的测量和监督人力资源的方式。信奉泰勒主义的管理者将甜和苦混合起来：自称“亚马逊机器人”的员工似乎乐于忍受微观管理，只要年终能拿到不错的奖金。管理学最基本的原理是“能量化的就能被管理”。因此，量化技术越进步，我们就越多地把权力交给了泰勒的继任者们。 ■



Schumpeter

Disrupting Mr Disrupter

Clay Christensen should not be given the last word on disruptive innovation

TWENTY years ago a then obscure academic at Harvard Business School published a career-making article in the *Harvard Business Review* (*HBR*), warning established companies that they were in grave danger from being disrupted. Today Clay Christensen is an established company in his own right. He is regularly named as the world's most influential management guru (his Harvard colleagues affectionately call him Mr Disrupter). He has applied his theory to an ever-wider range of subjects with books such as "Disrupting Class" (on education) and "The Innovator's Prescription" (on health). He even has his own consulting operation to help him stretch his brand. Businesspeople everywhere treat him as a guide on how to cope with change. But the risk is that by paying too much attention to his theory, they will miss other disruptive threats.

This thought is provoked by a new *HBR* article on the subject, written by Mr Christensen along with Michael Raynor and Rory McDonald. Mr Christensen rightly points out that the word "disruption" is now bandied about so much that it is losing all meaning. The number of newspaper and journal articles using the phrases "disruptive innovation" or "disruptive technology" has gone from practically zero when Mr Christensen coined them to more than 2,000 in 2014. However, he goes too far in arguing that Uber, a taxi-hailing service, is not "genuinely disruptive" because it does not fit his theory of how disrupters break into established markets. Mr Christensen does not have a monopoly on the word disruption, nor a patent on his "disruption theory": Joseph Schumpeter, for example, produced a rather compelling theory of "creative destruction" long before Mr Christensen was born.

The problem with Mr Christensen's argument is not that it is empty. Unlike so much of the output of other management writers, his big idea contains genuine insights. Mr Christensen argues that incumbent companies can fail despite being well run and serving their existing customers as assiduously as possible. Their success can blind them to the realisation that scrappy outsiders are quietly rewriting the rules. These upstarts, he says, begin by using unproven or inferior technologies and business models to offer a cheap alternative to mainstream products and services. That wins customers whom established firms regard as unprofitable or unreachable. Little by little, the newcomers get better, and eventually they are in a position to raid the incumbents' customer base. This leaves established firms in a dilemma: whether to keep investing in their current business—which is proven but now vulnerable—or take a leap into the unknown and emulate the disrupters, so as not to be wiped out by them.

Critics have picked holes in the case studies that Mr Christensen has used to illustrate his theory. In June last year Jill Lepore, a colleague at Harvard University, caused a stir with a takedown in the *New Yorker* magazine. In September Andrew King and Baljir Baatartogtokh published a more sober article in the *MIT Sloan Management Review*, arguing that “the majority” of Mr Christensen's 77 case studies did not fully fit his theory.

However, even if he stretches some examples Mr Christensen has clearly identified something big. The problem is more that the definition of disruption he seeks to impose is too narrow. He rules out Uber because, from the start, it offered a better level of service than existing taxi firms, rather than something cheap but inferior. But ask any cabbie if it threatens to disrupt his business, and you will be left in no doubt of the answer. As Isaiah Berlin, a philosopher, would have put it, Mr Christensen is a hedgehog (someone who knows one big thing) rather than a fox (who knows lots of little things): his hedgehog mind leads him to ignore or belittle companies or market forces that do not fit his template.

In Mr Christensen's theory, disruptive innovators are generally newcomers. But perhaps the most successful disrupter of recent years is an established firm—Apple—that has applied its mastery of technology and design to ever more areas. Mr Christensen greeted the arrival of the iPhone with a shrug: this was a “sustaining” rather than a disruptive innovation, with “limited” chances of success. He failed to see that Apple was reinventing an entire category of product, by turning the mobile phone into an all-purpose computer, entertainment system and shopping centre.

Mr Christensen argues that “real” disruptive innovators succeed by attacking from the low end of the market. But Apple has invariably succeeded by aiming at the top end. Likewise, Netflix destroyed Blockbuster by attracting its core customers: people who were so enthusiastic about watching films that they would pay a monthly subscription to consume them in bulk. Both Netflix and Uber have prospered by dealing with the “pain points” of core customers: in Netflix's case, Blockbuster's limited range and punishing late-return fees; and in Uber's case, the manifold inefficiencies of the established taxi industry.

| *Don't just follow the feet of Clay*

It would be going too far to predict that Christensen Inc will itself be disrupted out of existence: there are plenty of businesses ripe for his variety of innovation (not least his own, higher education). But he should be treated as one voice among many. There are types of disruptive innovation other than the one he champions. Insurgents can revolutionise old industries by using new technologies, but established companies can use their superior war chests and management skills to invade adjacent industries.

Indeed, there are good reasons for thinking that this second kind of disruptive innovation may be more important than Mr Christensen's: think of the threat that Google poses to carmakers, Facebook to newspapers and

Apple to television stations. Back in 1995 Mr Christensen struck fear into executives by warning them that they could be put out of their jobs by companies they had never heard of. Today the biggest threats may come from people they talk about every day. ■



熊彼特

颠覆“颠覆者”

不该让克莱·克里斯坦森垄断对颠覆性创新的解读

20年前，哈佛商学院一位当时籍籍无名的学者在《哈佛商业评论》（HBR）上发表了一篇奠定其事业基础的文章，警告成熟企业有被颠覆的严重危险。今天克莱·克里斯坦森（Clay Christensen）自己也相当于一家品牌公司。他常被誉为世界上最具影响力的管理学大师（他的哈佛同事们亲切地叫他“颠覆者先生”）。通过《颠覆课堂》（*Disrupting Class*）（关于教育）和《创新者的处方》（*The Innovator's Prescription*）（关于医疗）等书，他已经将自己的理论运用在一系列日益广泛的主题上，甚至有自己的咨询业务帮助他拓展品牌。世界各地的商业人士把他当作应对变化的指路明灯。但是，如果对克里斯坦森的理论关注过多，他们可能会遗漏其他的颠覆性威胁。

引发这一思考的是《哈佛商业评论》关于这一主题的一篇新文章，作者是克里斯坦森、迈克尔·雷诺（Michael Raynor）和罗里·麦克唐纳（Rory McDonald）。克里斯坦森正确地指出“颠覆”一词现在被严重滥用，已失去了全部意义。像“颠覆性创新”或“颠覆性技术”这样的词在克里斯坦森创造它们之初几乎从未见诸报端，但到2014年，使用它们的报刊杂志文章达两千多篇。不过，克里斯坦森认为打车服务公司优步并不“真正具有颠覆性”，因为它不符合他提出的有关颠覆者如何打入成熟市场的理论。这过于偏激了。克里斯坦森对“颠覆”一词并没有垄断权，他的“颠覆理论”也没有专利。例如，早在他出生之前，约瑟夫·熊彼特就创造出了相当令人折服的“创造性破坏”理论。

克里斯坦森论点的问题不是因为它空洞。与其他管理学作家的很多作品不同，他的宏大想法包含着真知灼见。克里斯坦森认为，尽管运营良好、竭尽所能兢兢业业地服务现有客户，既有公司仍可能失败。它们可能被成功蒙蔽了双眼，意识不到虎视眈眈的局外人正悄然改写规则。他说，这些新贵未经证实或较低级的技术和商业模式起步，提供比主流产品和服务更

便宜的选择，赢得了知名公司认为无利可图或无法触及的客户。渐渐地，后来者越做越强，最终走到了能够突袭既有业者客户基础的位置。这让既有业者进退两难：是继续投资成熟可靠但目前岌岌可危的现有业务，还是跃入未知领域、模仿颠覆者并与之竞争，以求不被彻底摧毁呢？

批评人士在克里斯坦森用来阐释其理论的案例分析中找出了漏洞。去年6月，他在哈佛大学的同事吉尔·莱波雷（Jill Lepore）发表于《纽约客》杂志上的一篇批判文章掀起了风波。今年9月，安德鲁·金（Andrew King）和巴尔吉·巴塔托格托克（Baljir Baatartogtokh）在《麻省理工斯隆管理评论》上发表了一篇更为严肃的文章，称克里斯坦森的77个案例分析中，“大部分”不完全符合他的理论。

不过，尽管有些例子过于牵强，但克里斯坦森的确有大发现。主要的问题是他想给“颠覆”下的定义太过狭隘。他排除了优步，因为优步从一开始提供的服务就比已有出租车公司更高一筹，而不是便宜但较低档的服务。但是无论问哪个出租车司机，优步是否有颠覆他生意的威胁，答案毋庸置疑。若是按照哲学家以赛亚·伯林（Isaiah Berlin）的两分法，则克里斯坦森是刺猬（懂得一件大事的人）而非狐狸（懂得许多小事的人）：他的刺猬头脑让他或是忽略或是轻视不符合其模板的公司或市场力量。

按照克里斯坦森的理论，颠覆性创新者通常是新来者。但近年来最成功的颠覆者可能正是一家成熟企业——苹果，它将自己掌握的技术和设计应用到更为广阔的领域。iPhone诞生时，克里斯坦森表示不屑，认为这只是“延续”而非颠覆性创新，成功的几率“有限”。他未能看到苹果在重新塑造整个产品类别，将手机转变为全功能的电脑、娱乐系统和购物中心。

克里斯坦森认为“真正的”颠覆性创新者靠从市场底端打拼而成功。但苹果一贯靠瞄准高端市场取得成功。同样，Netflix 摧毁百视达

（Blockbuster）正是通过吸引其核心客户，这些人非常喜欢看电影，愿意付月费看个够。Netflix和优步都通过打到核心客户的“痛点”取得了成功：在Netflix的例子中，痛点是百视达有限的选择和高昂的逾期归还罚金；在优步的例子中，痛点是已有的出租车行业在多方面效率低下。

| 别只追随克莱的脚步

就此预言“克里斯坦森公司”自身也会被颠覆消亡，未免太过偏激。很多行业已时机成熟，可以践行他的各式创新（尤其是他自己的高等教育领域），但是他仅应被视为百家之一。除了他支持的那种之外，还有各种类型的颠覆性创新。反叛分子可以用新科技革了传统行业的命，而老牌公司也能用丰厚的资金储备和管理技能侵占相关行业。

实际上，有很好的理由认为第二种颠覆性创新可能比克里斯坦森的那种更加重要：试想一下谷歌对汽车制造商、Facebook对报业、苹果对电视台造成的威胁。回想1995年，克里斯坦森警告企业高管，他们可能会因为自己闻所未闻的公司而丢了饭碗，这让他们心生恐惧。今天，最大的威胁可能来自他们每天挂在嘴边的那些人。■



Schumpeter

Here comes SuperBoss

A cult of extreme physical endurance is taking root among executives

IN A crowded field, a contender for most absurd business-related tweet of the year must surely be the World Economic Forum (WEF) for its “14 things successful people do before breakfast”. They get up with the lark, avers the article being promoted in the tweet. They exercise furiously. They spend time on a “personal-passion project”. (“Novel-writing and art-making are easy to skip when you’ve been in meetings all day.”) They connect with their spouses. (“What could be better than pre-dawn sex to energise you for the day?”) They make their beds (because this is supposedly correlated with increased productivity). They spend quality time with the family. They network over coffee. They meditate to clear their minds. And so on. But they still find time to work on an important business project.

The tweet was quickly drowned in ridicule. One commenter said this represented a busy month for him. Another noted that it appears successful people don’t take showers or get dressed. But for all its inanity, the WEF’s tweeting does point to something real: a growing cult of extreme performance among the Davos crowd. In the pre-industrial world, elites abided by a code of conspicuous leisure. In the era of gentlemanly capitalism, they replaced this with a code of effortless superiority. Today’s code is all about effortful superiority: the successful deserve their success because they get on the treadmill and sweat.

Successful people make a great fuss about getting up early. Laura Vanderkam, a “time-management expert” who inspired the WEF’s tweet, says that, in a straw poll of 20 executives, 90% woke up before 6am on weekdays. Brett Yormark, the boss of the Brooklyn Nets basketball team, is said to get up at 3.30am; and Indra Nooyi, the CEO of PepsiCo, at 4am. Bob

Iger of Disney reportedly rises at 4.30am; whereas Jack Dorsey apparently slouches in bed until 5.30am, despite running two companies, Twitter and Square. Your columnist once had a 7am breakfast with Michael Milken, the inventor of junk bonds. Offered a sticky bun, Mr Milken declined on the ground that “I’ve already had a pre-breakfast breakfast with a Nobel prize-winner.”

An early start is followed by furious exercise. David Cush, the CEO of Virgin America, is on his exercise bike shortly after getting up at 4.15am. Tim Cook of Apple is in the gym at 5am. However strenuous the workout, it is often combined with other tasks. Mr Cush reads, makes phone calls and listens to a sports-radio station while cycling. Mr Iger once told the *New York Times* that, while exercising, “I look at e-mail. I surf the web. I watch a little TV, all at the same time.” And all while listening to music.

A striking number of bosses are going further and becoming devotees of extreme sports. John Rost, the president of Fiesta Insurance Franchise Corporation, has climbed the highest mountains on seven continents (the “seven summits”). Rick Davidson of Century 21 Real Estate spends his spare time climbing mountains, skydiving, scuba diving, racing NASCAR vehicles and flying fighter jets. Sir Rocco Forte of Rocco Forte Hotels and Michael Johnson of Herbalife are among the bosses who take part in regular “CEO Challenges”, in which they push themselves to their physical limits through such things as triathlons and 100-mile mountain-biking trails.

This cult of hyper-performance is nurtured by a growing army of personal trainers and yoga coaches who make their living by fine-tuning and de-stressing business leaders. For example, Ursula Burns, the CEO of Xerox, schedules an hour with a trainer twice a week at 6am. Business magazines bulge with articles on how to train like a Navy SEAL or how to achieve “cognitive fitness”. Business schools and corporate in-house “universities” compete to have the most expensive gyms. Deloitte’s new \$300m training

facility, near Dallas, Texas, has a 12,000 square-foot (1,100 square metres) fitness room whose classes start at dawn; and SAS, a software firm, has run a 90-day “leadership and energy for performance” programme for its high-flyers.

| *Pill-popping*

The cult of super-performance may now be spreading into more troubling areas. First, brushing privacy concerns aside, some companies are experimenting with using wearable devices to monitor their executives’ vital signs. One provider of such monitoring systems, Peak Health, lists Goldman Sachs, Bank of America and several hedge funds among its clients.

Second, according to one CEO, several of his peers are now dabbling in mind-boosting drugs such as Modafinil and Ritalin, which aid concentration. This trend is likely to intensify: surveys of American university students suggest that one in six now use mind-boosting drugs to get through their exams, a habit they may continue in their subsequent careers. Once again business is learning from both the sporting and military spheres. Sports teams routinely use biometric devices to track their star athletes (and occasionally drugs to boost their performance). America’s armed forces are experimenting with “go pills” that help fighters function for long periods without sleep.

It is time to call a halt on all this hyperactivity, before it gets out of hand. There is no doubt that many bosses have heavy weights resting on their shoulders. But are they likely to make these decisions better if they arrive at work exhausted and sleep-deprived? Working around the clock is probably a sign that you are incapable of delegating, not that you are an invincible hero. Frenetic multi-tasking—surfing the web while watching TV while listening to music—is a formula for distraction, rather than good management. And bosses who think of themselves as supermen and

superwomen can weaken their companies. As Peter Drucker, a management guru, once pointed out, “No institution can possibly survive if it needs geniuses or supermen to manage it. It must be organised in such a way as to be able to get along under a leadership composed of average human beings.” ■



熊彼特

超人老板来了

对极端体能和耐力的狂热崇拜正在管理者中扎根

在“年度最荒诞商业相关推文”这一竞争激烈的领域，世界经济论坛（the World Economic Forum, WEF）所发的“成功人士早餐前会做的14件事”必会成为个中翘楚。他们像百灵鸟一样早起，阅读推文推荐的文章。他们疯狂地锻炼身体。他们花时间做“自己热爱的项目”（“如果已经开了一整天的会，写小说和艺术创作这类事自然就作罢了。”）他们与爱侣缠绵（“还有什么比黎明前的性爱更能让你一天活力四射？”）他们整理床铺（因为据说这和提高工作效率密切相关）。他们和家人享受天伦之乐。他们趁喝咖啡时社交。他们通过冥想理清思路。诸如此类。但他们仍然能找出时间专注于重要的商业项目。

这篇推文很快淹没在嘲讽中。有人评论说文章展现的是他一个月的忙碌生活。还有人评论说原来成功人士不洗澡也不换衣服。不过尽管空洞浅薄，世界经济论坛的这篇推文的确指出了一个事实：达沃斯帮对极致表现的狂热崇拜正愈演愈烈。在工业化之前的世界，精英人士遵循的是一套炫耀式休闲的准则。到了绅士资本主义时期，取而代之的是一套不费力优越性准则。而今天的准则是劳心费力的优越性：成功者理应成功，因为他们在跑步机上挥汗如雨。

成功人士总爱念叨早起这件事。启发世界经济论坛这篇推文的“时间管理专家”劳拉·万德坎姆（Laura Vanderkam）称，对20位管理者的一次非正式调查显示他们当中90%的人工作日会在六点前起床。布鲁克林篮网队的老板布雷特·约马克（Brett Yormark）据说凌晨三点半起床；百事公司的CEO卢英德（Indra Nooyi）凌晨四点起床。据报道迪士尼的鲍勃·艾格（Bob Iger）四点半起床；而杰克·多西（Jack Dorsey）显然要在床上赖到五点半，尽管他有Twitter和Square两家公司要经营。笔者曾有幸在早上7点与垃圾债券的创始人迈克尔·米尔肯（Michael Milken）共进早餐。米尔肯拒绝了给他的面包卷，理由是“早餐前我已经跟一位诺贝尔奖获得者

用过早早餐了”。

早起之后是疯狂的锻炼。维珍美国的CEO大卫·卡什（David Cush）早上四点一刻起床，紧接着骑健身自行车。苹果的库克早上五点去健身房。无论锻炼多么艰苦，通常都还附有其他任务。卡什在骑车时会阅读、打电话、听电台体育节目。艾格曾对《纽约时报》说，锻炼时，“我查看电子邮件，上网，看点电视，都是同时进行。”此外还会听音乐。

更有甚者，数量惊人的老板们正成为极限运动的拥趸。嘉年华保险公司（Fiesta Insurance Franchise Corporation）总裁约翰·罗斯特（John Rost）已经登上七大洲最高的山峰（即所谓“七高峰”）。21世纪地产（Century 21 Real Estate）的瑞克·戴维森（Rick Davidson）利用业余时间登山、跳伞、水肺潜水、参加纳斯卡车赛（NASCAR）、开飞机等。罗克福特酒店（Rocco Forte Hotels）的罗克·福特（Rocco Forte）爵士、康宝莱（Herbalife）的迈克尔·约翰逊（Michael Johnson）和其他老板一起定期参加“CEO挑战赛”，其间他们会把自己逼到体能极限，例如做三项全能、百英里山地自行车赛等。

日益庞大的私人教练和瑜伽教练队伍助长了这种对超能表现的狂热崇拜。他们以帮商业领袖微调和减压为生。例如，施乐的CEO乌尔苏拉·伯恩斯（Ursula Burns）和私教约定，每周两次早上6点开始一小时的训练。商业杂志里充斥着诸如“怎样像海豹突击队一样锻炼”或者“如何获得‘认知健康’”之类的文章。商学院和企业内部“学院”争相打造最贵的健身房。德勤（Deloitte）新的训练场靠近德州达拉斯，拥有12,000平方英尺（1,100平方米）的健身房，课程从黎明就开始；软件公司SAS曾为公司精英开展过为期90天名为“领导力和绩效所需活力”的项目。

| 瘾君子

对超能表现的狂热崇拜现在可能正向更为麻烦的领域扩展。首先，有些公司正尝试用可穿戴设备监控高管们的生命体征，置隐私问题于不顾。这类监控系统的供应商之一Peak Health称高盛（Goldman Sachs）、美国银行和几家对冲基金都是它的客户。

第二，某位CEO说，他的几位同事正试着服用莫达非尼（Modafinil）和利他林（Ritalin）之类的提神药物，帮助集中注意力。这一趋势可能会加剧：对美国大学生的调查显示目前有六分之一的人在考试期间使用提神药物，他们可能会在今后的工作中延续这一习惯。商业又一次向体育界和军事领域学习。运动队通常会使用生物特征检测设备追踪明星运动员的动向（偶尔会使用药物提升他们的表现）。美国的武装部队正在做实验，通过服用药物让士兵无需睡觉而长时间执行任务。

是时候在事情失控前叫停所有这些超能活动了。诚然，很多老板肩上的担子很重，但是如果开始上班时他们已经精疲力竭、睡眠不足，他们可能做出更好的决定吗？日以继夜地工作很可能是你不会放权的一种表现，而并不意味着你是无敌英雄。疯狂地一心多用，例如上网的时候既看电视又听音乐，只会让人三心二意，而不会造就良好的管理。认为自己是超人或女超人的老板可能会削弱他们的公司。正如管理学大师彼得·德鲁克（Peter Drucker）曾经指出的那样，“如果需要天才或超人来管理，这样的机构不可能存活。机构的组织方式一定要让它能够在由普通人组成的领导层的管理下生存。”■



BlaBlaCar

Something to chat about

A \$1.6 billion French startup revs up

ANIL GAUR is planning to drive from Delhi to Jaipur shortly, and is offering to fill his three empty seats for 700 rupees (\$10) each. He is chatty—he advertises the ride as “Blablaba”, or suitable for those who like to natter—and he enjoys listening to music on the road. Based in India, he is among the latest recruits to the world’s biggest ride-sharing service, BlaBlaCar, which now boasts 20m users in 19 countries from Mexico to Russia.

The idea behind BlaBlaCar, a French startup, is simple: the driver “sells” empty seats to cover petrol and road tolls, but not at a profit; the passenger gets a cheap trip, even last-minute. The business model is that of Airbnb: BlaBlaCar takes an average 10% cut on transactions once it is established in a market; trust is built through peer review. Investors seem to bet that it could do for transport what Airbnb has for accommodation. In September, BlaBlaCar raised €180m (\$200m), taking its valuation to €1.4 billion, making it one of the rare European billion-dollar-plus technology startups.

For now, BlaBlaCar has avoided Uber-style collision with regulators and incumbents. This is chiefly because it is not competing with taxis: its average trip is 320km (200 miles). Rather, it is undercutting trains and coaches, proving popular among young people and students, short of cash and allergic to forward planning. A road trip from Paris to Marseille using BlaBlaCar, for instance, would cost half that of a high-speed TGV train ticket. Frédéric Mazzella, the founder, says diplomatically that it is disrupting the mobility business, by opening up the inventory of empty car seats, not any particular transport sector.

Originally called Covoiturage (carpooling, in French), BlaBlaCar is focusing now on building a global brand, rather than on profitability. The firm has expanded both by buying competitors, such as Germany's Carpooling, which it acquired in April, and launching in emerging markets less familiar with the concept, such as India and soon Brazil. The service does well where public transport is chaotic, or driving costs high. In Europe, over 72% of kilometres travelled are by car, but petrol is expensive so drivers are keen to cover costs. This makes its appeal to drivers less obvious in America—but BlaBlaCar is ruling nothing out. “When you start from France,” Nicolas Brusson, the firm's co-founder, joked at a technology conference earlier this year, “everything looks simple.” ■



BlaBlaCar

谈资

一家估值16亿美元的法国创业公司正在提速

阿尼尔·高尔（Anil Gaur）打算即刻从德里驾车前往斋浦尔（Jaipur），为了填满车上三个空位，他报出700卢比（10美元）一位的价格。他很健谈，给这趟旅程打出的广告是“喋喋不休”，也就是适合那些喜欢闲聊的人，他还喜欢在路上听音乐。他在印度开工，是世界上最大的旅途拼车服务公司最新招募的人员之一。这家公司名叫BlablaCar，如今在从墨西哥到俄罗斯的19个国家拥有2000万名用户。

法国创业公司BlaBlaCar背后的创意很简单：司机“卖掉”空座位，用来支付油费和过路费，但不为了赚钱；乘客享受到便宜的旅程，即便是最后关头才上车。其商业模式与Airbnb相同：一旦在其市场上立足，BlaBlaCar就抽取平均10%的分成；它通过大众评价建立信任度。投资者似乎确信它在交通领域的作为将能堪比住宿领域的Airbnb。9月BlaBlaCar获得1.8亿欧元（2亿美元）融资，将其估值推高至14亿欧元，成为少有的估值超过10亿美元的欧洲科技创业公司之一。

迄今为止，BlaBlaCar避免了像Uber那样与监管者和既有业者冲突。这主要是因为它并不和出租车竞争：它的平均旅程为320公里（200英里），更确切地说，它以更低的价格抢火车和长途汽车的生意，因而在手头缺钱又讨厌预先规划的年轻人和学生中很有市场。例如，用BlaBlaCar乘车从巴黎到马赛，花费是法国高铁（TGV）票价的一半。公司创始人弗雷德里克·马泽莱（Frédéric Mazzella）委婉地说，它通过开发空闲的座位而非哪个具体的运输部门，颠覆了交通行业。

BlaBlaCar刚开始叫Covoiturage（法语中的“拼车”），目前它专注于树立全球品牌而非盈利。公司扩张的途径有二：一是收购竞争者，比如今年4月收购了德国的“拼车”（Carpooling）；二是进入不太熟悉这一理念的新兴市场，比如印度以及它很快将登陆的巴西。在公共交通混乱或驾车成本很

高的地方，这项服务开展得很好。在欧洲，开车出行占出行总里程的72%以上，但油费昂贵，因此车主们热衷于和人分担费用。而在美国它对车主的吸引力就不那么明显了。不过BlaBlaCar不排除任何可能性。“如果你是从法国起步，”公司的联合创始人尼古拉斯·布鲁松（Nicolas Brusson）今年早些时候在一个技术大会上调侃道，“那什么事看起来都简单了。”





Reviews on Amazon

Five-star fakes

The evolving fight against sham reviews

“I WILL post awesome review on your amazon product,” bess98 declared on Fiverr, a website where individuals sell freelance services for \$5 or more. On October 16th Amazon charged that bess98 and more than 1,000 others were illegally hawking customer reviews. The case comes just six months after Amazon sued the operator of four sites peddling similar stuff, including the subtly named buyamazonreviews.com.

Like Amazon, other websites have fought fakes with lawsuits, carefully honed algorithms and even sting operations—Yelp, a popular review site, has had undercover staff answer ads from firms seeking glowing write-ups. Yet the problem persists.

For as long as there have been online reviews, there have been fakes. The motivation is clear: for example, one extra star on a restaurant’s Yelp rating boosts revenue by 5-9%, according to Michael Luca of Harvard Business School. Mr Luca and Georgios Zervas of Boston University have shown that restaurants seeking fake acclaim are likely to be independent—online reviews matter more to them than to chains with established reputations. So some businesses ask friends to post raves, seek reviewers-for-hire and offer customers discounts in exchange for praise.

For websites that claim to be an impartial resource, such practices are troubling. “While small in number,” Amazon contends in its new suit, “these reviews can significantly undermine the trust that consumers and the vast majority of sellers and manufacturers place in Amazon.” The problem is particularly irksome for sites dedicated to offering reviews, such as Yelp and TripAdvisor. Amazon sells everything from books to

lawnmowers; Yelp's main offerings are its 83m reviews. "If consumers can't rely on the content," says Vince Sollitto of Yelp, "then the service is of no value."

So websites have tried to fight fakes. Algorithms comb reviews for suspicious wording. Expedia allows hotel recommendations only by those who have paid for a room there. Amazon tags a review as "verified" if the writer has indeed bought the product. Presumably such reviews are more reliable, though *bess98* is one of many who claim to be able to game Amazon's system.

Yelp may have the most aggressive strategy. An algorithm removes a whopping 30% of posts from Yelp's list of "recommended" reviews, though consumers can still see the suspicious ones if they like. Businesses that try to weasel their way to a higher rating (paying off grumpy clients, for instance) have their Yelp pages branded with a red warning.

Despite all this, some false acclaim and critiques inevitably slip past firms' defences. For websites, fake reviews will remain a stubborn headache. Meanwhile businesses are finding new ways to boost their reputations online. Social bots—lines of code that pose as real accounts—can build buzz on social-media sites like Twitter and Facebook. For the average consumer, it may become ever harder to distinguish real praise from puff. ■



亚马逊评论

五星造假

评论打假，攻防不断

“我可以给你在亚马逊上出售的产品写超棒的评论。”网名为bess98的用户在众包服务网站Fiverr上宣称。该网站为自由职业者提供平台，让他们以最低价五美元出售服务。10月16日，亚马逊对bess98及其他1000多人提起诉讼，指控他们非法兜售虚假用户评论。仅在六个月前，亚马逊起诉了兜售类似服务的四家网站，包括名称直白的网站buyamazonreviews.com。

像亚马逊一样，其他网站纷纷采取法律诉讼、精心设计的算法，甚至“钓鱼行动”等方式来打击虚假评论。流行点评网站Yelp就曾派员工做卧底，回应发广告寻求好评的公司。但问题依旧存在。

自从有了在线评论功能，虚假评论便一直存在。动机很明确：举个例子，据哈佛商学院的迈克尔·卢卡（Michael Luca）研究，一家餐厅在Yelp上的评分每提高一个星级，其营收将提升5%至9%。卢卡和波士顿大学的乔治斯·泽瓦斯（Georgios Zervas）的调查显示，那些寻求虚假赞誉的餐厅一般为独立经营，和那些业已建立声誉的连锁餐厅相比，网上评论对它们更为重要。所以有些商家会请朋友写热情洋溢的赞誉，雇用好评专业户来做粉饰，并给顾客打折以换取好评。

这些做法令那些自称童叟无欺的网站深感不安。“虽然数量不大，”亚马逊在新诉讼中称，“但这些评论会大大削弱顾客和大多数买家及厂商对亚马逊的信任。”对于Yelp和TripAdvisor这类专门提供点评服务的网站来说，这一问题尤其令它们烦恼。亚马逊销售从书籍到割草机的各类产品，Yelp提供的则主要是其8300万条评论。Yelp的文斯·苏里图（Vince Sollitto）表示：“如果顾客不能信赖我们提供的内容，我们的服务就没有价值了。”

所以各类网站都努力打假。计算机算法能扫描评论来寻找可疑字眼。Expedia只允许付款入住过某家酒店的顾客留言推荐该酒店。亚马逊会对

真正购买了产品的用户所写的评论贴上“已验证”的标签。也许这样的评论更为可信，但许多像bess98这样的“好评卖家”声称有能力骗过亚马逊的系统。

Yelp的对策也许最为激进。它使用的算法会删除Yelp的“推荐”评论列表上多达30%的点评。不过，如果消费者想看那些可疑点评的话也还是能看得到。企图弄虚作假求得高评级的商家（比如，向不满意的客户付钱以求息事宁人）在Yelp的页面会被标上红色警示。

尽管有以上种种对策，一些虚假的好评和差评仍难免会成为漏网之鱼。对网站而言，虚假评论仍将是令人头痛的痼疾。同时，商家还在寻找新方法在网上提高自己的声誉。僵尸帐号（伪装成真实帐号的几行代码）可以在推特和Facebook这类社交媒体上制造口碑。对于一般消费者而言，这可能令评论更加真假莫辨。 ■



Robo-advisers

Does not compute

The growth of firms selling computer generated financial advice is slowing

GIVEN the many mistakes that human investors are prone to—selling after a market tumble, trading too often, believing they can beat the stockmarket—dealing with money is perhaps best left to computers. That is the premise behind a host of firms selling computer-generated financial advice, which assist savers tired of paying for pricey human counsel. The low cost of these “robo-advisers” had helped them grow rapidly, to the horror of conventional money-managers. But growth in assets under management (AUM) at the biggest outfits has sagged recently, and with it the upstarts’ prospects.

It used to be only those with hundreds of thousands of dollars to invest, if not millions, who could afford advice about where to put their money. Humans charge 1-3% of their clients’ portfolios every year, simply to rebalance among asset classes every so often and do clever things to minimise taxes. Robo-advisers, led by Wealthfront, a Californian outfit, and Betterment, based in New York, do much the same, but for a mere 0.25% or so a year.

Largely because they squash fees, robo-services do a good job for anyone bar the very rich with complex financial arrangements. A basic questionnaire—age, salary, investment aims and the like—helps establish risk appetite. Money is then allocated to low-cost funds provided by third parties. For those who believe, correctly, that fees and human error are the main pitfalls of investing, the approach is hard to beat.

Other features include snazzy smartphone apps (customers tend to be on the younger side), transparent pricing and low or no minimum investment.

Wealthfront describes itself as the Charles Schwab of the millennial generation, widening access to investing by cutting costs, just as the discount stockbroker has done for baby-boomers since the 1970s.

But being very cheap means Betterment and Wealthfront need lots of assets to turn a profit. Their AUM of roughly \$2.9 billion each, accumulated largely in the past two years, delivers revenues of \$7m or so a year. That is not enough to sustain around 100 staff each as well as hefty marketing budgets. Total costs are likely to be \$40m-50m a year, according to one fintech grandee (neither firm discloses the data).

Scale is vital, as every new client brings fresh revenue at little extra cost. AUM in the tens of billions of dollars, if not hundreds, will be needed to break even. The two firms' venture-capital backers, which have poured over \$100m into each, expect initial losses. But even they will hope for profits in years, not decades.

Last year the two firms' AUM grew by over 10% a month, so doubling every seven months. Growth has since fallen to less than 5% (see chart).

Wealthfront used to trumpet its AUM, but now reveals it only in regulatory filings. In August it was \$2.6 billion; assuming it is now \$2.9 billion (it says only that it is less than \$3 billion), it will take a year and a half to double at its recent rate of growth. Betterment is faring only slightly better.

Adam Nash, Wealthfront's boss, says AUM is a misleading measure, as it is affected by asset-price swings, such as the stockmarket slide of the late summer (largely reversed since). It might be that volatility has spooked potential investors. Both firms say customers are joining in big numbers, and that AUM will grow with their savings.

Competition from incumbent wealth managers will have hurt the robotic duo. Vanguard (which puts together many of the funds Betterment and

Wealthfront recommend to clients) and Schwab have both recently launched robo-advisory services. These have grown quickly—Schwab’s now has \$4.1 billion in AUM—if only by poaching existing customers. Robo-purists decry potential conflicts of interest.

In dollar terms, both Betterment and Wealthfront are still attracting over \$100m a month—it is the second \$100m that is proving elusive. Yet fintech firms usually count on their custom growing at exponential, not arithmetic, rates. If AUM growth does not pick up, both firms will have to raise prices, expand their offerings or put themselves up for sale. In August BlackRock, a giant asset manager, bought FutureAdvisor, a smaller robo-rival. That robots of the sort devised by Betterment and Wealthfront will direct an ever-larger chunk of investors’ cash seems inevitable. Whether such products can be sold profitably by startups remains in doubt. ■



机器人顾问

“算”不起来

一些公司销售计算机生成的理财建议，它们的增长正在减缓

考虑到人类投资者容易犯许多错误，比如在市场暴跌后卖出、交易太过频繁、相信自己能跑赢股市等等，把钱的事留给计算机处理可能是最好的选择。由此出现了一批公司，它们销售计算机生成的理财建议，为厌倦了付高价给人类顾问的理财客户提供帮助。由于“机器人顾问”成本低廉，这类公司发展迅速，让传统的财富管理公司惊恐不已。但是，最大型机构的资产管理规模增速近来已经下降，后起之秀的前景也随之黯淡。

在过去，即便不是百万富翁，也得是手头有几十万美元的人才能请得起理财顾问。人类顾问每年收取相当于客户资产组合1%至3%的费用，所做的只是偶尔重新配置各资产类别、用聪明的法子交最少的税。以加州机构Wealthfront和总部位于纽约的公司Betterment为首的机器人顾问公司所做的事大致相同，但每年只收取总资产0.25%左右的费用。

机器人服务主要因为压低了管理费，所以对于任何人来说都算干得不错，除了那些需要复杂财务安排的巨富们。一份基本的问卷包括年龄、收入、投资目标等问题，就可以帮助确定客户的风险偏好，然后把资金配置到第三方提供的低成本基金上。有些人相信费用和人为错误是投资的主要隐患，这是正确的，对于他们来说，其他方式很难与机器人顾问匹敌。

其他的特色包括新潮的智能手机应用（客户倾向于年轻化）、定价透明，以及起投门槛很低或者完全没有。Wealthfront形容自己是千禧一代的嘉信理财（Charles Schwab），通过削减成本降低投资门槛，正如20世纪70年代折扣经纪人为婴儿潮一代所做的一样。

但是，收费很低意味着Betterment和Wealthfront需要管理大量资产才能盈利。这两家公司的资产管理规模各为约29亿美元，大部分是过去两年中积累的，一年产生700万美元左右的收入。这不足以负担每家公司约100名员

工的人力成本，还有高昂的营销预算。据一位金融科技达人说，总成本可能达一年四千万到五千万美元（两家公司均未公布数据）。

规模至关重要，因为每一位新客户会带来新收入，而产生的额外成本极低。若要收支平衡，即便不要数千亿美元，也需要数百亿美元的资产管理规模。这两家公司的风险投资人已向每家投入超过1亿美元，并做好了初期会亏损的准备。但即便如此，他们也希望在几年内就能盈利，而不是几十年。

去年这两家公司的资产管理规模每月增长超过10%，每7个月翻一番。之后增长率降至5%以下（见图表）。Wealthfront以前常大肆宣扬自己的资产管理规模，但现在只在给监管部门的备案中才会透露。8月其资产管理规模为26亿美元；假设现在是29亿美元（公司只说不到30亿美元），按照最近的增长速度，翻番需要一年半的时间。Betterment的发展也只是稍好一点。

Wealthfront的老板亚当·纳什（Adam Nash）称资产管理规模是一个有误导性的指标，因为它受到资产价格波动的影响，比如夏末的股市下跌（之后已基本反弹）。可能是波动性吓坏了潜在的投资者。两家公司都说现在有大量新客户加入，而资产管理规模将随着他们的积蓄增加而扩大。

来自传统财富管理公司的竞争将伤害到这两家机器人公司。领航集团（Vanguard）（集合了Betterment和Wealthfront推荐给客户的多支基金）和嘉信最近都推出了机器人咨询服务。仅仅通过迁徙现有客户，它们的业务已在迅猛增长：嘉信目前的资产管理规模为41亿美元。机器人纯化论者强烈反对潜在的利益冲突。

以美元计，Betterment和Wealthfront每月仍在吸引超过1亿美元，但第二个1亿美元才是困难所在。然而，金融科技公司通常都指望它们的客户以指数级而非算术级增长。如果资产管理规模的增速不回升，两家公司都将不得不提高价格、拓宽产品服务或寻求买家。8月，资产管理巨头贝莱德集团（BlackRock）收购了一家较小的机器人对手FutureAdvisor。看来可

以肯定的是，由Betterment和Wealthfront发明的这些机器人顾问将管理投资者资金中越来越大的一块。但创业公司能否在这类产品上盈利则仍旧存疑。 ■



The world economy

Out of ammo?

Central bankers are running down their arsenal. But other options exist to stimulate the economy

WORLD stockmarkets are in bear territory. Gold, a haven in times of turmoil, has had its best start to a year in more than three decades. The cost of insurance against bank default has surged. Talk of recession in America is rising, as is the implied probability that the Federal Reserve, which raised rates only in December, will be forced to take them back below zero.

One fear above all stalks the markets: that the rich world's weapon against economic weakness no longer works. Ever since the crisis of 2007-08, the task of stimulating demand has fallen to central bankers. The apogee of their power came in 2012, when Mario Draghi, boss of the European Central Bank (ECB), said he would do "whatever it takes" to save the euro. Bond markets rallied and the sense of crisis receded.

But only temporarily. Despite central banks' efforts, recoveries are still weak and inflation is low. Faith in monetary policy is wavering. As often as they inspire confidence, central bankers sow fear. Negative interest rates in Europe and Japan make investors worry about bank earnings, sending share prices lower. Quantitative easing (QE, the printing of money to buy bonds) has led to a build-up of emerging-market debt that is now threatening to unwind. For all the cheap money, the growth in bank credit has been dismal. Pay deals reflect expectations of endlessly low inflation, which favours that very outcome. Investors fret that the world economy is being drawn into another downturn, and that policymakers seeking to keep recession at bay have run out of ammunition.

The good news is that more can be done to jolt economies from their low-growth, low-inflation torpor. Plenty of policies are left, and all can pack a punch. The bad news is that central banks will need help from governments. Until now, central bankers have had to do the heavy lifting because politicians have been shamefully reluctant to share the burden. At least some of them have failed to grasp the need to have fiscal and monetary policy operating in concert. Indeed, many governments actively worked against monetary stimulus by embracing austerity.

The time has come for politicians to join the fight alongside central bankers. The most radical policy ideas fuse fiscal and monetary policy. One such option is to finance public spending (or tax cuts) directly by printing money—known as a “helicopter drop”. Unlike QE, a helicopter drop bypasses banks and financial markets, and puts freshly printed cash straight into people’s pockets. The sheer recklessness of this would, in theory, encourage people to spend the windfall, not save it. (A marked change in central banks’ inflation targets would also help)

Another set of ideas seek to influence wage- and price-setting by using a government-mandated incomes policy to pull economies from the quicksand. The idea here is to generate across-the-board wage increases, perhaps by using tax incentives, to induce a wage-price spiral of the sort that, in the 1970s, policymakers struggled to escape.

All this involves risks. A world of helicopter drops is anathema to many: monetary financing is prohibited by the treaties underpinning the euro, for example. Incomes policies are even more problematic, as they reduce flexibility and are hard to reverse. But if the rich world ends up stuck in deflation, the time will come to contemplate extreme action, particularly in the most benighted economies, such as Japan’s.

Elsewhere, governments can make use of a less risky tool: fiscal policy. Too many countries with room to borrow more, notably Germany, have held back. Such Swabian frugality is deeply harmful. Borrowing has never been cheaper. Yields on more than \$7 trillion of government bonds worldwide are now negative. Bond markets and ratings agencies will look more kindly on the increase in public debt if there are fresh and productive assets on the other side of the balance-sheet. Above all, such assets should involve infrastructure. The case for locking in long-term funding to finance a multi-year programme to rebuild and improve tatty public roads and buildings has never been more powerful.

A fiscal boost would pack more of a punch if it was coupled with structural reforms that work with the grain of the stimulus. European banks' balance-sheets still need strengthening and, so long as questions swirl about their health, the banks will not lend freely. Write-downs of bad debts are one option, but it might be better to overhaul the rules so that governments can insist that banks either raise capital or have equity forced on them by regulators.

Deregulation is another priority—and no less potent for being familiar. The Council of Economic Advisors says that the share of America's workforce covered by state-licensing laws has risen to 25%, from 5% in the 1950s. Much of this red tape is unnecessary. Zoning laws are a barrier to new infrastructure. Tax codes remain Byzantine and stuffed with carve-outs that shelter the income of the better-off, who tend to save more.

| *It's the politics, stupid*

The problem, then, is not that the world has run out of policy options. Politicians have known all along that they can make a difference, but they are weak and too quarrelsome to act. America's political establishment is riven; Japan's politicians are too timid to confront lobbies; and the euro area seems institutionally incapable of uniting around new policies.

If politicians fail to act now, while they still have time, a full-blown crisis in markets will force action upon them. Although that would be a poor outcome, it would nevertheless be better than the alternative. The greatest worry is that falling markets and stagnant economies hand political power to the populists who have grown strong on the back of the crisis of 2007-08. Populists have their own solutions to economic hardship, which include protectionist tariffs, windfall taxes, nationalisation and any number of ruinous schemes.

Behind the worry that central banks can no longer exert control is an even deeper fear. It is that liberal, centrist politicians are not up to the job. ■



世界经济

弹药耗尽？

各国央行官员正在耗尽其军火库。但刺激经济仍有其它选项

全球股市处于熊市。在动荡时期作为避风港的黄金有了逾三十年来最好的开年。预防银行违约的保险成本飙升。关于美国衰退的言论四起，美联储刚在去年12月加息，有关它将被迫把利率重降至零以下的潜在可能性的传言也在增加。

困扰市场的最大的忧虑是：富裕国家对抗经济疲软的武器已不再奏效。从2007-2008年危机以来，刺激需求的任务已经落到中央银行官员的肩上。他们的权力在2012年达到顶峰，当时欧洲央行行长马里奥·德拉吉（Mario Draghi）称，他将采取“任何可能的”措施来拯救欧元。随后债券市场回升，危机感减退。

但这只是暂时的。尽管央行做出了种种努力，经济复苏依然疲软，通胀保持低迷。对货币政策的信心正在动摇。央行官员每次激发信心时，也在散播恐惧。欧洲和日本的负利率令投资者担心银行盈利，进而压低了股价。量化宽松（印钞票以购买债券）推动新兴市场大幅举债，如今其正面临违约风险。虽然贷款利率低，银行信贷的增长仍旧低迷。各种（限薪的）工资协议反映出对无休止的低通胀的预期，而这本身又反过来导致低通胀。投资者忧心世界经济正被拖入新一轮衰退，而试图避免衰退的政策制定者已无计可施。

| 火箭炮有风险

好消息是若要让经济从低增长、低通胀的麻木中有所撼动，我们尚有不少可为。还有许许多多的政策，都可作为重拳出击。坏消息是各国中央银行需要政府的帮助。直至现在，央行不得不去挑起重担，因为政客们厚颜无耻地不肯承担责任。至少他们中有的人没能认识到财政政策与货币政策需要运行一致。实际上，很多政府采取紧缩政策，恰恰积极地抵消了货币刺激的作用。

政客是时候同央行人士并肩作战了。最激进的政策理念融合了财政和货币政策。选项之一是打开印钞机直接为公共支出提供融资（或减税），即所谓的“直升机撒钱”。与量化宽松不同，“直升机撒钱”绕过了银行和金融市场，直接把新印的现钞放进人们的口袋。如此毫无顾忌，理论上会鼓励人们花掉这笔意外之财，而不是存起来。（央行通胀目标的显著变化也会有所帮助。）

另一套想法试图通过政府强制的收入政策影响工资和价格的设定，于流沙中拯救经济。这一想法是要全面提升工资，可能通过税收优惠的办法，以此引发工资到价格的螺旋上升，而这正是上世纪70年代政策制定者想要苦苦挣脱的。

这些政策都有风险。很多人坚决反对直升机撒钱的世界：例如，支撑欧元的协定严禁发钞融资。收入政策甚至更成问题，因为这些政策降低了灵活性且难以逆转。但如果富裕世界最终陷入通缩的境地，考虑极端举措的时刻则即将到来，尤其是在最无知且不幸的经济体里，例如日本。

在其它地方，政府可以采用风险较小的工具：财政政策。太多国家，尤其是德国，有空间增加负债，却一直没有这么做。这种勤谨主妇式的节俭危害甚大。举债前所未有的便宜。如今全球七万多亿美元政府债券的收益为负值。如果资产负债表的另一边有新鲜且有收益的资产，债券市场和评级机构对公共债务的增加将更为宽容。毕竟，这样的资产应当包括基础设施。锁定对一个多年项目的长期投资，重建或改善破旧的公共道路和建筑，如此做的理由从来没有现在这般充分。

如果能同与刺激政策目的一致结构化改革相结合，财政刺激的效果会更好。欧洲银行的资产负债表还需加强，只要对它们健康的疑问挥之不去，银行就不能自由放贷。剥离坏账是一个选择，不过更好的做法也许是改革规则，以便政府能够坚持银行或者自己融资充实资本，或者由监管机构强令注资。

放松监管是另一个优先考虑的事项，虽然被人津津乐道却不损其影响力。

美国国家经济顾问委员会（Council of Economic Advisors）称，美国就业人员中受国家颁发执照的法规监管比例从20世纪50年代的5%上升至如今的25%。这样的繁文缛节大多没有必要。土地使用分区管制法令是建设新基础设施的一大障碍。税法依然错综复杂，充斥着保护富人收入的例外条款，而富人们的存款通常更多。

| 这是政治，笨蛋

因此，问题不在于政策选择已然耗尽。政客一直都知道他们可以推动变革，但他们软弱且执着于争论，因而无所行动。美国的政治体制四分五裂；日本的政客过于懦弱，无法应对游说；欧元区看来在制度上存在不足，无法团结在新政策之下。

如果政客在目前尚有时间之时却无所行动，市场上的全面危机将迫使他们不得不动。尽管这会是个糟糕的结果，但还是好过其它的选择。最大的担忧是市场下跌和经济停滞让政权转移到民粹主义者手中，在2007-2008年危机的支持下，他们已经发展壮大。民粹主义者对经济困境有自己的解决方法，包括保护主义关税、暴利税、国有化和其它很多破坏性的方案。

在对央行不再能掌控局面的担忧背后，是更深的恐惧。那便是自由主义中间派政客的无能。 ■



Railways in America

Doing the locomotion

The second golden age of American railroads is drawing to a close. Consolidation may follow

DURING the crisis of 2008-09, Warren Buffett made two big bets in the midst of the panic. He bought a slug of preferred stock in Goldman Sachs. And he took over BNSF, a huge railway. Goldman's 32,500 bankers and BSNF's 32,000 miles of tracks, stretching from the Pacific to Texas, had nothing in common, except that it was impossible to imagine American capitalism without them. "It's an all-in wager on the economic future of the United States," declared Mr Buffett when he bought the railway company, which, naturally, was advised by bankers working for a certain "vampire squid".

How right Mr Buffett was. The last decade has been a golden one for shipping goods around the world's biggest economy (each citizen's consumption of goods and power requires the movement of 36 tonnes of freight a year). American railways have been a rare example of capitalism working well, with a virtuous cycle of demand, giant profits and vast investment in rolling stock and tracks.

Foreigners who snipe at America's late-Brezhnev-era airports, smelly subways and rutted roads should, as the Proclaimers sang, take a look up the rail tracks from Miami to Canada. Fixed assets at North America's six biggest freight-rail firms rose by 58% between 2004 and 2014, to \$250 billion (see chart). Private firms have been spending almost as much each year on modernising American locomotives and tracks as the federal government has on roads. The infrastructure splurge has helped the environment, too, since trains are about four times as fuel-efficient as lorries. America's freight railways are more efficient and far busier than

their counterparts in Europe.

But now this privately fuelled locomotive has been derailed. In the last quarter of 2015 the combined earnings of the big American and Canadian freight-rail firms fell by a fifth, compared with a year earlier, mainly because of the commodity-price crash. The industry has tried to shrug this off as a temporary blip. But if the downturn persists, the investment extravaganza will be over.

Tougher times also raise the spectre of rail mergers, a phenomenon that has vexed America ever since the first transcontinental line was hammered together in the Utah desert in 1869. Dealmaking is already in the air, with Canadian Pacific (CP) pursuing a reluctant Norfolk Southern. Last week CP said it would propose a shareholder resolution calling on Norfolk's board to negotiate a merger. The deal is backed by Bill Ackman, an activist investor. It has thrilled Wall Street, peeved rival firms and put regulators on red alert.

Before asking how the industry's fortunes could go wrong, however, how did it all go right? Since being deregulated in 1980, American railways have gradually got their acts together. Plenty of tailwinds are behind them. Freight volumes typically grow with GDP. And rail, with a market share of about 40%, should take business from road haulage, now with over 50% of traffic, which faces tightening emissions rules and a struggle to recruit drivers.

Greasing the tracks in the past decade was the commodity bubble. Newly drilled shale oil needed to be shipped from remote basins, and coal moved to power stations and ports—American coal exports doubled between 2005 and 2011, thanks to demand from East Asia and Europe. Intermodal transport (containers moved from ship to rail to lorry) rose rapidly, too, and now accounts for a fifth of sales.

Rail managers discovered their inner rottweilers. Hunter Harrison, who runs CP (and before that was at CN, Canadian National), is eulogised by investors for his ruthless scheduling—he is said to monitor individual trains as they chug across the continent. Most important of all, after declining steadily since the 1980s, freight prices were jacked up stealthily, rising by 42% in real terms since 2004.

Railroads could be accused of gouging their customers: pre-tax return on capital for the big six firms rose from 10% in 2004 to 19% in 2014. But that misses the bigger point. For every dollar of gross cashflow in 2014, 67 cents was reinvested. The industry's appetite for capital spending is all but unique in America, where most firms spend bumper profits on share buy-backs to boost their stock price. Rail firms' resistance to this corporate crack cocaine is hard to explain, but may reflect the lingering presence in their boardrooms of gnarled railmen with a love of horn blocks and glad-hand connectors, rather than earnings-per-share enhancement.

What is clear is that the investment spree is now under threat from slumping profits. The shale industry is reeling. Coal volumes have fallen, as domestic power generators switch to dirt-cheap natural gas and the strong dollar hurts coal exports. The industry has solid enough balance-sheets to weather a storm, with net debt of 1.8 times gross operating profit. But an age of austerity beckons. Capital investment fell by 15% in the last quarter of 2015 compared with a year earlier. In 2016 it could drop by 20%.

The industry's unspoken plan is probably to keep raising prices while investing less and returning more cash to shareholders to keep them happy. This approach is likely to enrage everyone else. Customers such as carmakers, energy utilities and shipping firms will complain of being squeezed. Regulators will fret that the pace of modernisation has slowed. Despite a decade of huge investments there are still pressing congestion problems, particularly in Chicago, a bottleneck through which much of

America's freight is rammed.

So how can the industry continue to satisfy both investors and society if demand and profits are lower and the need for capital spending is just as high? Perhaps by turning the big six railways into four, or even two. How big the rewards would be from mergers is fiercely contested. Mr Harrison says he could cut \$1.8 billion a year from Norfolk's costs (equivalent to a quarter of the total), although most of those gains would come from running it better, not from synergies through bolting it onto CP. Norfolk says he is exaggerating.

| *Take your hands off my train set*

Train mergers have been an explosive subject for over a century, with a dread of isolation or exploitation at the hands of railway robber-barons lodged deep in America's subconscious. The last round of deals was permitted in the 1990s, when the number of big train firms fell by half. The antitrust apparatus today is clunky. The federal Surface Transportation Board (STB) has had broad powers to block rail mergers on public-interest grounds since 2001. But it struggles to articulate a logic for assessing what it thinks makes a system better—does it want choice, modest returns on capital, lots of operators, lots of route combinations, or low prices?

The industry already consists of three geographical duopolies—the West (where BNSF and Union Pacific dominate), the east (Norfolk and CSX) and Canada and its links to the United States' industrial north (CP and CN). It is not obvious why linking two non-overlapping rail networks would make any area less competitive.

But even saying that is taboo, and a giant head of steam is building up across the country against the CP-Norfolk deal. The Alabama State Port Authority is sceptical, Ohio's soyabean farmers are livid, western Kentucky's coal miners are perturbed, and the Brotherhood of Locomotive

Engineers and Trainmen foresees a “death spiral”. Most are worried about services and jobs being slashed. Both Union Pacific and CSX have said they oppose a deal. On February 4th nine members of Congress from Indiana asked the STB to be vigilant. The regulator itself is likely to be worried about the short-term disruption dealmaking could create. Consolidation in the 1990s caused chaotic delays.

So Mr Harrison’s proposed deal looks likely to struggle. Yet the near-universal hostility to consolidation reflects a complacency born of the golden years. Now that cash is no longer raining down it will be harder to satisfy investors, customers and the long-term national interest all at once. Perhaps a rationalised rail system will ultimately be seen as the best solution for congestion. It may, however, take someone with Mr Buffett’s legendary patience to witness it. ■



美国铁路

拉动起来

美国铁路的第二个黄金时代接近尾声，整合或将接踵而至

2008年至2009年的危机期间，在一片恐慌之中，巴菲特投下了两大赌注。他大笔购入高盛的优先股，又收购了大型铁路公司BNSF。难以想象美国资本主义世界可以缺少高盛的32,500名员工与BNSF从太平洋延伸至德州32,000英里铁轨，除此之外，两者并无共通点。“这是对美国经济前景的孤注一掷。”巴菲特在购入BNSF时宣称，但这自然是由那些为某“吸血乌贼”效力的银行家们所建议的行动。

巴菲特赌得太对了。过去十年是美国这一全球最大经济体货物运输的黄金时代（国民对商品及电力消费的需求造就其每年36吨的人均货运量）。一直以来，美国铁路是资本主义运作良好的罕例，需求、巨额利润、对机车及铁轨的大量投资三方面呈现良性循环。

那些对美国后勃列日涅夫时期的机场、脏臭地铁及颠簸公路吐槽的外国投资客，正如普罗克莱门兄弟乐队（The Proclaimers）唱得那样，应该看看从迈阿密到加拿大的铁道。北美六家最大货运铁路公司的固定资产在2004年至2014年间增长了58%，达到2500亿美元（见图表）。每年，私人公司用于机车和铁道现代化的投资几乎等同于联邦政府在公路建设上的花费。此番基建大潮也有助环保，因为火车的燃料效率是货运卡车的四倍。美国的货运铁路相较欧洲更加高效且远为繁忙。

但如今，由私营部门驱动的这一火车头已经出轨。2015年最后一季度，美国及加拿大各大货运铁路公司的收入总和同比下降了五分之一，主要原因是大宗商品价格暴跌。业界一直试图将此轻描淡写为短期现象。但如果衰退持续，这场投资盛宴也将终结。

愈发艰难的时节也令人担忧铁路公司会出现合并潮，美国自1869年首条横贯大陆的铁路线在犹他州的沙漠中接轨以来便受此问题困扰。并购交易已

蠢蠢欲动，加拿大太平洋铁路公司（CP）有意收购诺福克南方铁路公司（Norfolk Southern），但后者并不情愿。上周，太平洋铁路表示将提出股东决议，希望与诺福克的董事会商议合并计划。该交易得到维权投资者比尔·阿克曼（Bill Ackman）的支持。华尔街为之兴奋，对手公司焦躁不安，监管机构则严防警戒。

然而，在探讨美国铁路业的命运可能怎样陷入歧途之前，先要问一问当初它是如何走上正轨的？自上世纪80年代放开管制后，美国铁路业已逐步发展壮大。诸多因素都有利于此。货运量往往随GDP的增长而攀升。公路运输量现在的市场占比超过50%，但面对排放规则日益收紧及司机短缺的问题，市场占比约为40%的铁路运输应该抢得更大份额。

过去十年为铁路运输润滑提速的是大宗商品泡沫。新钻取的页岩油需从偏远的盆地运出，煤炭需要运往电站及港口——得益于东亚及欧洲的需求，美国煤炭出口在2005至2011年间翻了一番。多式联运（集装箱经历船运、铁路及货车运输）也快速增长，如今已占销售量的五分之一。

铁路公司管理者也斗心旺盛。太平洋铁路的总裁亨特·哈里森（Hunter Harrison，先前任职于加拿大国家铁路公司）的铁腕调度深得投资者称颂——据说他会监控在美洲运行的各辆列车。最重要的是，货运价格自上世纪80年代以来持续下降，现在已悄然回升，自2004年至今实际增长42%。

铁路企业有可能被指对客户狮子大开口：六大公司的资本税前收益从2004年的10%上升至2014年的19%。但那忽略了更重要的一点。2014年总现金流的每一美元中就有67美分用于再投资。铁路界尤其偏好资本投资，这在美国几乎是独树一帜的，要知道那里多数公司会把丰厚利润用于股份回购，以推高自身股价。难以解释为何铁路公司能抗拒这种“企业可卡因”的诱惑，但也许反映了其董事会仍保有铁路人那份粗犷气质，爱捣鼓轴箱角片和握手阀连接器，而非琢磨提高每股收益。

很清楚的是，这股投资热潮正因利润下滑而受到威胁。页岩业如今阵脚大乱。随着国内电厂改用极为便宜的天然气，美元强劲又殃及到煤炭出口，

美国煤炭产量已经下降。虽然铁路业的财务状况稳固，净负债为经营毛利的1.8倍，足以经受风暴考验，但紧缩时代正在来临。在2015年第四季度，铁路业的资本投资同比下跌了15%，到2016年可能会下降20%。

铁路业可能在默默计划继续提高价格，同时减少投资，向股东返还更多现金以做安抚。但这一做法很可能激怒其他所有人。列车制造商、能源公用事业及运输公司等客户会抱怨受到挤压。监管机构会忧心现代化的步伐放缓。尽管十年来投资巨大，拥塞问题依然迫切，尤其芝加哥已成瓶颈，而美国大部分货运都经由这一枢纽转运。

假如需求和利润下降，而资本投资需求却高涨不退，美国铁路业怎样能继续令投资者和社会各界皆大欢喜？也许要把六家铁路公司变为四家，甚至两家。合并的回报会有多大？对此，争议激烈。哈里森表示，他能使诺福克每年减低18亿美元的成本（等同总成本的四分之一），但节省成本大多会源自经营改善，而非与太平洋铁路合并的协同效应。诺福克则认为哈里森言过其实。

| 别动我的火车

一个多世纪以来，铁路公司兼并一直是个爆炸性议题，对铁路在“强盗大亨”手中被垄断或剥削的忧虑根植美国人的潜意识之中。上一轮交易在20世纪90年代获批，大型铁路公司的数目随之减半。今天的反托拉斯体系网络庞大。美国联邦政府地面交通运输委员会（STB）自2001年起拥有广泛权力，可以出于公众利益阻止铁路兼并交易。但它仍然无法就其是如何衡量什么是更好的铁路体系给出清晰的逻辑——是要提供多种选择、适度的资本回报、众多运营商、多种路线组合、还是更低的价格？

该行业已包含三大地域性双头垄断——西部由BNSF及联合太平洋铁路主导，东部是诺福克和CSX铁路运输公司的天下，而加拿大及相连的美国北方工业区则由太平洋铁路及加拿大国家铁路公司雄霸。两个非重叠的铁路网络联手为何会导致某一地区竞争减弱？理由并不清晰。

但是，连这么一提也是大忌，而且全国上下正蓄势全力反对太平洋铁路和

诺福克的合并。阿拉巴马州港务局持怀疑态度，俄亥俄州的大豆农民怒气冲冲，西部肯塔基州的煤矿工人忧虑不安，美国“火车工程师及乘务员工会”（Brotherhood of Locomotive Engineers and Trainmen）预感将现“死亡螺旋”。多数人担心铁路运输服务及工作岗位会遭削减。联合太平洋铁路和CSX铁路运输公司均表示反对合并交易。2月4日，印第安纳州的九位国会议员要求STB警惕。而这一监管机构本身则可能担忧并购交易也许会造成短期乱象。上世纪90年代的铁路企业合并就曾引起混乱延误。

所以，哈里森拟议中的交易似乎难以推进。然而，对铁路合并近乎一致的敌意反映了在黄金年代滋生的一股自满。现在，资金已不再源源涌入，要同时满足投资者、客户及国家长远利益变得更为艰难。也许，理性改造铁路体系会最终被认为是解决拥堵问题的最佳方案。但这或许需要具备巴菲特那传奇耐心的人才能见证到。 ■



Russia's economy

Phase two

Russia's economic problems move from the acute to the chronic

DMITRY MALIKOV, a wavy-haired crooner, normally sings schmaltzy love tunes. But his latest clip, which he calls “A New Year’s Appeal to the Rouble”, captures the zeitgeist in Russia. “Sure, it’s a bit tough, but happiness is ahead,” he belts. “Just wait, just wait, don’t fall.” Despite his plea, the rouble is falling: on January 21st it dropped to more than 85 to the dollar, a record low. References to the economic “crisis” pepper daily conversation; news broadcasts lead with breathless coverage of the oil markets, and even the patriarch of the Russian Orthodox church was asked his thoughts on the exchange rate during his annual Christmas interview.

Russia’s economy had a torrid 2015. As the oil price tumbled from its mid-2014 peak of over \$100 a barrel, Russia’s exports and government revenues, heavily dependent on oil and gas, collapsed. GDP shrank by nearly 4%; inflation ran close to 13%. Having lost half its value against the dollar in the second half of 2014, the rouble dipped a further 20% in 2015. But in the autumn the contraction slowed. Vladimir Putin, Russia’s president, triumphantly declared that “the peak of crisis” had passed.

Recent turbulence in the oil market has put hopes of a speedy recovery to rest. The IMF reckons GDP will contract again this year, by 1%. Senior officials speak morosely of a “new reality”, acknowledging that their energy-driven growth model has exhausted itself. Yet Russia is unlikely to see a repeat of the acute problems that befell it in late 2014. For one thing, Russian businesses have much healthier finances. Their foreign debt has fallen by a third since 2014. From now until May, firms and banks are due to repay less than they did in December 2014 alone. The second half of the year will be about as easy.

The banking sector is looking better, thanks to a raft of measures from the central bank to recapitalise it and to allow greater forbearance on souring debts. The big oil companies, meanwhile, have coped with a weak currency. Their operating expenses are priced in roubles but most of their revenues come in dollars. Progressive oil and gas taxes have also helped: when prices fall, the state budget absorbs much of the pain. Total oil production grew by 1.4% in 2015, reaching record highs. The profitability of beasts like Rosneft, Lukoil and Bashneft is higher than it was in 2014, according to Moody's, a rating agency.

The government's finances, however, are shaky. The budget for 2016 assumes an average oil price of \$50 a barrel, which was to have produced a deficit of 3% of GDP. However, the arithmetic of Russia's public finances is unforgiving: the budget deficit rises by roughly 1% of GDP for every \$5 drop in the oil price. At the current \$30 a barrel (and assuming no change in spending plans or the exchange rate), the deficit would probably hit 7%.

Yet Mr Putin has decreed that the deficit should not exceed 3%. In response, the finance ministry has called for cuts of 10% (defence and social spending are largely exempt). Officials have also suggested privatising state assets. All this, though, is unlikely to yield enough to plug the growing deficit. Filling the gap by issuing bonds would be expensive: yields are high. Moreover, Russia's default in 1998-99 left its elite with an aversion to debt.

The government can always tap its rainy-day fund, but it holds only \$50 billion, down from \$90 billion a year ago. If the budget deficit hits 6% of GDP the fund will be empty by the end of the year, says Timothy Ash of Nomura, a bank. A second fund, which is supposed to finance pensions, holds a further \$70 billion, but many of its assets are illiquid.

If the government runs out of ready cash, Mr Putin may be tempted to

repeat a well-worn trick—printing roubles. But that would boost inflation and hasten the rouble's decline, further sapping the purchasing power of Russian firms and families. Deep cuts to government spending, on the other hand, will also add to the travails of the non-oil economy.

Russians face a fundamental degradation of their quality of life, says Natalia Zubarevich of the Independent Institute for Social Policy, a think-tank. Real wages fell by 9% in 2015 and 4% in 2014, the first dip since Mr Putin came to power in 2000 (see chart). GDP per person is down from a post-Soviet peak of close to \$15,000 in 2013 to around \$8,000 this year. While official unemployment is just 6%, wage arrears are up. More than 2m people fell into poverty in 2015, and the share of families that lack funds for food or clothes rose from 22% to 39%. Pensions are normally indexed to inflation, but in 2016 they will rise by just 4%.

In turn, consumer spending, once the engine of Russia's economy, has withered. Retail sales dropped by 13%, year on year, in November. Foreign travel during the recent holiday season dipped by 30% compared with a year ago. Even those seeking darker escapes are finding them ever less affordable: the price of heroin (mainly smuggled from Afghanistan) has doubled in roubles over the past year.

In theory the 25% fall in the inflation-adjusted exchange rate in the past year provides a golden opportunity to diversify away from hydrocarbons. To a foreign buyer, labour is now cheaper in Russia than in China. However, foreign investment is wilting too. FDI inflows, which were sliding before the crisis, fell from a quarterly peak of \$40 billion in early 2013 to \$3 billion in the second quarter of 2015. Foreigners are likely to become net divestors soon. Small wonder that manufacturing production was down by 5% year on year in the first half of 2015; agricultural output is stagnant.

The first, most dramatic phase of Russia's crisis may indeed be behind it, as

Mr Putin claimed. But for ordinary Russians, phase two will not seem much better. ■



俄罗斯经济

第二阶段

俄罗斯的经济问题从急性转为慢性

卷发的低音抒情歌手德米特里·马利科夫（Dmitry Malikov）通常演唱伤感情歌。然而，他的那首最新单曲《新年对卢布的祈求》（A New Year's Appeal to the Rouble）捕捉的却是俄罗斯人当下的情绪。“当然，现在有点艰难，但幸福就在前方，”他高唱到，“等一等，等一等，别跌了。”尽管他这般恳求，卢布却仍在贬值：1月21日跌至1美元兑换超过85卢布，创历史新低。人们的日常交谈中充斥着经济“危机”的话题，新闻广播总是以石油市场令人窒息报道开场，甚至连俄罗斯东正教大牧首在一年一度的圣诞采访中都被问及他对汇率的看法。

俄罗斯经济在2015年备受煎熬。随着油价从2014年中期每桶超过100美元的峰值暴跌，俄罗斯严重依赖石油和天然气的出口及政府收入陷于崩溃。GDP缩水了近4%，通胀率接近13%。继2014年下半年卢布兑美元贬值一半之后，2015年卢布进一步下跌20%。但是经济紧缩在秋季有所放缓。俄罗斯总统普京得意洋洋地宣称“危机的顶峰”业已过去。

最近石油市场的动荡已令经济快速复苏的希望破碎。国际货币基金组织预计，今年俄罗斯的GDP将再度下滑1%。高级官员们郁闷地谈论着一种“新的现实”，承认其能源驱动的增长模式已经难以为继。然而，俄罗斯不太可能再经历一次2014年末遭遇的急性问题。原因之一是俄罗斯企业的财务状况已经变得健康了许多。2014年以来，它们的外债减少了三分之一。从现在起到5月，企业和银行须到期偿还的债务要少于2014年12月一个月的数目。今年下半年日子也会一样好过。

银行业看起来也在好转，这多亏了中央银行实施的一系列措施，重组了银行业并且对不良债务更为宽容。同时，大型石油公司已能应对疲软的货币。它们的营业费用以卢布定价，但大多数收入却以美元计算。石油和天然气的累进税也有一定帮助：价格下降时，国家预算承担了大部分的痛

苦。石油总产量在2015年增长了1.4%，创历史新高。根据评级机构穆迪（Moody's）的数据，俄罗斯石油公司（Rosneft）、卢克石油（Lukoil）和巴什石油公司（Bashneft）等大型公司的盈利能力均好于2014年。

不过，政府的财政状况并不稳定。2016年的预算假设平均油价为每桶50美元，而这会导致预算赤字达GDP的3%。然而，俄罗斯公共财政面临着严峻的困难：油价每下降5美元，预算赤字占GDP的比例就会上升约1%。以目前每桶30美元的油价计算（同时假设政府开支计划或汇率不变），赤字可能会达到7%。

但普京已经下令要求赤字不得超过3%。对此，财政部要求削减10%的开支（国防和社会支出基本上不在此列）。官员还提议将国有资产私有化。不过，所有这些举措都不可能产生足够的资金来填补日益扩大的赤字。由于收益率高企，通过发行债券来填补缺口代价高昂。此外，俄罗斯在1998年至1999年曾发生债务违约，这使得精英们倾向于规避债券的风险。

政府可以随时动用应急基金，但该基金目前仅有500亿美元，而一年前还有900亿美元。投资银行野村控股（Nomura）的蒂莫西·阿什（Timothy Ash）表示，如果预算赤字占GDP的比例达到6%，到年底就将耗尽应急基金。另有一个基金预定用于资助养老金，还持有700亿美元，但它的许多资产缺乏流动性。

倘若政府现金耗尽，普京或许会忍不住重施一个老掉牙的伎俩——印卢布。但这会推高通胀、加速卢布的下跌，从而进一步削弱俄罗斯企业和家庭的购买力。另一方面，大幅削减政府支出也将加剧非石油经济的阵痛。

智囊机构“社会政策独立研究所”（Independent Institute for Social Policy）的娜塔莉亚·朱巴列维慈（Natalia Zubarevich）表示，俄罗斯人的生活质量面临一次根本性的恶化。实际工资在2014年和2015年分别减少了4%和9%，这是普京2000年上台后首次下滑（见图表）。人均GDP从苏联解体后的最高峰即2013年的15000美元降至今年的8000美元左右。尽管官方失

业率仅为6%，但工资拖欠却在增加。2015年，超过200万人加入贫困大军，没钱购买食品或衣服的家庭比例从22%上升到39%。养老金通常与通胀挂钩，但2016年养老金只会增加4%。

相应地，一度曾是俄罗斯经济发动机的消费支出已经萎缩。去年11月，零售销售额同比下降了13%。刚过去的节假日里，出国旅行比一年前减少了30%。即使是那些藉毒品寻求解脱的人也发现越来越难以负担了：过去一年，海洛因（主要从阿富汗走私而来）的卢布售价翻了一倍。

过去一年中，经通胀调整后的汇率下降了25%，从理论上讲，这提供了一个向油气以外领域多元化发展的黄金机遇。对外国买家来说，俄罗斯的劳工如今比中国更便宜。然而，外国投资也在萎缩。外国直接投资在危机前已在下滑，从2013年初高峰时的单季400亿美元跌至2015年第二季度的30亿美元。外资流向很可能很快就会成为净流出。难怪2015年上半年制造业生产同比下降了5%，而农业产出停滞不前。

可能如普京声称的那样，俄罗斯危机的第一个也是最具戏剧性的阶段确实已经过去，但对于普通俄罗斯人来说，第二阶段看来也好不到哪里去。





Schumpeter

Sailing through a scandal

Why the phone-hacking affair has left Rupert Murdoch better off

IT MUST all seem like a distant nightmare now. After the revelations of phone-hacking at the *News of the World* emerged in 2011, Rupert Murdoch was hauled before Parliament, calling it “the most humble day of my life”. Executives and journalists were arrested. The scandal prompted Mr Murdoch’s News Corp to drop a cherished plan to buy out the other investors in BSkyB, a satellite broadcaster (since renamed Sky). Some predicted that the affair, which included the hacking of a murdered schoolgirl’s voicemails, could be Mr Murdoch’s and his firm’s undoing.

However, corporate karma turns out to be more lenient than business schools lead students to believe. Far from watching their empire crumble, Mr Murdoch and his family have more than doubled their wealth since the scandal broke. Mr Murdoch, who is 83, remains firmly in charge, and his sons, Lachlan and James, seem better placed than ever to succeed him one day.

The Murdoch clan’s resilience points to an overlooked reality in business: sometimes a loss can turn into an unexpected win. The crisis forced Mr Murdoch, a devoted newspaperman, to make difficult choices that he never would have in calmer circumstances. When the extent of the phone-hacking was uncovered, he promptly closed the *News of the World*, which he had owned since 1969 and whose sales had been falling since the 1980s. His ambitions to take over BSkyB frustrated, he handed some of News Corp’s spare cash back to investors, in the form of buy-backs that boosted its share price.

More momentous for shareholders, Mr Murdoch agreed to split his

company in two, separating its high-growth film and television assets from the declining newspaper business, which was exposed to the scandal's legal liabilities. Investors had been calling for such a split for years, but had no power to force it, because of the group's dual-class equity structure. To please them further Mr Murdoch handed more power to Chase Carey, an executive whom investors trust more than they do his boss.

All this has had a remarkable effect on the businesses' combined value. An analysis by Sanford C. Bernstein, a research firm, reckoned that even after the \$500m or so in legal fees and other costs incurred over the phone-hacking scandal, shareholders probably made around \$2.6 billion more than if the Murdochs had pursued the BSkyB deal instead. It is an echo of what happened in 1911, a century before the hacking scandal, when John Rockefeller, an oil tycoon as unpopular as Mr Murdoch was during the scandal, was hit with a huge antitrust fine and had his Standard Oil empire broken up. Its pieces proved to be worth far more apart than together, making Rockefeller richer than ever.

The popular belief in media circles is that Mr Murdoch is an unchanged man. Not quite. The events of the last few years have curbed his hubris. Mr Murdoch used to be notorious for pouncing on the biggest, grandest assets without regard to value. His purchase of TV Guide and other businesses for \$3 billion in 1988 nearly bankrupted his company. In 2007 he paid around \$5.5 billion for Dow Jones, publisher of the *Wall Street Journal*, at least double what it was worth at the time. Having weathered his most recent crisis, however, he does not want to suffer more embarrassment, or generate future losses for his heirs. Many expected that once his publishing company was spun out, he would pursue more newspapers, such as the *Los Angeles Times*. He has not. Earlier in 2014, 21st Century Fox, the spun-out entertainment division, proposed an \$80 billion bid for Time Warner, a rival. But when Fox's stock sank, making it harder to seal the deal, Mr Murdoch walked away.

Meanwhile, Lachlan and James have been given an inadvertent crash course in management. The crisis gave them cause to work out of the public eye, honing their skills before stepping cautiously back into the limelight. Lachlan, who resigned abruptly from News Corp in 2005, has come back and is now “non-executive co-chairman” of both the entertainment and publishing firms. James is now “co-chief operating officer” of the entertainment firm, working alongside Mr Carey and helping to cook up deals. The timing and the details of the succession remain unclear, though one obvious possibility is for Lachlan to become CEO of the news side and James CEO of the entertainment side. ■



熊彼特

安度丑闻危机

为什么电话窃听丑闻让默多克更加富有

现在想来，当初的一切必定都像一个遥远的噩梦。在2011年《世界新闻报》电话窃听事件曝光后，鲁伯特·默多克（Rupert Murdoch）被英国议会传讯，他说那是“我生命中最卑微的一天”。涉案高管和记者被捕。丑闻促使默多克的新闻集团（News Corp）放弃一项酝酿已久的计划，即收购卫星广播公司英国天空广播集团（BSkyB，现已更名为Sky）其他股东的股权。当时有人预测，这一事件，包括窃听被害女童的语音信息在内的丑闻，可能导致默多克及其传媒帝国的毁灭。

然而结果是，生意场上的因果报应比商学院教导学生相信的要仁慈得多。默多克的帝国不仅没有分崩离析，他和家人的财富在丑闻爆发之后反而翻了不止一番。83岁高龄的默多克仍然牢牢掌权，他的两个儿子，拉克兰（Lachlan）和詹姆斯（James）似乎地位更加稳固，有朝一日定能继承父业。

默多克家族的韧性点明了商业世界里一个被忽略的现实：塞翁失马，焉知非福。危机逼着默多克这位虔诚的报人做出了一些在平时绝不会考虑的艰难抉择。在意识到电话窃听事件的严重性后，他立刻关闭了《世界新闻报》。这份他1969年收购的报纸销量从上世纪80年代开始一直下滑。收购英国天空广播集团的雄心受阻，他就以股份回购的方式将新闻集团闲置的部分现金返还给投资者，从而推高股价。

对股东意义更为重大的是，默多克同意将公司一分为二，将高增长的电影和电视资产与持续下滑的报纸业务分拆，后者需承担丑闻带来的法律责任。投资者们多年来都在呼吁这样的拆分，但由于双层股权结构，一直无力实现。为了进一步取悦他们，默多克将更多权力移交蔡斯·凯里（Chase Carey）。相比老板默多克，这位高管更为投资者所信任。

所有这些举措对公司业务的总价值产生了难以估量的积极影响。根据研究公司桑福德·伯恩斯坦（Sanford C. Bernstein）的估算，即使在付出了差不多5亿美元的法律费用及电话窃听丑闻连带的其他花销之后，相比默多克按原计划收购英国天空广播，股东们的收益还是多了26亿美元。这几乎是历史的重现，在窃听丑闻发生一个世纪之前的1911年，和默多克一样不受欢迎的石油大王约翰·洛克菲勒（John Rockefeller）收到了反垄断的巨额罚单，他所拥有的标准石油（Standard Oil）帝国也不得不被拆分。事实证明，分拆后各部分价值总和大大超过分拆前，令洛克菲勒比以往任何时候都更富有。

传媒圈里普遍认为默多克是个一成不变的人，其实并不完全如此。过去几年的事情让他的骄满之气收敛了不少。此前众所周知，默多克向来是看到最大最光鲜的资产就紧抓不放，无论价值是否合理。1988年他以30亿美元的价格收购《电视指南》（TV Guide）杂志及其他业务，公司差点因此破产。2007年，他用大约55亿美元的价格收购了道琼斯公司——《华尔街日报》的出版商，交易金额是其市值的至少两倍。然而，在经历了最近的危机事件后，默多克不愿再遭受更多的尴尬，也不想为继承人带来更大的损失。很多人曾预计在出版公司分拆出去之后，他会收购更多的报纸，如《洛杉矶时报》，但他并没有这样做。2014年早些时候，从新闻集团分拆出去的娱乐业务公司21世纪福克斯（21st Century Fox）提出以800亿美元收购对手时代华纳（Time Warner）。但是当21世纪福克斯的股票下跌，令交易难以达成时，默多克放弃了。

同时，拉克兰和詹姆斯也在无意间上了一堂企业管理速成课。危机提供了契机，令他们得以淡出公众视野，磨练技巧以备时机成熟重回聚光灯下。拉克兰在2005年曾突然从新闻集团辞职，现在已经回归，担任娱乐和出版两家公司的“非执行联席董事长”。詹姆斯现在是娱乐公司的“联席首席运营官”，和凯里一起工作并协助寻求并购机会。两位继承人接班的时机和方式尚不明朗，不过一个明显的可能是拉克兰将成为新闻业务的CEO，而詹姆斯将成为■



Central banks

Shifting the burden

Central banks need to do less, and politicians more

THE past seven years have been an extraordinary period for central bankers. Not only have they cut interest rates to zero (and even below) in the developed world; for the first time in their history central banks have greatly expanded their balance sheets, buying government bonds and other assets. Most economists agree that vigorous action was needed in the wake of the financial crisis in 2007-08 in order to head off a repeat of the Great Depression. Nevertheless, the sheer scale and protracted nature of such monetary stimulus is now a cause for concern among some commentators; have the banks permanently distorted the economy? In December the Federal Reserve made the first, tentative step towards normality, with a quarter-point rate increase.

Mohamed El-Erian, a former IMF economist and executive at the Pimco fund management group, is the latest to sound the alarm. While central banks “averted tremendous human suffering”, he argues that they have failed to generate what the Western world really needs—“the combination of high, durable and inclusive growth together with genuine financial stability”.

Worse still, politicians have come to rely on central bankers to provide the main source of economic stimulus. As a result, Mr El-Erian asserts, they have failed to force through reforms that were badly needed. The long period of easy monetary policy has pushed up asset prices and thus wealth inequality. It has also meant that the appetite for financial risks (market speculation, in other words) is greater than the willingness of businesses to take economic risks by increasing investment.

Other problems include high long-term unemployment, a loss of trust in authority and the failure to co-ordinate economic policy. The global economy is rapidly approaching a T-junction, he argues, where the road heads in two diametrically opposite directions. One will lead to higher growth, reduced financial risk and a lessening of inequality; the other will see all those measures head in the wrong direction.

Mr El-Erian does a good job of describing the problems. But the book falters when he tries to set out his plan for taking the right path away from the T-junction. He cites a number of necessary measures, including revamping the education system, strengthening infrastructure, improving labour competitiveness and flexibility, while simultaneously closing tax loopholes and increasing marginal tax rates on the wealthy in order to reduce inequality. But he only touches on these issues; a lot more detail is needed. Improving education may be a good idea, but it will be a decade or so before today's schoolchildren have any impact on labour productivity. How will growth be improved in the meantime?

Instead of answering such questions, he launches into a meandering section about the need for new thinking to deal with "bimodal distributions" (his T-junction metaphor). Just when readers want to get into the meat of the debate on economic policy, they are served a chapter called "Translating Awareness into Optionality, Resilience and Agility". Mr El-Erian is right that employers need to embrace diversity in hiring, but that subject does not belong in a book on central banking.

In a sense, however, the disappointing ending symbolises the state of economic debate. Central banks have provided all the help they can, and the burden of improving long-term growth ought to fall on politicians. But no one can agree on precisely what needs to be done. ■



中央银行

转嫁负担

央行需要做得少些，而政客要做得多些

过去七年对央行行长们是一段非凡的时期。他们不仅把发达国家的利率降到了零（甚至零以下），而且前所未有地极大扩展了其资产负债表来购买政府债券和其他资产。大部分经济学家都认同，2007年至2008年的金融危机过后，需要强有力的行动来避免大萧条重演。然而，这种货币刺激方案的庞大规模与长期持续如今引发了一些评论人士的担忧。央行是否已经永久地扭曲了经济？12月，美联储将利率上调0.25个百分点，迈出了货币政策回归常态化尝试性的第一步。

曾任国际货币基金组织经济师、太平洋投资管理公司（Pimco）前主管的穆罕默德·埃尔-埃利安（Mohamed El-Erian）是最近又一位敲响警钟的人。他认为，虽然央行“避免了巨大的人类苦难”，但它们未能创造出西方世界真正需要的东西：“持久的、包容性的高增长与真正的金融稳定性并举”。

更糟的是，政客们已经变得依赖央行作为提供经济刺激的主要来源。其结果是，埃尔-埃利安断言，他们未能强力推行亟需的改革。长期宽松的货币政策推高了资产价格，从而扩大了贫富差距。它也意味着，人们对金融风险（换言之，投机）的胃口要大于企业冒险增加投资的意愿。

其他问题包括长期失业率高企、对政府的信任丧失，以及未能协调实施经济政策。他指出，全球经济正快速接近一个三岔路口，道路自此将向两个截然相反的方向前进。其中一条导向更高的增长率、更低的金融风险，以及不平等的减少，而在另一条路上，所有相关措施都会通向歧途。

埃尔-埃利安在描述这些问题时表现出色，但当他尝试阐述他认为该如何在三岔路口走上正确道路时，开始变得支吾其词。他罗列了一些必要的措施，包括改造教育系统、加强基础设施、提升劳工竞争力和灵活度，与此

同时填堵税收漏洞、提高对富人的边际税率以减少不平等。但他只是提到了这些议题，而细节远远不足。改善教育可能是一个好主意，但要让今天的学童能对劳工生产力产生任何影响，大概还要等上十年。那么在这段时间里，要如何改善经济增长？

作者没有回答这类问题，反而另辟一章，开始漫谈我们需要新的思维来应对“双峰分布”（他对三岔路口的比喻）。正当读者想要进入有关经济政策辩论的核心部分时，他们却读到了名为“把认知转化为可选性、适应力和敏捷度”的新章节。埃尔-埃利安说得没错，雇主在招人时确实需要拥抱多样性，但这个话题和一本有关央行的书无甚关系。

不过，在某种程度上，这一令人失望的结尾恰恰象征了经济辩论的现状。央行已经提供了它们能够提供的所有帮助，改善长期增长的负担应该落到政客们的身上了。但是，对于确切需要做些什么，尚无人能够达成共识。





Cool clothing

Chilled out

How to put air-conditioning into people's garments

THE idea came to Ralph Liedert while he was sweltering in the Californian sunshine, having been standing with his daughter for over an hour in a queue for a ride at Disneyland. What, he thought, if his T-shirt had a cooling system he could switch on, at the tap of a smartphone app, when he needed it. No doubt similar thoughts have crossed the minds of many a parent in such circumstances. They, though, did not have the means to make their dream reality. Mr Liedert does, for he works at the VTT Technical Research Centre of Finland, as one of a team there studying the burgeoning field of microfluidics.

Cooling vests already exist (they are sometimes used by racing drivers, motorcyclists and people such as furnace operators, who work in hot conditions). But the tubes through which the cooling water is being pumped, and the vests' need to be connected to external units that chill this water, make them bulky and unwieldy. Mr Liedert thought VTT's microfluidics department could do things better.

As its name suggests, microfluidics is the art of building devices that handle tiny amounts of liquid. Inkjet-printer cartridges are a familiar example. Less familiar, but also important, are "labs-on-a-chip". These are tiny analytical devices that transport fluids such as blood through channels half a millimetre or less in diameter, in order to carry them into chambers that hold analytical reagents. Sensors, either in the chip itself or in a machine into which the chip is inserted, then detect the resulting reactions and provide an instant analysis of a sample. Designing labs-on-a-chip is the VTT microfluidics department's day job. One of its chips, for example, can tell whether water is contaminated with the bacteria that cause

Legionnaires' disease.

The department's biggest contribution to the field, though, is to have developed a way of printing microfluidic channels onto large rolls of thin, flexible plastic, which can be cut up into individual devices. This process, called hot embossing, is faster and cheaper than conventional ways of making labs-on-chips, such as photolithography of the sort employed to manufacture computer chips. It works by passing the plastic between two heated rollers, one of which contains raised outlines of the required channels. As the rollers squeeze the plastic they create a pattern of channels recessed into one surface. A second plastic film is then fused over the top as a cover. This process might, thought Mr Liedert, be suitable for printing a microfluidic fabric that was thin enough and pleasant enough to wear as a cooling vest.

The group's first prototype demonstrated that such a material could indeed be made and used to circulate chilled water. The initial idea was to put the material into a jacket, but the team found that it worked much better when in direct contact with the skin. They are therefore making a second prototype which covers the wearer's neck and shoulders, and can be clipped inside a sports shirt.

They are also looking at ways the water being circulated through the microchannels might be cooled. They have identified two. One uses a small heat-exchanger, the details of which they are keeping secret at this stage. The other employs evaporation. It thus works in the same way that heat from circulating blood is removed by the evaporation of sweat. (The vest also permits such natural sweating, via small holes in the fabric.)

Whichever cooling system prevails, the electronics needed to power and control it would be shrunk into a small package contained on the back of the vest. This could be operated manually or, as Mr Liedert originally

envisaged in his Californian queue, by a wireless link to a smartphone. Moreover, what can cool down can also, if run in reverse, warm up. In Finland, where winter temperatures fall as far as -50°C , that might be the technology's killer app. ■



制冷衣

凉爽轻便

如何把空调塞进人们的衣服里？

为了玩迪斯尼的一个项目，拉尔夫·利德特（Ralph Liedert）已经和女儿在加州艳阳下排了一个多小时的队，汗流浹背的他想：如果自己的T恤上装有一个制冷系统，在有需要时只要按一下智能手机上的一个应用就能将它打开……类似的想法肯定曾出现在许多处于相同境地的父母头脑中，但他们没有办法让这个梦想成真。而利德特却有，因为他在芬兰VVT国家技术研究中心（VTT Technical Research Centre of Finland）工作，这里的一个团队正在研究微流控这项迅速发展的技术。

制冷背心已经存在（赛车手、摩托车手以及熔炉操作员等在高温环境中工作的人有时会穿它）。但是，冰水要被注入管道中，而衣服还要和外部机器连接来冷却水，使得这种衣服既大又笨重。利德特认为，VVT的微流控部门有更好的解决办法。

正如其名字所示，微流控这项工艺打造可以处理微量液体的设备。喷墨打印机的墨盒就是一个广为人知的例子。另一个不那么为人熟知但很重要的例子是“晶片上的实验室”。它们是微小的分析仪器，将诸如血液这样的液体通过直径半毫米或更窄的管道传输到存放试剂的反应室。然后，芯片带有的传感器或者插入芯片的机器内部装载的传感器会探测出已发生的反应，对样本提供即时分析。设计晶片实验室是VTT微流控部门的日常工作，比如，它研发的其中一个芯片能判断水是否感染了会导致军团菌肺炎的细菌。

不过，该部门对这一领域的最大贡献是研发出了一种方法，将微流控管道压印到大卷有弹性的薄塑料片上，而后塑料片可被切割成单个设备。这一过程叫热压成形，比制造芯片实验室的传统方法（比如在制造电脑芯片中使用的光刻法）更快也更便宜。它让塑料片穿过两个加热的滚轴中间，其中一个滚轴上带有要制造的管道凸起的轮廓。当滚轴挤压塑料时，就在塑

料的一个表面产生了向下凹陷的管道。然后第二张塑料薄膜被熔融覆盖其上。利德特想到，这个过程或许适合压印出微流控织物，它足够薄，也足够舒适，可做成制冷背心。

该团队的第一个原型显示这样一种材料确实能被制造出来，也能用来循环冷水。最初的创意是把这种材料放入外套里面，但该团队发现，如果它和皮肤直接接触效果会好得多。因此他们正在制造第二套原型，它覆盖穿着者的脖子和肩膀，可被固定在一件运动衫里边。

他们也在探索冷却微管道中水循环的方法，目前已经发现了两种。其一使用小型热交换设备，但现阶段他们还不愿透露细节。另一个利用蒸发效应，过程就和血液循环产生的热通过汗水被蒸发掉一样（这件背心的织物带有小洞，也可以自然排汗）。

不论哪种制冷系统胜出，用来供电和控制该系统的电子部件将被紧缩成一小包，放在背心的背部。这套设备可以手动操控，或者可以像利德特最初在加州排长队时想到的那样，通过和智能手机无线连接来操控。此外，它既然可以被冷却，同样也可以被加热——只需反向操作。在冬季气温可跌至负50摄氏度的芬兰，这可能会成为该技术的杀手级应用。 ■



Semiconductors

Chips on their shoulders

China wants to become a superpower in semiconductors, and plans to spend colossal sums to achieve this

THE Chinese government has been trying, on and off, since the 1970s to build an indigenous semiconductor industry. But its ambitions have never been as high, nor its budgets so big, as they are now. In an earlier big push, in the second half of the 1990s, the government spent less than \$1 billion, reckons Morgan Stanley, an American bank. This time, under a grand plan announced in 2014, the government will muster \$100 billion-\$150 billion in public and private funds.

The aim is to catch up technologically with the world's leading firms by 2030, in the design, fabrication and packaging of chips of all types, so as to cease being dependent on foreign supplies. In 2015 the government added a further target: within ten years it wants to be producing 70% of the chips consumed by Chinese industry.

It has a long way to go. Last year China's manufacturers, both domestic and foreign-owned, consumed \$145 billion-worth of microchips of all kinds (see chart). But the output of China's domestic chip industry was only one-tenth of that value. And in some types of high-value semiconductor—the processor chips that are the brains of computers, and the rugged and durable chips that are embedded in cars—virtually all of China's consumption is imported.

To help them achieve their dream, the authorities realise that they must buy as much foreign expertise as they can lay their hands on. In recent months, state-owned firms and various arms of government have been rushing to buy, invest in or do deals with overseas microchip firms. On

January 17th the south-western province of Guizhou announced a joint venture with Qualcomm, an American chip designer, to invest around \$280m in setting up a new maker of specialist chips for servers. The province's investment fund will own 55% of the business. Two days earlier, shareholders in Powertech Technology, a Taiwanese firm that packages and tests chips, agreed to let Tsinghua Unigroup, a state-controlled firm from the mainland, buy a 25% stake for \$600m.

Officials argue that developing a home-grown semiconductor industry is a strategic imperative, given the country's excessive reliance on foreign technology. They can point to the taxpayers' money that politicians in America, Europe and other parts of Asia have lavished on their domestic semiconductor industries over the years.

China's microchip trade gap is, by some estimates, only around half of what the raw figures suggest, since a sizeable proportion of the imported chips that Chinese factories consume go into gadgets, such as Apple's iPhones and Lenovo's laptops, that are then exported. Even so, a policy of promoting semiconductors fits with the government's broader policy of moving from labour-intensive manufacturing to higher-added-value, cleaner industries.

Morgan Stanley notes that profit margins for successful semiconductor firms are typically 40% or more, whereas the computers, gadgets and other hardware that they go into often have margins of less than 20%. So if Chinese firms designed and made more of the world's chips, and one day controlled some of the underlying technical standards, as Intel does with personal-computer and server chips, China would enjoy a bigger share of the global electronics industry's profits.

In the government's earlier efforts to boost domestic manufacturing of solar panels and LED lamps, it spread its largesse among a lot of local firms, resulting in excess capacity and slumping prices. This time it seems to be

concentrating its firepower on a more limited group of national champions. For instance, SMIC of Shanghai is set to be China's champion "foundry" (bulk manufacturer of chips designed by others). And HiSilicon of Shenzhen (part of Huawei, a maker of telecoms equipment) will be one of a select few champions in chip design.

Most intriguing of all, Tsinghua Unigroup, a company spun out of Tsinghua University in Beijing, has emerged in the past year or so as the chosen champion among champions, a Chinese challenger to the mighty Intel. Zhao Weiguo, the firm's boss, started out herding goats and pigs in Xinjiang, a remote province in north-western China, to where his parents had been exiled in the 1950s, having been labelled as dissidents. After moving to Beijing to study at the university, Mr Zhao made a fortune in electronics, property and natural resources, before becoming chairman and second-largest shareholder (after the university itself) at Tsinghua Unigroup.

The company's emergence from obscurity began in 2013 when it spent \$2.6 billion buying two Chinese chip-design firms, Spreadtrum and RDA Microelectronics. In 2014 Intel bought a 20% stake in its putative future rival, for \$1.5 billion, as part of a plan for the two to work together on chips for mobile devices, an area in which Intel has lagged behind. In May last year Tsinghua spent \$2.3 billion to buy a 51% stake in H3C, a Hong Kong subsidiary of Hewlett-Packard that makes data-networking equipment. And in November it announced a \$13 billion share placement to finance the building of a giant memory-chip plant.

| *Shopping for silicon savvy*

Other Chinese firms have also been splashing out. Jiangsu Changjiang, a firm that packages chips, paid \$1.8 billion in 2014 to gain control of STATS ChipPac, a Singaporean outfit in the same line of business. In 2015 state-controlled JianGuang Asset Management paid a similar sum for a division

of NXP of the Netherlands, which makes specialist chips for cell-phone base stations. A group led by China Resources Holdings, another state enterprise, has made a \$2.5 billion takeover bid for Fairchild Semiconductor International, an American firm. But the undisputed leader of the “national team” buying up foreign chip know-how is Tsinghua.

“Many people suspect I’m a ‘white glove’ for the government,” Mr Zhao declared recently, “but we’re really just a very market-oriented company.” That somewhat understates the official backing that it clearly enjoys: without this, it is hard to imagine the company affording the 300 billion yuan (\$45 billion) that Mr Zhao says Tsinghua plans to spend on further deals over the next five years.

Chinese approaches to foreign semiconductor firms—unlike its firms’ acquisitions of foreign consumer brands—have not always met with a warm reception. Tsinghua reportedly made a \$23 billion bid last year for Micron, a big American maker of DRAM—the type of memory chips used to store data on desktop computers and servers. But the bid faltered because of political opposition. The firm’s overtures to SK Hynix, a South Korean maker of DRAM and flash-memory chips (as used in USB sticks and smartphones), were rebuffed in November. In December Tsinghua bought a 25% stake in Siliconware Precision Industries (SPIL), a Taiwanese chip packager and tester. The resulting political backlash prompted Advanced Semiconductor Engineering (ASE), a bigger Taiwanese chip packager, to launch a takeover bid for SPIL in December. Tsai Ing-wen, the main opposition candidate in Taiwan’s presidential election, declared China’s investments in the island’s chip firms a “very big threat”—and on polling day, January 16th, she emerged the victor.

As to whether China will realise its ambitions, or whether it will continue to be dependent on foreign chip technology, Taiwan’s own experience is instructive. From the 1980s, it was highly successful in developing world-

class chip foundries, such as TSMC, and in cultivating sparky designers of processor chips such as MediaTek. But in part that was because of good timing: the chip industry was moving towards a model of separating the design and the fabrication of chips, and Taiwan successfully rode that trend. But its more recent attempt to be big in memory chips was a disaster. Mark Li of Sanford C. Bernstein, a research firm, reckons that despite \$50 billion in capital expenditure during the late 1990s and 2000s, mostly financed by the government, Taiwanese firms met with “en masse failure in memory.”

These firms lost further fortunes chasing market share. From 2001 to 2010, the global memory-chip business made \$8 billion in aggregate profits—but subtract the two successful South Korean makers, Samsung and SK Hynix, and everyone else lost nearly \$13 billion. Despite their vast outlays, reckons Mr Li, Taiwanese firms spent too little to reach the technology frontier and were expecting profits too early.

Douglas Fuller of Zhejiang University in Hangzhou argues that the maturing of the global semiconductor industry in recent years will make it harder still for China to crack. The incumbents in memory chips have become entrenched, especially after recent consolidation; and the chips themselves, with their associated software, are becoming much more complex, making it harder for Chinese firms to master them. ASE’s chief operating officer, Tien Wu, adds that Taiwanese firms were entering the chip market at a time when it was enjoying heady expansion; it will be more difficult for Chinese firms to succeed at a time of slow growth.

If China’s putative chip champions are to succeed, they must accomplish three hard things. Lee Wai Keong, head of ASM Pacific Technology, a Hong Kong-listed supplier of equipment to the industry, believes that, first, Chinese firms must shift from “a culture of cost to a culture of innovation.” He laughs when asked if firms like Tsinghua can buy in cutting-edge

research through acquisitions, insisting there are “no short cuts in semiconductors.” His scepticism is justified: export controls and other policy barriers in Taiwan, South Korea and America inhibit the transfer of the latest technologies to Chinese firms.

The mainland’s chip firms mostly lag far behind global leaders in invention (though HiSilicon is a notable exception). Intel alone spends about four times as much on research and development as does the entire Chinese chip industry, calculates Christopher Thomas of McKinsey, a consulting firm. Besides pumping more into research, Chinese firms also need to attract many more experienced scientists and engineers. This is not impossible, given that Silicon Valley is teeming with brilliant people of Chinese extraction. But if firms like Tsinghua are to attract them, they must learn how to innovate globally, for example by running multiple R&D centres around the world.

That points to the second challenge: the need to shift to a global frame of mind. So far Chinese firms have been mostly catering to booming local consumption. But they must prepare for demanding global markets. Even Chinese firms, especially those serving foreign markets, are unlikely to remain satisfied with subpar chips just because they are made at home.

The final challenge may be the most daunting. Investors in China’s chip firms need to get ready for a long, hard slog. Analysis by McKinsey reveals that across the global semiconductor industry, in memory or processor chips, and in design, fabrication or packaging, the top one or two firms in each area account for all profits—with the rest losing money.

A positive example China could follow, if it wants to avoid wasting its \$150 billion, is that of Samsung. It has become a semiconductor colossus by investing heavily in R&D, amassing an array of technical talent and accepting low returns for many years. Boosters argue that Chinese firms

could pull this off, given that the government will be the main investor, and is in it as a strategic priority rather than for profit.

However, there is a potential contradiction in the way the government is implementing its latest plan. Burned by the poor outcome of previous efforts to promote microchips, solar panels and LEDs, officials are funnelling a large chunk of their initial investment—around \$30 billion—through a handful of state-backed investment funds. The hope is that these intermediaries will make more market-minded investments than bureaucrats did in the past. However, managing these funds so that they achieve this objective, even though outside investors will want a profitable exit before the government's 2030 target, will be no mean feat.

Even so, Morgan Stanley's analysts think Chinese firms have a fair chance at becoming world-class in certain parts of the industry. Local chip firms may have a strong hand in product areas such as televisions, mobile phones and computers, in which China dominates both production and consumption. Regulators may be tempted to tilt the playing-field further in their favour by dictating indigenous standards or imposing local-content requirements, though the risk is that China ends up with firms that are strong at home but lack global competitiveness.

In memory chips of either the DRAM or flash variety, Chinese firms' chances would be bolstered if they could persuade some of the largest foreign firms to form technology-sharing alliances, enlisting those firms to help overcome their home governments' curbs on technology transfer. In this, having deep pockets will be a great help. In September an offshoot of Tsinghua agreed to pump \$3.8 billion into Western Digital, an American maker of hard-disk drives. Its balance-sheet bolstered, Western Digital soon afterwards spent \$19 billion buying SanDisk, another American firm, which is among the world leaders in flash memory.

China's efforts to develop national champions in what it calls "pillar industries" have a decidedly chequered record. In carmaking, its attempts to make foreign firms share their technology through compulsory joint ventures with domestic makers have only entrenched local firms' dependence on their foreign partners. In commercial aircraft, a state aerospace conglomerate, COMAC, has spent years, and huge sums, developing planes that are still not ready for the market, and will be outdated by the time they arrive.

In the various parts of the microchip business, Chinese firms may eventually catch up technologically, but in the process undermine the industry worldwide, as happened in solar panels, through excessive capacity-building. As Bernstein's Mr Li puts it, China "will not stop until it dominates the market, with value and economics being destroyed." Tsinghua's boss, Mr Zhao, is unabashed about his ambitions. "The chip sector is entering the era of giants, with accelerating integration," he declared recently, making it clear that he intends his firm to be one of the few surviving giants. The coming shakeout will separate the sheep from the goats, which is an area in which Mr Zhao happens to have some experience. ■



半导体

芯片之重

中国计划投入巨资打造半导体超级大国

自上世纪70年代起，中国政府就一再努力尝试打造本土半导体产业，然而目前其野心之大、预算之高前所未见。据美国银行摩根士丹利估计，上世纪90年代的后半段，中国政府大力推动半导体产业时，投入的资金不到10亿美元。而这一次，根据2014年公布的宏大规划，政府将从公共和私募基金筹集1000至1500亿美元。

其目标是在2030年前在技术上赶上世界领先企业，在各类芯片的设计、制造及封装上达到先进水平，从而不再依赖外国供应。2015年，政府又新增目标：十年内能生产中国产业所消耗芯片的70%。

这还有很长的路要走。去年，中国本土及外资制造商共消耗了价值1450亿美元的各类微芯片（见图表）。但国内芯片业的产值仅为这一数字的十分之一。而对于某些高价值半导体（计算机核心部件处理器芯片以及坚固耐用的嵌入式车用芯片），中国消费的几乎全是进口产品。

为实现梦想，当局意识到必须尽可能地从国外购入他们能拿来利用的专业技术。近几个月来，国有企业及各类政府机构纷纷收购、投资海外微芯片公司或与其交易。1月17日，中国西南省份贵州宣布与美国芯片设计公司高通（Qualcomm）合资2.8亿美元，设立一家生产服务器专用芯片的新公司。该省的投资基金将持有合资公司55%的股份。此前两天，台湾芯片封装及测试企业力成科技公司的股东与紫光集团达成协议，让这家内地国有控股公司以六亿美元购入其25%的股份。

官员们认为，由于中国过度依赖外国技术，发展本土半导体产业是战略要务。他们指出，多年来，欧美及亚洲其他地区的政客都在各自的本土半导体行业上大肆挥霍纳税人的钱。

根据一些估测，中国的微芯片贸易逆差仅是原始数据显示的一半左右，因为中国工厂消耗的相当大一部分进口芯片实际上被用于苹果iPhone和联想笔记本电脑这类之后又再度出口的电子设备。即便如此，政府的宏观政策希望实现从劳动密集型制造业向更高附加值、更清洁的产业转型，振兴半导体产业的政策与之吻合。

摩根士丹利指出，成功的半导体公司利润率一般为40%或以上，而使用半导体芯片的计算机、电子设备及其他硬件企业往往只有不到20%的利润率。所以，假如中国公司在全球芯片设计和制造中占据更大份额，并且有朝一日像英特尔在个人电脑和服务器芯片领域那样，控制了其中部分基础技术标准，那么中国在全球电子行业的利润占比将会更大。

政府之前致力推动国内生产商制造太阳能电池板及LED灯具，为此大力资助众多地方企业，结果导致产能过剩，价格暴跌。这次，政府似乎正集中火力资助为数相对有限的全国性龙头企业。比如，上海的中芯国际要成为中国的“代工厂”（批量制造别人设计的芯片）领头羊，而深圳的海思（电信设备制造商华为的下属企业）将成为芯片设计的少数领军企业之一。

最有趣的是，大概从去年开始，由清华大学分拆出的企业紫光集团跃升为领军团队中的领头者、一家将和强大的英特尔一争高下的中国企业。公司老板赵伟国幼时在新疆养猪放羊，上世纪50年代其父母被划为异见份子而流放到这一西北偏远省份。后来，赵伟国来到北京，进入清华大学学习，之后在电子、房地产及自然资源行业发家致富，目前是紫光集团的董事长和第二大股东（清华大学是头号股东）。

该公司在2013年以26亿美元购入两家中国芯片设计公司——展讯和锐迪科微电子，自此开始崭露头角。2014年，英特尔以15亿美元购入这一公认未来对手20%的股权，这是两者合作开发移动设备用芯片计划的一部分，移动芯片是英特尔一直落后的领域。去年5月，紫光集团斥资23亿美元收购惠普旗下制造数据网络设备的香港子公司华三通信51%的股权。11月，紫光公布130亿美元的配股计划，准备融资打造规模宏大的内存芯片工厂。

| 购买芯片技术

其他中国企业也挥金如土。芯片封装公司江苏长江电子科技公司在2014年投资18亿美元取得新加坡同行新科金朋（STATS ChipPac）的控股权。2015年，国有控股的建广资产管理公司以类似金额收购了荷兰恩智浦公司（NXP）旗下的手机基站专用芯片制造部门。另一国有企业华润集团牵头的财团已出价25亿美元，希望收购美国公司飞兆半导体（Fairchild Semiconductor International）。但在收购国外芯片技术的“国家队”中，紫光是无可争议的领头羊。

“许多人怀疑我是政府的‘白手套’，”赵伟国最近宣称，“但我们真的只是非常市场化的公司。”这么说多少淡化了紫光集团享受的政府支持，而这种支持显而易见，否则难以想象该公司要如何像赵伟国所说的，负担3000亿元（450亿美元）来完成未来五年的进一步收购计划。

和收购国外消费品牌的情况有所不同，中国企业在接触收购海外半导体公司时并非总是受到热情相待。据报道，紫光集团去年出价230亿美元收购美国DRAM（用于台式电脑及服务器数据存储的内存芯片）大型制造商美光（Micron），但由于政治反对而失败。紫光对韩国DRAM及闪存芯片（用于U盘及智能手机）制造商SK海力士（SK Hynix）的收购要约也在11月被拒。12月，紫光购入台湾芯片封装测试企业矽品精密工业（SPIL）25%的股权。随之掀起的政治风波促使台湾规模更大的芯片封装厂商日月光半导体制造股份有限公司（ASE）在12月出价收购矽品精密工业。台湾总统选举中，主要反对党候选人蔡英文宣称内地企业对台湾芯片公司的投资是“巨大的威胁”。她在投票日1月16日胜出当选。

中国会实现其野心还是会继续依赖国外的芯片技术，台湾的经验值得借鉴。从上世纪80年代开始，台湾非常成功地打造了台积电（TSMC）这样世界级的芯片代工厂，也培育出了联发科技（MediaTek）这样朝气蓬勃的处理器芯片设计公司。但某种程度上，那是时势造英雄：当时，芯片产业正转向设计与制造分离的模式，台湾恰逢其时。但其最近意欲在内存芯片业务上做大的尝试却一败涂地。研究公司盛博的马克·李（Mark Li）认为，尽管在上世纪90年代末到本世纪初，台湾芯片企业投入500亿美元

的资本支出（主要来自政府资助），但“在内存芯片领域遭遇集体失败”。

这些公司在追逐市场份额的过程中进一步流失财富。从2001年至2010年，全球内存芯片业总利润为80亿美元，但除去韩国两大成功厂商三星和SK海力士的利润后，其他公司损失近130亿美元。马克·李认为，尽管这些台湾企业支出庞大，但在前沿技术研究上的投资太少，而且过早期望获利。

杭州浙江大学教授道格拉斯·富勒（Douglas Fuller）认为，近年来全球半导体产业日渐成熟，将令中国更难跻身其中。现有内存芯片企业已经稳扎市场，尤其是在近期的一轮整合后。而芯片本身及相关软件变得愈加复杂，令中国公司更难以掌握。日月光集团的首席营运官吴田玉补充道，台湾公司是在芯片产业迅猛扩展的年代进入芯片市场，中国内地企业要在如今增长缓慢之时成功打入会更难。

中国公认的芯片龙头企业要取得成功，必须完成三件难事。半导体行业设备供应商、香港上市公司ASM太平洋科技的总裁李伟光认为，首先，中国企业必须从“成本文化向创新文化”转型。被问到紫光集团这类公司是否可以通过收购获得尖端科研成果时，他报之一笑并坚称“半导体行业没有捷径可走”。他的怀疑确有道理：台湾、韩国、美国的出口管制及其他政策壁垒限制了最新技术向中国公司的转移。

内地芯片企业在发明创造上大多远远落后于世界领军企业（尽管海思是个明显的例外）。据麦肯锡咨询公司的克里斯托弗·托马斯（Christopher Thomas）计算，单单英特尔的研发支出就是中国内地整个芯片业研发支出的四倍。除了在科研上加大投入，中国企业还需要吸引更多资深科学家和工程师。这并非不可能，毕竟硅谷到处是华裔英才。但如果紫光集团这类公司要吸引他们，则必须学会如何在全球范围推动创新，比如在世界各地运作多个研发中心。

这就带出了第二个难题：需要转变思维，从全球角度思考。目前为止，中国企业主要在迎合蓬勃发展的本地消费需求。但它们必须为挑剔的全球市场做准备。即使是中国企业，尤其是那些服务国外市场的公司，也不太可

能只因为芯片是本国制造的就能继续容忍其欠佳的性能。

最后一个挑战也许最令人生畏。中国芯片企业的投资者需要有所准备：前路将是漫长的艰苦跋涉。麦肯锡的分析显示，整个全球半导体业，无论是内存还是处理器芯片，也无论是设计、制造还是封装，各领域里数一数二的企业抢占了所有利润，而其他企业全部都在亏损。

中国若要避免浪费其1500亿美元的投入，可效仿的一个正面例子是三星。通过大量投资研发，招揽各类技术人才，而且容忍多年的低回报，这家企业已成为半导体行业的巨人。支持者认为，中国企业能够做到这一点，毕竟政府将是主要投资者，并且是以战略考量为先，盈利为次。

然而，政府在实施其最新计划时的方式可能存在潜在的矛盾。因为之前推动微芯片、太阳能电池板和LED的结果不尽人意，碰壁后的官员们现在通过几个政府支持的投资基金来注入大部分的初始投资（约300亿美元）。此举是希望相比以往的官僚决策，这些中间机构能作出更具市场意识的投资决定。但是，管理这些基金以达成该目标绝非易事，尽管外部投资者会希望在达成政府设定的2030年目标之前就获利退场。

即便如此，摩根士丹利的分析师认为中国企业还是很有可能在半导体业的某些领域达到世界水平。本地芯片公司也许会在电视、手机和电脑这些产品领域变得举足轻重，中国在这些产品的生产和消费上均占主导地位。监管机构可能会出台一些本土标准或实施国产化要求，进一步倾斜政策，扶助其青睐的企业，但风险在于，中国企业最终可能变得只能在本土称强，却缺乏全球竞争力。

无论是在DRAM还是闪存芯片领域，中国企业如果能说服一些国外大公司与之建立技术共享联盟，让这些公司帮忙克服其所在国政府对技术转让的限制，中国企业突围的机会将因而提升。在这方面，财力雄厚将有莫大的帮助。9月，紫光集团旗下公司协议向美国硬盘驱动器制造商西部数据（Western Digital）注资38亿美元。财力得到充实的西部数据随即以190亿美元收购了另一美国公司、全球领先的闪存制造商闪迪（SanDisk）。

中国在所谓的“支柱产业”上发展本土龙头企业的历程显然充满波折。在汽车制造业，政府要求外国公司必须与本地汽车厂商合资经营，希望藉此让外国公司分享技术，结果却令本地企业更加依赖其外国合作伙伴。在商用飞机行业，国有航空集团中国商飞多年来投入巨资研发民航飞机，却仍未能投产，等到可以上市时飞机也将过时。

在微芯片业的各项技术上，中国企业也许最终会迎头赶上，但在这一过程中会因过度扩张产能而对全球产业造成破坏，正如太阳能电池板一样。如盛博的马克·李所言，中国“不称霸市场是不会罢休的，即使摧毁价值及经济效益也在所不惜”。紫光集团的老板赵伟国对自己的野心毫不掩饰。“芯片业正步入巨头时代，整合加速。”他最近如此宣称，显然他意图让自己的公司成为少数幸存的巨头之一。即将到来的行业震荡将把绵羊和山羊区分开来，而赵伟国在这方面恰好有点经验。■



Aircraft engines

Flying's new gear

A quieter, more economical jet engine, fitted with a gearbox, is about to arrive

EVERYONE remembers the Wright brothers, who made the first powered, heavier-than-air flights by human beings on a beach in North Carolina in 1903. Few, by contrast, remember Charlie Taylor, a mechanic at the brothers' bicycle business in Dayton, Ohio. Yet it was Taylor who, by building an internal-combustion engine out of aluminium castings rather than iron ones, created a device both light enough and powerful enough to lift Orville and Wilbur into the sky.

Engine design has always been crucial to aviation. To start with, more powerful versions of the piston-driven motor pioneered by Taylor ruled the roost. Then, a radical, new approach emerged as the designs of Frank Whittle, a British engineer, ushered in the jet age. The jet has since evolved into the turbofan, whose gaping intakes have—as seasoned air travellers will have noticed—grown larger and larger over the years, to accommodate ever bigger and better fans. And now, as 2015 turns into 2016, another new design is being rolled out. This is the geared turbofan, which is available as an option on the A320neo, the latest product of Airbus, Europe's biggest aerospace group.

Geared turbofans, as their name suggests, include a gearbox as part of the mechanism. Those on the A320neo are the brainchildren of engineers at Pratt & Whitney, a division of United Technologies, an American conglomerate. Designing and building geared turbofans, which Pratt & Whitney brands "PurePower", is a gamble. The firm has spent two decades and more than \$10 billion developing them. Connecting an engine's inlet fan to the compressor and turbine in its core through a gearbox should give better fuel economy and make the thing quieter—both desirable outcomes.

But the bigger the engine the bigger the forces on the gearbox and the more likely it is that something will go wrong. So, though gearboxes are found in turboprops (jet engines that turn a propeller) and in a few executive jets, no one had until now managed to scale one up to cope with the 30,000 horsepower delivered by the core of an airliner's engine.

Pratt & Whitney has persevered because it thinks the conventional, ungeared turbofan is reaching its limits, and that only by adding a gearbox can airlines achieve the performance and economy which will be required of them in the future. Airlines, though, are notoriously conservative, and are wary of new, complicated kit like gearboxes, which are yet one more thing that can go wrong. So Pratt & Whitney has had its work cut out to persuade them.

| *Meshing it together*

A jet engine works according to Newton's third law of motion: to every action there is an equal and opposite reaction. The reaction is forward movement. The action which provokes that is the ejection from the back of the jet of fast-moving gas. This gas generates thrust in proportion to its mass and to the speed with which it is being ejected. In the early, ear-splitting jet engines designed by Whittle and his contemporaries, the thrust came from air that entered the engine's core at the front (see diagram) where it was squeezed by a compressor, mixed with fuel and ignited to produce hot gases that rushed out of the rear. Though the mass of this exhaust gas was small, its velocity was high, so the resulting thrust kept an aircraft fitted with such an engine aloft. The compressor, meanwhile, was turned by a turbine propelled by the exhaust gases.

A turbofan works in a broadly similar way, but with a fan also turned by the turbine to push some of the air around, rather than through, the core. Though this core-bypassing air is not moving as fast as the exhaust gases, there is a lot of it—so it, too, produces a great deal of thrust. The upshot is a

system that is more efficient and quieter than earlier jet engines.

The proportion of air going around the core compared with that going through it is known as the bypass ratio. Some of the latest turbofans have bypass ratios as high as 9:1. It is to achieve this that fans (and therefore inlets) have increased in size. But as fan blades get longer, their tips travel faster—and now those tips are going at close to the speed of sound. Accelerating them any further would cause shock waves, and these might result in dangerous vibrations.

A gearbox gets around this by letting the fan turn more slowly than the compressor and the turbine. This means the fan can be made bigger (and can thus accelerate a greater volume of air) without slowing everything else down to its rev rate. This arrangement permits all parts to be engineered for optimal performance. As a result, PurePower has a bypass ratio of 12:1.

Doing all of this does, though, require an utterly reliable gear box. Pratt & Whitney uses advanced nickel-based alloys for the components of the box itself. The fan blades are made from a lightweight alloy of aluminium and lithium. And the turbine is composed of titanium aluminide, a substance developed in collaboration with MTU, a German firm, that has twice the strength of the conventional cast alloys used to make turbines.

The upshot is that a pair of PurePower engines slung under an A320neo's wings promise to reduce fuel consumption by 15% compared with a standard A320. This could save an airline more than \$1.5m a year per aircraft in fuel costs. Geared turbofans also give the plane a longer range and are markedly less noisy.

There have, inevitably, been teething problems. Industry reports suggest that the geared turbofan needs a slightly longer period to cool down than was expected, to avoid uneven wear when it is restarted. This might sound

trivial, but at a busy airport it could cost a plane its take-off slot. For that reason Qatar Airways, which had been expected to be the first to take delivery of the A320neo, is believed to have postponed receipt. The honour of being first now looks like going to Lufthansa, a German carrier. Pratt & Whitney says the geared turbofan meets or exceeds all its performance requirements. During routine flight testing, ways to improve the engine were identified, but the company adds that any modifications will be minor.

Whether geared turbofans will sweep all before them remains to be seen—and depends, at least in part, on the response of Pratt & Whitney's two big rivals in the jet-engine business, General Electric (another American firm) and Rolls-Royce (a British one). These companies are also working on more efficient aircraft engines. Both, though, think improvements can still be squeezed from the conventional turbofan design without resorting to a gearbox. General Electric, in partnership with Snecma, a French firm, is offering a rival engine, called the CFM Leap, for the A320neo. This will be available later in 2016 and is claimed by the partners to provide fuel savings similar to those of a geared arrangement. The Leap is a conventional turbofan, but it is made using some unconventional techniques. These include new composite materials and also additive manufacturing (popularly known as 3D printing). Rolls-Royce, too, aims to get greater efficiency from its turbofan designs, though it does also have a gearbox-development programme, with a view to making a geared turbofan that might enter service on large passenger aircraft in around a decade's time.

As to PurePower itself, so far the opinion of airlines is divided. Airbus has taken orders for more than 4,400 A320neos. About a third of these will sport PurePower, a third Leap, and in the cases of the remaining third, the customer has yet to make up his mind.

Pratt & Whitney, though, does not plan to be tied only to Airbus. It is also offering versions of PurePower to firms trying to break the duopoly enjoyed on short-to-medium-range aircraft by that firm and Boeing. Bombardier of Canada is one such. Its competitor to the A320 is called the CSeries. The Mitsubishi Regional Jet, from Japan, is another plane which Pratt & Whitney hopes might use PurePower. And there are also the MC-21, a 180-seat airliner from Irkut, a Russian aerospace company better known for its Sukhoi fighter jets, and the E-Jet from Embraer, of Brazil. Whether Pratt & Whitney's PurePower play will pay off remains to be seen, but as Charlie Taylor knew over 100 years ago, gearing up for success does mean taking risks. ■



飞机引擎

飞行新装备

一种装有齿轮变速箱、更安静也更经济的喷气式引擎即将投用

所有人都记得莱特兄弟：1903年，在美国北卡罗莱纳州的沙滩上，他们完成了人类第一次驾驶由引擎驱动、重于空气的飞行器飞上天空。相比之下，很少有人记得查理·泰勒（Charlie Taylor）其人。他是莱特兄弟位于俄亥俄州达顿市（Dayton）的自行车公司里的一名机械工。然而，正是泰勒用铝铸件而非铁铸件制造了一台内燃机引擎，创造出一套够轻又够强大的设备，才能把两兄弟送上天空。

引擎设计从来都对航空至关重要。最初，在泰勒的首创后出现了各种更为强大的活塞驱动马达，统领了航空界。而后，英国工程师弗兰克·惠特利（Frank Whittle）的设计开启了喷气式引擎时代，一种更激进的新方法崛起。喷气式引擎继而发展成涡扇，而就像经常乘飞机的人会注意到的那样，多年来涡扇敞开的进气口越变越大，以容纳更大更好的风扇。如今，2016年伊始，又一项新设计正在推出：齿轮传动式涡扇。欧洲最大的航空航天集团空客最新的A320neo系列将会在部分飞机上使用这种引擎。

顾名思义，齿轮传动式涡扇的一部分是一台齿轮变速箱。A320neo上的齿轮变速箱由美国企业集团联合技术公司（United Technologies）子公司普惠（Pratt & Whitney）的工程师研发。普惠设计和生产这些名为“洁静动力”（PurePower）的引擎是一次赌博。这家公司已经花费20年时间、投资一百多亿美元来研发它们。齿轮变速箱将引擎的进气风扇和位于引擎核心部位的压缩机及涡轮机相连接，由此应能节省燃料，并减少噪音——都是可喜的成果。不过，引擎越大，变速箱承受的力越大，出问题的可能性更大。因此，虽然齿轮变速箱在涡轮螺旋桨引擎（使用螺旋桨的喷气式引擎）和一小批商务飞机中使用，但之前一直没有哪家公司能把它做大到足堪承受一架客机的引擎内核所产生的3万马力功率。

普惠坚持了下来，因为它认为传统的无齿轮传动涡扇引擎正接近性能的极

限，唯有添加齿轮变速箱，航空公司未来才能达到人们要求的性能和经济性。但是，航空公司的保守做派人尽皆知，对于像齿轮变速箱这样复杂的新工具，它们态度谨慎，因为这让可能发生故障的源头又多了一个。因而普惠需要花大力气来说服它们。

| 齿轮连接

喷气式引擎的运作遵循牛顿第三定律：每一个作用力都会产生一个大小相等、方向相反的反作用力。这里的反作用力是向前运动。引发这种反作用力的是从飞机尾部排放的快速运动的气体。这种气体产生了与其质量和运动速度成正比的推力。在惠特尔及其同代人设计的那些震耳欲聋的早期喷气式引擎中，这种推力来自进入引擎内核的空气，空气首先在前部压缩机内挤压，与燃料混合后被点燃，产生高温气体从引擎的后方冲出。虽然这种尾气的质量很小，但速度很快，因而能产生让飞机保持飞行的推力。与此同时，由尾气驱动的涡轮机带动了压缩机的运转。

涡扇的运作方式大致也是如此，但它有一台风扇，也是由涡轮机驱动，推动部分空气从引擎内核周围而非内核中穿过。虽然这种绕过核心部分的空气并不像尾气移动得那么快，但它的量很大，因此也产生了极大的推力。结果是一套比之前的喷气式引擎更高效也更安静的系统。

在引擎内核周围运动的气体和穿过内核的气体的量之比率叫旁通比。最近生产的一些涡扇的旁通比高达9: 1。正是为了获得这样的高比率，风扇（以及涡扇的进气口）才会越做越大。但随着风扇的叶片越做越长，叶片尖端的移动速度越来越快，如今已经接近音速。再做任何加速将造成冲击波，继而可能导致危险的振动。

齿轮变速箱避免了这一问题，因为它让风扇以慢于压缩机和涡轮机的速度转动。这样一来，风扇可以被做得更大（继而可以让更多空气加速流动）而无需让其他部件都放慢至和它的转速相同。这种设计使得引擎的所有部分都能发挥最佳功效。因此“洁静动力”的旁通比高达12: 1。

不过，这套机制需要一台绝对可靠的齿轮变速箱。普惠使用先进的镍基合

金来制造变速箱的部件。风扇叶由一种轻型的铝锂合金打造。涡轮则由钛铝打造，普惠和德国的发动机及涡轮机联盟弗里德希哈芬公司（MTU）合作研发了这种材料，它比传统用来制造涡轮机的铸造合金坚固两倍。

其结果是，悬挂于A320neo机翼下方的一对“洁静动力”引擎应能让燃料消耗比标准A320客机减少15%。这可以让航空公司每年在每架客机上节省150万美元的燃料费。齿轮传动涡扇也让飞机可以飞行更长的里程，而噪音大为减少。

初期的问题总不可避免。行业报告显示，齿轮传动涡扇冷却的耗时比此前的预期略长，这种冷却是为避免在重新启动时发生不匀磨损。这听起来可能是小事，但在一些繁忙的机场，这可能会让一架飞机因延误而不得不重新排队等候起飞。由于这一原因，原本预期第一家接收A320neo的公司卡塔尔航空据信已经延迟收货。“第一家”的荣誉如今看来将会属于德国的汉莎航空。普惠称，齿轮传动涡扇达到甚至超过了所有的性能要求。在常规飞行试验中已经发现了改善该引擎的途径，但该公司补充说，任何调整都将是细小的。

齿轮传动涡扇能否扫除一切障碍还是未知数，至少在一定程度上这取决于普惠在喷气式引擎业务上的两大竞争对手的反应。它们是另一家美国公司通用电气（GE）和英国公司罗尔斯罗伊斯（Rolls-Royce）。两家公司也都在研发更高效的飞机引擎，但它们都认为仍然可以从传统的涡扇设计中寻求改善，而无需求助于齿轮变速箱。通用电气正和法国的斯奈克玛公司（Snecma）合作，为A320neo提供另一套竞争性的引擎CFM Leap。它将在2016年稍晚时投用，两家公司称它和齿轮变速设计所能节省的燃料量差不多。Leap是一套传统的涡扇，但使用一些非传统的工艺制成，包括新的复合材料和增材制造（广为人知的称法是3D打印）。罗尔斯罗伊斯也志在提升其涡扇的效率，虽然该公司也有研发齿轮变速箱的项目。其目标是在约十年后让齿轮传动涡扇能用在大型客机上。

而说到“洁静动力”本身，目前各家航空公司对其态度不一。空客已经接到4400多架A320neos的订单，其中约三分之一将使用“洁静动力”引擎，三分

之一使用Leap，其余三分之一尚未决定。

不过普惠并无意只同空客捆绑，它也在向那些试图打破空客和波音对中短程客机双头垄断的公司提供“洁静动力”的各种版本。加拿大的庞巴迪公司（Bombardier）即是其一，该公司制造的C系列和A320竞争。日本的三菱支线客机（MRJ）是普惠希望能用上“洁静动力”的另一款飞机。此外还有俄罗斯飞机制造商Irkut的180座飞机MC-21（该公司更出名的是苏霍伊[Sukhoi]战斗机），以及巴西航空公司（Embraer）的E-Jet飞机。普惠的这出“洁静动力”大戏是否会赢得满堂彩，还需拭目以待，但正如一百多年前查理·泰勒心知肚明的那样，追求成功确实免不了冒险。■



Ethics and the environment

Eco-waverers

When people feel good about themselves, they do bad things

“VIRTUE,” according to George Bernard Shaw, “is insufficient temptation.” But new research on the consumption patterns of the environmentally minded suggests that virtue and self-indulgence often go hand-in-hand.

A recent paper* by Uma Karmarkar of Harvard Business School and Bryan Bollinger of Duke Fuqua School of Business finds that shoppers who bring their own bags when they buy groceries like to reward themselves for it. For two years the authors tracked transactions at a supermarket in America. Perhaps unsurprisingly, shoppers who brought their own bags bought more green products than those who used the store’s bags. But the eco-shoppers were also more likely to buy sweets, ice cream and crisps.

Psychologists call this sort of behaviour “moral licensing”: the tendency to indulge yourself for doing something virtuous. Although this example may seem harmless (except to the shoppers’ waistlines), the results can be perverse. A study from 2011 on water-conservation in Massachusetts shows how. In the experiment, some 150 apartments were divided into two groups. Half received water-saving tips and weekly estimates of their usage; the other half served as a control.

The households that were urged to use less water did so: their consumption fell by an average of 6% compared with the control group. The hitch was that their electricity consumption rose by 5.6%. The moral licensing was so strong, in other words, that it more or less outweighed the original act of virtue.

Moral licensing does not seem to occur when virtuous conduct is

obligatory. In one study, participants imagined themselves doing community service. Then they were asked to pick between two rewards: an indulgent one (a pair of designer jeans) and a practical one (a vacuum cleaner). If they were told to imagine that they had been sentenced to community service for a driving violation, they were much less likely to choose the jeans than if they pictured themselves as volunteers. The best way to get people to do good, it seems, is to make them feel bad about themselves.

* “BYOB: How Bringing your Own Shopping Bags Leads to Treating Yourself and the Environment”, Harvard Business School working paper, December 2014. ■



道德规范与环境

环保墙头草

当人们自我感觉良好时，他们会做坏事

萧伯纳曾言，“美德即为诱惑不足。”但是对具有环保意识的人士消费模式的新研究表明，美德和自我放纵常常携手偕行。

哈佛商学院的乌玛·卡玛卡（Uma Karmarkar）和杜克大学富卡商学院（Duke Fuqua School of Business）的布莱恩·博林杰（Bryan Bollinger）合著的新报告*发现，自备购物袋的购物者在买食品杂货时喜欢因此犒劳自己。作者连续两年追踪美国一家超市的交易。有一点或许在意料之中，自备购物袋的购物者比使用商店购物袋的人购买的绿色产品更多。然而这些环保购物者也更可能购买糖果、冰淇淋和薯片。

心理学家将这种行为称作“道德许可”：因为做了好事就放纵下自己的倾向。尽管这个例子看起来无害（除了对购物者的腰围有影响），但结果可能有悖常情。2011年在马萨诸塞州开展的一项关于节水的研究说明了这一点。在试验中，150户家庭被分成两组。一半会收到节水小贴士及每周估算的用水量提示；另一半作为对照组。

被要求节约用水的家庭的确做到了：与对照组相比，他们的用水量平均减少了6%。但问题是他们的用电量增加了5.6%。道德许可如此严重，换句话说，它会或多或少地超出原来的善举。

当做好事是必须时，似乎不太会出现道德许可行为。在一项研究中，参与者想象自己在做社区服务。然后让他们从两种奖励中挑选一个：放纵的（一条名牌牛仔裤）或是实用的（一台吸尘器）。与想象自己是志愿服务者相比，当让他们想象自己是因为违反交通规则而被判罚做社区服务时，他们选择牛仔裤的可能性小得多。看来让人们做好事的最佳办法是让他们觉得愧疚。

* 《BYOB（请自备购物袋）：自备购物袋如何导致自我款待以及对环境的
态度》。哈佛商学院研究报告，2014年12月 ■



New York property

Reason not the need

The strange story of the General Motors Building

THE property business, goes an industry proverb, is “a circle of men holding a revolver to each other’s heads”. And, all too often, to their own, as Vicky Ward illustrates in her colourful history of America’s most fought-over office block: the 50-floor General Motors Building on Fifth Avenue in Manhattan.

Built for the carmaker’s bosses in the mid-1960s—when what was good for the company was said to be good for America—the white-marble tower was never New York’s tallest or most beautiful skyscraper. But something about it drove the property tycoons nuts. Their pursuit of it was often sordid, and the sums they were willing to risk irrational. One mogul compares the building to “the girl you keep asking to the prom but says no. And each time you ask she gets more expensive.”

Ms Ward, whose breakthrough book was “The Devil’s Casino”, about the fall of Lehman Brothers, has fun with the obsessive, hubristic cast of characters who have scrapped over the building (though the scene is at times too crowded with names and personal details). Among them are Donald Trump, the industry’s master of self-promotion, who was the first to push rents over the magic figure of \$100 per square foot; Disque Deane, a uniquely unpleasant financier who broke bottles over heads and divorced his wife in Bermuda to avoid having to pay her a fair share of his wealth; and Cecilia Benattar, the “housewife tycoon”, who was so wrapped up in dealmaking that it took her six months to name her first child.

As they hustle, in some cases taking on vast debts to secure the prize (you can’t buy a \$50m building until you first find \$5,000, according to another

industry joke), these bigwigs do plenty of dangerous gambling, double-crossing and, of course, suing. The most financially reckless of them all was Harry Macklowe, a local developer who, after many years of trying, got his hands on the block in 2003 for a record \$1.4 billion, only to lose it five years later because he had posted it as collateral for loans for the spectacularly ill-advised purchase of seven other buildings.

One of Mr Macklowe's better decisions was to sign a deal with Apple. Its flagship store, located under a giant glass cube in the plaza, attracts hundreds of thousands of visitors a year. Today the skyscraper is associated more with mobile devices than with motor vehicles. Owned by a rival developer and Chinese and Brazilian interests, it is worth more than twice what Mr Macklowe paid for it a decade ago. Reflecting on his lost prize, the only thing he seems sure of is that "Business turns. Business always turns." ■



纽约地产

无关需要

通用汽车大厦的离奇故事

地产生意，用行话来说，是“一群人围成一圈，用左轮手枪互相指着头”。而且如维基·沃德（Vicky Ward）在书中所说，时常还是指着自己的头。她描绘了美国最抢手的办公大楼多彩的历史。这栋大楼是位于曼哈顿第五大道50层高的通用汽车大厦。

这座大厦于1960年代中期为通用汽车公司的老板们建造。那时的说法是，为通用好就是为美国好。这座白色大理石外立面的高楼从来不是纽约最高或最漂亮的摩天大厦，但它就是有些地方令地产大亨们疯狂。他们不择手段地追逐它，不惜铤而走险，一掷千金。一位显贵把这座大楼比作“你不停邀请去毕业舞会但总被拒绝的姑娘。你每问一次，她的要价就又高了一些。”

沃德的成名作是讲述雷曼兄弟衰亡的《魔鬼赌场》（The Devil's Casino）。在她嬉笑怒骂的笔触之下，傲慢而执迷不悟的各色人等在争夺通用汽车大厦的舞台上粉墨登场（尽管其场景中时常充斥着太多的人名和个人轶事）。其中包括：房地产界自我推销的大师唐纳德·特朗普（Donald Trump），他首次把租金推高到不可思议的每平方英尺100美元以上；令人生厌的奇葩金融家迪斯克·迪恩（Disque Deane），他曾拿瓶子砸别人的脑袋，和妻子在百慕大（Bermuda）离婚以避免她分走应得的那部分财产；“主妇大亨”塞西莉亚·拜纳塔（Cecilia Benattar），她醉心于商界交易，耽搁了六个月才给自己的第一个孩子起好名字。

你争我夺之际，他们有时背负巨债来获得这一锦标（地产界的另一句玩笑话是：先弄到5000块，才能去买5000万的大楼），这些大亨们孤注一掷，尔虞我诈，当然，还大打官司。在所有这些人当中，本地开发商哈里·麦克洛（Harry Macklowe）在财务上最为冒进，他在多年的尝试后于2003年以创纪录的14亿美元将这座大楼揽入怀中，但仅仅五年后就易手他

人，因为他做了一笔极其没脑子的交易，用大楼做抵押贷款收购了另外七座大厦。

麦克洛一个较明智的决定是和苹果签约。后者的旗舰店位于大厦广场上一个巨大的玻璃立方体之下，每年吸引着成千上万游客。如今这座摩天大楼更多地与移动设备而非汽车联系在一起。它现在由麦克洛的对头开发商以及中国和巴西的财团所有，价值相当于十年前他所付价钱的两倍多。反思他所失去的锦标，麦克洛似乎只能确定一件事情：“商场上，风水轮流转。风水总是轮流转。”■



Investing in railways

On the right track

Private investment in rolling stock is set to gather steam

AS AN asset class, railways have a worrying history. Railway mania in Britain in the 1840s left plenty of unwary investors nursing hefty losses; that episode sits in most lists of history's biggest speculative bubbles. But the prices of shares and bonds are dauntingly high, which has stoked interest in all manner of outlandish "alternative" assets in recent years. That, along with legal changes making it easier to repossess collateral that goes clickety-clack, may soon have investors funnelling cash into locomotives, carriages and goods wagons again.

Precious little private money is currently invested in rolling stock. That partly reflects the ownership of railways around the world, which are mainly in state hands. Around 87% of the €10.8 billion (\$14.4 billion) spent on locomotives and railway cars in Europe in 2011-13, for example, came from governments, according to a new study by Roland Berger, a consulting firm. This reliance on the public purse means that investment comes fitfully, if at all, arriving when it is available rather than when it is needed. Romania's state railway still operates 60-year-old steam trains.

The scarcity of public funds has hastened deregulation. The European Union's fourth package of railway reforms, for example, is designed to open all domestic rail markets to full competition by 2019. Operators should be keen. Passenger services tend to provide a steady income even when the local economy is derailed (freight is more likely to hit the buffers in a downturn). What is more, the public-private partnerships involved typically include a guaranteed return.

Deregulation should, in turn, encourage the growth of firms that lease

rolling stock to operators, according to Howard Rosen of the Rail Working Group, a non-profit organisation representing the rail industry. It was outfits of this sort that accelerated the expansion of budget flying in the 1990s, by sparing startup airlines the cost of buying new planes. A good number of banks and other institutions are ready to invest.

The hitch is that investors in rolling stock currently have little security over their assets. These are hard to identify and are designed to be moved across borders, from one legal jurisdiction to another. There is an international treaty called the Cape Town convention, which allows creditors to establish their interest in capital goods that cross borders, and repossess them if necessary—but it focuses mainly on aeroplanes. However, a new codicil to the treaty, which is now on the verge of ratification, seeks to institute a similar system for rolling stock. The addition will create a centralised record of serial numbers—something that exists for planes but not for bits of trains. This will reduce risks and costs for private investors.

So far the protocol has been ratified by the EU and awaits rubber-stamping by its member states. Other countries outside Europe are likely to sign up too. Indeed the opportunities may be even greater in Latin America and South-East Asia, where private cash is almost entirely absent but railways are needed more than ever. Another mania is unlikely, but the signal could be about to turn green for private capital. ■



投资铁路

走上正轨

对铁路车辆的私人投资势必高涨

作为资产的一类，铁路有令人担忧的历史。19世纪40年代英国的铁路狂潮让许多草率的投资者蒙受了巨大的损失，大部分罗列史上最大投机泡沫的榜单都将这一事件包含在内。但是，目前股票和债券的价格高得吓人，使得人们近年来对各种稀奇古怪的“另类”资产兴趣增加，加之法律的变化让那些咔哒咔哒开动的抵押品更易收回，因此可能很快就有投资者再度将现金投向机车、铁路客车和铁路货车。

目前鲜有私人资金投入于铁路车辆，部分原因是全球的铁路主要仍属国有。例如，咨询公司罗兰贝格（Roland Berger）的一项新研究表明，欧洲2011年至2013年在机车和轨道车辆上花费的108亿欧元（合144亿美元）中，约87%来自政府。这种对国库的依赖意味着投资时有时无，即便有，也是在有资金而非有需要时做出投资。罗马尼亚国家铁路上的蒸汽火车已经跑了60年。

公共资金的缺乏加快了放松监管的步伐。例如，欧盟第四期铁路改革的目标是到2019年放开所有国内铁路市场，启动全面竞争。运营商应当很感兴趣。即便本地经济脱轨，客运服务往往也能提供稳定的收入（货运在经济低迷时更易搁浅）。而且其中所涉及의公私合作关系通常包括回报保证。

霍华德·罗森（Howard Rosen）来自代表铁路行业的非营利组织“铁路工作组”（the Rail Working Group），他认为放松监管反过来应当会激励那些将铁路车辆租赁给运营商的公司的成长。20世纪90年代，正是这类机构为航空创业公司省下了购买新飞机的支出，从而加快了廉价航空业的扩张。很多银行和其他机构已准备投资。

问题是铁路车辆的投资者目前几乎无法确保资产的安全性。这些资产很难

识别，而且本身就是用于跨境转移，往返于一个又一个法定管辖地之间。有一项名为《开普敦公约》的国际条约允许债权人对跨越国境的资本货物确立权益，必要时可以收回资本货物，但这一公约主要针对航空器。不过目前即将批准该公约的一个附加条款，试图在铁路车辆方面建立类似的体系。此项附加条款将创建集中统一的序列号记录。飞机已经有类似的记录，但火车还没有。这一做法会降低私人投资者的风险和成本。

目前为止该协议已获欧盟批准，有待其成员国走完审批程序。欧洲以外的其他国家也可能签署。实际上，在拉丁美洲和东南亚或许有更大的机遇，因为私人资金在这里几乎完全不见踪影，但对铁路的需求比以往任何时候都大。不太可能爆发另一轮狂潮，但对私人资本而言，信号灯可能即将变绿。 ■



Travel visas

A strange sort of welcome

Governments are deterring business travellers and tourists with cumbersome visa requirements that do little to make their countries more secure

THE rise of big emerging economies like China and India, and the steady march of globalisation, have led to a surge in the numbers of people wanting to travel abroad for business or tourism. As a result, demand for visas is at unprecedented levels. In the fiscal year to the end of September 2014 the United States granted just under 10m visas—up from around 6m in 1997, despite blips in the wake of the terrorist attacks of September 11th 2001 and the global financial crisis of 2007-08 (see chart 1).

Citizens of America, Britain and some other rich countries can travel to most places without a visa. Chinese and Indian travellers are far more likely to have to apply for them. And citizens of a few benighted places, such as Iraq and Afghanistan, have to submit to the cost and bureaucracy—and often the humiliation—of the visa-application process to get to most places (see chart 2).

The most sensible response to this surge in demand for short-term visas would be for governments to streamline the application process and scrap the most onerous requirements. But governments are often not sensible about such things. The 26 European countries with a common visa policy—the “Schengen group”—require tourists from India and other developing countries to provide several months’ worth of bank statements and pay slips. Visitors to Britain often have to fill in a ten-page application form, including details of every trip abroad for the past ten years. Business travellers to India must provide two references. Mexico has scrapped a rule requiring visa applicants (including women) to submit a description of their moustaches. But in 2016 America will start requiring visas for some

travellers who currently do not need them—if, for example, they have visited Iran, Iraq, Syria or Sudan in the previous five years.

In many cases, instead of simplifying the visa process, governments have offloaded it to private contractors. Travellers may now have to pay a service fee to the company handling their application on top of the standard visa fee. The biggest firm in this growing business is VFS Global, which is part of Kuoni, a Swiss tourism company. Starting from a single premises in Mumbai in 2001, handling applications for American visas, VFS now has more than 1,900 visa centres in 124 countries, processing paperwork for 48 governments.

Of the 113m visa applications made worldwide in 2013, one in three went through a contractor, reckons VFS, which has about half the market. Its main rivals are CSC, with around 10% of the market, and TLScontact, with around 7%. Dozens of smaller firms make up the remainder of the market. The private contractors collect and verify the applicant's paperwork, ensure that forms are filled in properly, take fingerprints and other biometric information and collect the fees. The consular staff of the destination country simply decide whether to grant the visa, and slap a sticker in the passport of successful applicants.

For the contractors, it is a nice little earner. VFS probably enjoys operating margins of 20%, reckons Kathleen Gailliot, an analyst at Natixis, a French bank. The companies are given a free hand to pad their earnings with pricey “premium” services. In Mumbai, for example, VFS offers Indians applying for British visas a text on their mobile phones to notify them that their passports are ready for collection, at 128 rupees (\$2) a shot. For an extra 2,548 rupees, applicants can use a special “lounge” area while submitting their documents, and have their passports posted back to them.

VFS accounts for just 5% of Kuoni's revenues but more than 60% of its

operating profits. So bright are the division's prospects that its parent company is getting out of the tour-operator business, which it has been in since 1906, to concentrate on visa-processing and a few other specialist travel services.

Until VFS opened its Mumbai office, applicants had to queue for an average of five hours in the sweltering heat outside the American consulate. After the job was handed to the contractor, the typical waiting time fell to one hour. However, applicants still have no choice but to submit to whatever petty demands contractors make—such as, say, banning them from using mobile phones while they sit waiting for their appointments. If the staff are rude, the queues are badly managed or the “extras” extravagantly priced, travellers can hardly take their business elsewhere.

The application-processing firms are profiting both from travellers' lack of choice and from governments' failure to consider the economic damage caused by their visa requirements. There is scant evidence that making all travellers submit the same documents every time they want to travel, or provide extensive financial details, protects countries from terrorists or illegal immigrants. In contrast, there is evidence of how liberal visa regimes bring in the bucks. A report in 2014 from the European Parliament, “A Smarter Visa Policy for Economic Growth”, estimated that over-strict visa rules probably cost the EU economy 250,000 jobs and €12.6 billion (\$13.8 billion) a year in lost output. It recommended requiring fewer documents from applicants, handing out longer visas and simplifying the whole process.

Since Britain is not part of the Schengen group, Chinese people taking a tour of Europe have to apply for a second visa to cross the Channel. Only 6% of them do so, says Euromonitor, a research firm. The British Tourist Authority has complained that the country's visa policies cost it £2.8 billion (\$4.1 billion) a year in lost revenue.

However, amid worries about the wave of asylum-seekers from Syria and elsewhere, governments in Europe and beyond will face pressure to keep making life hard for tourists and business travellers—even as other departments of those same governments spend heavily on promoting tourism and foreign investment. ■



旅行签证

奇怪的欢迎方式

多国政府正以繁琐的签证要求阻挡商务旅行者和观光客，而这对维护国家安全作用甚微

中国和印度等大型新兴经济体的崛起，加上全球化的稳步迈进，使得想出国商务旅行或观光旅游的人数激增。因此，对签证的需求达到了前所未有的水平。截至2014年9月底的财政年度里，美国颁发了接近1000万份签证。签证数量从1997年的约600万份起逐渐增加，仅在2001年911恐怖袭击和2007至2008年全球金融危机之后有所波动（见图表1）。

美国、英国和其他一些富裕国家的公民无需签证即可到世界上大部分地区旅行。中国和印度的旅行者需要申请签证的几率要大得多。而少数几个落后国家如伊拉克和阿富汗等国的公民想去大部分地方都不得不忍受签证申请的高成本和繁缛流程，还时常被羞辱（见图表2）。

短期签证的需求激增，最明智的应对应当是政府简化申请程序，废除最繁重的要求。但是各国政府在这方面往往不那么明智。拥有统一签证政策的26个欧洲国家，即“申根国”，要求来自印度和其他发展中国家的旅行者提供数月的银行对账单和工资单。去英国旅行的人通常得填写十页的申请表，包括过去十年每次出国旅行的详细情况。去印度的商务旅行者必须提供两份推荐信。墨西哥已经废除了一条规定，要求签证申请人（包括女性）提交关于其胡须的描述。但2016年美国将开始要求一些目前无需签证的旅行者申请签证，例如，那些在过去五年内到访过伊朗、伊拉克、叙利亚或苏丹的人。

很多时候，政府并未简化签证流程，而是把它转交给私营承包机构。现在，除了标准的签证费，旅行者可能还需要向处理申请的公司支付一笔服务费。在这个不断增长的行业中，最大的公司是VFS Global，它是瑞士旅游公司瑞士旅业集团（Kuoni）的子公司。2001年VFS从位于孟买的一个单一办理机构起家，处理美国签证申请，现在它在124个国家设有1900多

个签证中心，为48个政府处理签证材料。

据VFS估算，2013年全球1.13亿份签证申请中，有三分之一通过承包商处理，其中VFS占有一半市场。它主要的对手是约占10%市场份额的CSC和约占7%市场的TLScontact。几十家较小的公司瓜分了剩下的市场。私营承包机构收集并验证申请者的文件，确保表格正确填写，采集指纹和其他生物特征信息，并且收取费用。目的地国领事馆的工作人员只决定是否颁发签证，并在申请成功者的护照上贴上贴纸。

对于承包机构来说，这门生意很好赚。法国外贸银行（Natixis）的分析师凯特琳·加耶里奥（Kathleen Gailliot）估算，VFS很可能享有20%的毛利率。这些公司已被赋予自主权，通过昂贵的“高级”服务来增加收入。例如，在孟买，VFS向申请英国签证的印度人提供发送短信到手机的服务，通知他们护照已经可取，收费为128卢比（2美元）一单。另加2548卢比，申请人在提交文件时可以使用特别的“休息区”，办好的护照也可以寄回给他们。

VFS仅占瑞士旅业集团收入的5%，但占其营业利润的60%还多。这一部门的前景非常光明，因此母公司正逐步脱离自1906年起就开始运营的旅行社业务，专注于签证办理和其他几项专业旅行服务。

VFS在孟买开设分公司之前，申请人要顶着酷暑在美国领事馆外排平均五个小时的队。这项工作转交承包机构之后，一般的等候时间减至一小时。但是，申请人除了接受承包机构的各项要求之外仍然别无选择，无论这些要求多么琐碎，例如，不准在等待面谈时使用手机。即便工作人员粗鲁无礼，队伍排得乱七八糟，或者“额外费用”高昂，旅行者也难有其他选择。

签证申请处理公司从两个方面获利：一是旅行者缺乏选择，二是政府没能考虑到签证要求造成的经济损失。鲜有证据能证明，让所有旅行者每次想旅行时都提交同样的文件，或是提供大量的财务信息，就能保护国家免受恐怖分子或非法移民的侵害。相反，倒是有证据显示自由的签证制度能带

来何等利益。2014年欧洲议会一份名为“促进经济增长的更明智签证政策”的报告估算，过于严格的签证规定可能让欧盟经济每年损失25万个工作岗位，产出损失达126亿欧元（138亿美元）。报告建议减少要求申请者提交的文件，颁发更长期的签证，并且简化整个流程。

因为英国并不是申根国，去欧洲旅游的中国人要穿越英吉利海峡就不得不再申请一个签证。研究公司欧睿（Euromonitor）称仅有6%的人这么做。英国旅游局曾经抱怨英国的签证政策让该国每年损失28亿英镑（41亿美元）的收入。

不过，由于担心来自叙利亚和其他地区的难民蜂拥而至，欧洲和欧洲以外的各国政府将面临压力，商务旅行者和观光客的日子仍然不会好过，尽管这些政府的其他部门在花大钱促进旅游业和外国投资。 ■



Natural gas

Step on it

It will take time, but a fragmented market is on the verge of going global

THE Singapore Sling is a cocktail with such a variety of ingredients that few ever taste exactly alike. So it may seem an odd name to apply to a contract to help standardise the global trade in gas. That has not deterred the Singapore Exchange, a market for stocks, bonds and derivatives. Last year, as part of the city-state's push to become a global trading hub for liquefied natural gas (LNG), it developed the slightly laboured SLInG, a spot-price index for Asian LNG. On January 25th it complemented this with a derivatives contract. There is a long way to go though. As yet the spot market accounts for only about 5% of volumes traded in Asia, executives say.

Instead, the international gas market is dominated by long-term contracts linked to the price of oil, both for gas delivered via pipeline and as LNG. This is an anomaly that dates back to the 1960s, when European suppliers developing their first gasfields had no price on which to base long-term contracts, so used oil instead. Since then, supply and demand for these commodities have diverged; oil indexation increasingly fails to reflect the disparities.

Analysts believe that, as a result, the pricing mechanism for natural gas is on the verge of change, and that a real global market will start to emerge, adding Asian trading hubs to those in America and Europe. This should spur the spread of natural gas, the cleanest fossil fuel and one that should be in the vanguard of the battle against global warming. But producers, who fear any change will lead to a drop in prices, are set to resist. They say long-term oil-linked contracts are still needed to offset the risk of their huge investments in LNG. (Gazprom, a Russian producer, has made the same

argument in Europe about pipelines.)

Long-term and cyclical shifts explain why the gap between the two fossil fuels has widened. The LNG trade has grown massively in the past decade (see map). Daniel Lunt of the Singapore Exchange says LNG now rivals iron ore as the world's second-biggest traded commodity, after oil. In the past 40 years natural gas's share of the energy mix has grown from 16% to more than 21%. Oil's has shrunk. Gas generates 22% of the world's electricity; oil only 4%. It might make more sense to tie the price of natural gas to coal, against which it competes as a power source.

Moreover, during the current decade, the outlook for gas prices has become even more bearish than for oil. Sanford C. Bernstein, a research firm, reckons global LNG supply will increase by about a third over the next three years, pushing overcapacity to about 10%. (There is far less spare capacity in the oil market.) At least \$130 billion of this investment in supply is in Australia, which within a few years will overtake Qatar as the world's largest LNG producer. America will also add to the surplus. Its first, much-delayed LNG exports are due to be shipped from the Gulf Coast in weeks.

Investment in the liquefaction trains, tankers, regasification terminals and other paraphernalia needed to ship natural gas was boosted by a surge in demand from Asia. Japan and South Korea scrambled for LNG after Japan's Fukushima disaster in 2011 forced them to shut down nuclear reactors. China saw LNG as a way to diversify its energy sources and curb pollution from coal. Last year, however, those countries, which account for more than half of global LNG consumption, unexpectedly slammed on the brakes.

The subsequent supply glut means that the spot price of gas in Asia has plunged. Those buyers who took out long-term oil-indexed contracts when crude was much higher are suffering. Mel Ydreos of the International Gas

Union, an industry body, says that Chinese firms saddled with such contracts are urging suppliers to renegotiate them. He notes that a Qatari company recently agreed to renegotiate a long-term contract with an Indian buyer, cutting the price by half.

The drop in Asian prices has brought the cost of natural gas traded in different parts of the world closer to each other. America is an outlier. Thanks to the vast supplies unleashed by the shale revolution, its Henry Hub benchmark is by far the world's cheapest, at just over \$2 per million British thermal units (MBTU). But add liquefaction and transport costs, and American LNG prices rise above \$4 per MBTU. In Europe and Asia they are a dollar or two higher. A few years ago the range would have been much wider, from \$5 at Henry Hub to \$19 in Asia. More homogenous prices are an important step towards a globalised market, says Trevor Sikorski of Energy Aspects, a consultancy.

But to get there several more hurdles must be overcome. First, traded markets must become deeper, with a mix of piped gas and LNG, to provide more reliable prices. Asia, in particular, lacks infrastructure and international interconnections. Second, derivatives markets are needed to allow producers to hedge against price swings when investing in expensive new capacity. Third, end-users need deregulated energy markets to encourage competition for the best sources of supply. These, too, are scarce in Asia. Japan is only just starting to free its electricity and gas markets. (In the meantime the likely flood of American LNG into Asia may make Henry Hub a useful reference price.)

The strongest impetus for reform may be the fear of what happens without it. Few expect the overcapacity in oil markets to last much more than a year or two, after which prices of crude may spike. Yet the glut in the LNG market could last into the 2020s, in which case the disparity between spot and oil-indexed prices could balloon and buyers would rebel.

Other commodities have gone through similar upheavals when spot prices diverged from long-term contracts. The system of “posted prices” for oil fell apart in the 1970s. The spot iron-ore market got a boost as a result of the collapse in demand during the 2008-09 financial crisis.

Producers and consumers appear to be lining up for battle. On January 27th shareholders of Royal Dutch Shell, an Anglo-Dutch oil major, gave their approval to the \$35 billion purchase of BG (formerly British Gas). The deal will create the undisputed world leader in LNG. On the other side, TEPCO and Chubu Electric, two Japanese utilities, have teamed up to create the world’s biggest LNG buyer, to demand better terms from suppliers, including spot contracts. It will be a long, hard fight. But the days of oil-linked contracts seem to be numbered. ■



天然气

加快速度

尽管过程会耗费时日，但一个支离破碎的市场正迈向全球化

新加坡司令鸡尾酒的成分多种多样，几乎没有两杯酒的味道完全相同。所以，用它来命名一种旨在帮助全球天然气交易标准化的合约，或许有些奇怪。这并没有阻止从事股票、债券和衍生品交易的新加坡交易所这样做。去年，作为新加坡努力跻身全球液化天然气（LNG）交易中心的举措之一，新交所开发了这个有点拗口的“司令”（SLInG），即一种亚洲LNG现货价格的指数。1月25日，新交所用一种衍生品合约对这一指数做了补充。不过，未来还有很长的路要走。新交所的高层表示，到目前为止，现货市场仅占亚洲（LNG）交易量的5%左右。

事实上，与石油价格挂钩的长期合约主导了国际天然气市场，包括管道运输的天然气和LNG。这个异常现象可以追溯到上世纪60年代，当时，欧洲供应商正在开发他们的首批气田，为长期合约定价时没有依据，因而用石油来定价。其后，这些大宗商品的供求出现了差异，与油价挂钩的定价机制越来越不能反映个中的差异。

分析师认为，其结果是天然气的定价机制正处在变革的边缘，一个真正的全球市场即将出现，在美国和欧洲的交易中心之外还会增加亚洲的中心。这应该会加速天然气的推广，这种最清洁的化石燃料理应走在对抗全球变暖的最前沿。但是，生产商们担心任何变化都将导致价格下滑，因而注定将会抵制。它们表示，依然需要与油价挂钩的长期合约来抵消它们在LNG上投入巨资的风险。（生产商俄罗斯天然气工业股份公司 [Gazprom] 对于欧洲的管道天然气也提出过相同的观点。）

长期和周期性的变化解释了这两种化石燃料之间差距扩大的原因。过去十年中，LNG的交易已有大幅增长（见地图）。新交所的丹尼尔·伦特（Daniel Lunt）表示，LNG现在与铁矿不相上下，在世界大宗商品交易中排名第二，仅次于石油。在过去40年中，天然气在能源构成中的份额已从

16%上升到21%，而石油的份额则在减少。天然气发电占全球的22%，石油只有4%。把天然气价格同煤炭价格挂钩或许更有意义，它们作为电力来源互相竞争。

此外，到2020年，天然气价格的前景甚至比石油更为悲观。研究公司盛博（Sanford C. Bernstein）认为，全球的LNG供应未来三年内将增加大约三分之一，把过剩产能推高到10%左右。（石油市场的闲置产能则要少得多。）至少1300亿美元供应方面的投资发生在澳大利亚，它将在几年内取代卡塔尔成为全球最大的LNG生产国。美国也将为供应过剩增添一把火，其首度出口的LNG延迟已久，预计将于几周内从墨西哥湾沿岸运出。

亚洲的需求激增，这促进了对天然气运输所需的天然气厂内液化净化设施、液化气运输船、再气化终端和其他配套设备的投资。2011年日本福岛核灾难迫使日本和韩国关闭了核反应堆，其后两国竞相争夺LNG。中国视LNG为能源多样化、遏制燃煤污染的一种方式。但在去年，这些占全球LNG消费量一半以上的国家出乎意料地踩了急刹车。

随后的供过于求令亚洲的天然气现货价格暴跌。那些在原油价格高企时买入与油价挂钩的长期合约买家正在蒙受损失。行业机构国际天然气联盟（International Gas Union）的梅尔·伊德瑞罗尔斯（Mel Ydreos）表示，持有这些合约的中国企业正在敦促供应商重新协商。他指出，一家卡塔尔公司最近同意与印度的一个买家重新协商一份长期合约，将价格削减了一半。

亚洲价格下跌使世界各地天然气交易的成本更为接近。美国是一个特例。由于页岩革命释放了大量供应，美国亨利中心（Henry Hub）的基准价格无疑是世界上最便宜的，每百万英热单位（MBTU）略高于2美元。不过，加上液化和运输的成本，美国的LNG价格为每百万英热单位超过4美元。欧洲和亚洲的价格高一到两美元。几年前的差异则要大得多，从亨利中心的5美元到亚洲的19美元。咨询公司Energy Aspects的特雷弗·西科尔斯基（Trevor Sikorski）表示，价格更加均一是迈向全球化市场的重要步骤。

但是，要实现这个目标必须克服几个障碍。首先，可交易的市场必须更加深入，结合管道天然气和LNG以提供更可靠的价格。亚洲尤其缺乏基础设施和国际互联。其次，需要衍生品市场，让生产商在投资昂贵的新增产能时可以对冲价格的波动。第三，终端用户需要一个不受管制的市场来促进竞争，寻求最好的供应来源。这些在亚洲也很罕见。日本刚刚才开始放开电力和天然气市场。（同时，美国的LNG可能大量涌入亚洲，这或许会让亨利中心价格成为有用的参考价格。）

改革最强的推动力也许源于对不改革的后果的畏惧。很少人预期石油市场的产能过剩会持续超过一两年，那之后原油价格可能会飚升。然而，LNG市场的供应过剩可能会持续到本世纪20年代，在这种情况下，LNG的现货价与油价挂钩价之间的差异可能激增，买家会反抗。

当现货价格偏离长期合约价格时，其他大宗商品也经历过类似的震荡。石油的“标价”制度在上世纪70年代分崩离析。在2008年至2009年的金融危机中，由于对铁矿石的需求锐减，其现货市场得到了提振。

生产商和消费者似乎正在各自联合备战。1月27日，英荷石油巨头荷兰皇家壳牌（Royal Dutch Shell）的股东同意以350亿美元收购BG（原英国天然气）。这笔交易将在LNG领域缔造一家毫无争议的世界领先企业。另一方面，两家日本电力公司东京电力（TEPCO）和中部电力（Chubu Electric）联手打造了世界上最大的天然气买家，以要求供应商提供包括现货合约在内更优惠的条件。这将是一场长期而艰苦的斗争。然而，合约与油价挂钩的日子似乎已屈指可数了。■



Foreign students

Train 'em up. Kick 'em out

Shrewd governments welcome foreign students. Stupid ones block and expel them

YOUNGSTERS have long crossed borders in search of an education. More than 2,000 years ago the Roman poet Horace went to Athens to join Plato's Academy. Oxford University admitted its first known international student, Emo of Friesland, in 1190. Today more than 4.5m students are enrolled in colleges and universities outside their own countries. Their fees subsidise local students. Their ideas broaden and enliven classroom debate. Most go home with happy memories and valuable contacts, making them more likely in later life to do business with the country where they studied. Those who stay on use what they have learned to make themselves and their hosts wealthier, by finding work as doctors, engineers or in some other skilled career.

Immigration policy is hard: Europe is tying itself in knots over how many Syrian refugees to admit. But the question of whether to welcome foreign students ought to be much easier. They more than pay their way. They add to the host country's collective brainpower. And they are easy to assimilate. Indeed, for ageing rich countries seeking to import young workers to plug skills gaps and prop up wobbly pension systems, they are ideal. A foreign graduate from a local university is likely to be well-qualified, fluent in the local lingo and at ease with local customs. Countries should be vying to attract such people.

Places with the good fortune to speak English have a gigantic head start. Australia is the leader: a quarter of its tertiary students come from abroad, a bigger share than in any other country. Education is now its biggest export, after natural resources. For a while the influx of brainy foreigners was slowed by an overvalued currency and the reputational damage from the

collapse of some badly run private colleges. But recently the Australian dollar has weakened, degree mills have been shut down, visa rules have been relaxed—and foreign students have flooded back. Last year their numbers rose by 10%.

Canada, until recently an also-ran, now emulates Oz. In 2014 it set a goal of almost doubling the number of foreign students by 2022. It has streamlined visa applications and given international students the right to stay and work for up to three years after graduating. Those who want to make Canada their home have a good chance of being granted permanent residence. Its share of the market for footloose students is growing, and numbers have more than doubled in a decade.

America, by contrast, is horribly complacent. In absolute terms, it attracts the most foreign students, thanks to its size, its outstanding universities and the lure of Silicon Valley and other brainworking hotspots. But it punches far below its weight: only 5% of the students on its campuses are foreign. Its visa rules are needlessly strict and stress keeping out terrorists rather than wooing talent. It is hard for students to work, either part-time while studying or for a year or two after graduation. The government wants to extend a scheme that allows those with science and technology qualifications to stay for up to 29 months after graduating. But unions oppose it, claiming that foreign students undercut their members' wages. One that represents high-tech workers in Washington state has filed a court challenge, seeking to have the scheme axed.

| *The self-harming state*

Britain is even more reckless. It, too, has the huge advantages of famous universities and the English language. But its government has pledged to reduce net immigration to 100,000 people a year, and to this end it is squeezing students. Applying for a student visa has grown slower and costlier. Working part-time to pay fees is harder. And foreign students no

longer have the right to stay and work for two years after graduation. Britain's universities are losing market share: their foreign enrolments are flat even as their main rivals' are growing strongly.

Sajid Javid, Britain's business secretary, says the aim is to "break the link" between studying and immigration. This is precisely the wrong approach. For a country that wants to recruit talented, productive immigrants, it is hard to think of a better sifting process than a university education. Welcoming foreign students is a policy that costs less than nothing in the short term and brings huge rewards in the long term. Hence the bafflement of James Dyson, a billionaire inventor, who summed up Britain's policy thus: "Train 'em up. Kick 'em out. It's a bit shortsighted, isn't it?" ■



留学生

培养他们成才。赶他们出门

精明的政府欢迎留学生，愚蠢的政府限制并驱逐他们

长期以来，年轻人一直在出国求学。2000多年前，罗马诗人贺拉斯（Horace）到雅典入读柏拉图学园。1190年，牛津大学接收了第一位有记录的国际学生，来自荷兰弗里斯兰省（Friesland）的埃莫（Emo）。今天，超过450万名学生在国外的高等院校就读。他们缴纳的学费补贴了本国学生。他们的想法拓展并活跃了课堂讨论。大多数留学生带着美好的回忆和有价值的人脉关系回国，这使他们以后更有可能和自己曾经留学的国家有生意往来。那些毕业后留下来的学生则成为医生、工程师或其他专业人才，一展所学，为自己也为居留国创造财富。

移民政策难以制定，比如欧洲正在纠结该接受多少叙利亚难民入境。但是否该欢迎留学生的问題理应简单得多。留学生不仅自己承担费用，还会提高所在国的整体脑力水平。留学生还易于同化。实际上，老龄化的富裕国家需要输入年轻劳动力来填补技能缺口并支撑不稳定的养老体系，对它们而言，留学生是理想之选。从本地大学毕业的外国学生一般素质良好，能讲流利的本地语言，且适应本地风俗。各国应该争先恐后地吸引这样的人才。

有幸说英语的国家在这方面占有巨大先机。澳大利亚一马当先：其四分之一的大学生来自海外，这一比例高于其他任何国家。教育位列自然资源之后，成为澳大利亚第二大出口产业。过去有段时间，由于澳元升值以及一些管理不佳的私立学院垮台造成了声誉损害，聪明的外国学生流入有所放缓。但最近，澳元下跌、文凭工厂被关闭、签证政策放宽，外国学生已在回流。去年，留学生的数量增加了10%。

不久前还是落后者的加拿大正在效仿澳大利亚。2014年，该国定下目标，到2022年要使留学生数量增加近一倍。它简化签证手续，让国际学生毕业后可以居留或工作最多三年。那些想移民加拿大的学生大有机会获得永久

居留权。加拿大在自由选择的学生中的市场份额正在提高，并且数字在过去十年里翻了一番还多。

相比之下，美国极为自满。按绝对数量计算，它吸引了最多的留学生，这得益于其体量、杰出的大学和硅谷及其他脑力劳动热点地区的吸引力。但相对于美国的教学规模，这一数量远远不够：仅5%的美国大学生来自海外。它的签证政策无谓地收紧，更强调把恐怖分子拒之门外而非招揽人才。留学生在美国难以打工，无论是就学期间兼职还是毕业后工作一到两年。政府想要扩大允许理工科学生毕业后最多可居留29个月的方案。但工会反对，宣称外国学生令会员的工资缩水。一个代表华盛顿州高新技术工人的工会组织已经提起上诉，要求砍掉这一方案。

| 自损之国

英国甚至更为轻率。在著名大学和英语方面，它同样有着巨大的优势。但是英国政府已经承诺要把净移民人数减少至每年10万人，为此正在压缩留学生人数。申请英国学生签证已经变得更为缓慢和昂贵，要做兼职来支付学费也更困难。外国学生还不再享有在毕业后居留和工作两年的权利。英国的大学正在丢失市场份额：它们的海外入学人数保持平稳，而此时主要竞争对手的招生数量增长强劲。

英国商务大臣萨伊德·贾维德（Sajid Javid）说，政府的目标是在学习和移民中间“切断关联”。这实在是错误之举。对一个想要招揽高产移民人才的国家而言，很难想得到一个比大学教育更好的筛选方法。欢迎留学生的政策在短期几无成本，而在长期则回报丰厚。亿万富翁发明家詹姆斯·戴森（James Dyson）因此感到困惑，他对英国的政策总结道：“培养他们成才，再赶他们出门。这有点短视了，不是吗？”■



Animal behaviour and missile design

Hawker hunters

The American air force is sponsoring zoologists at Oxford

FALCONRY is less fashionable now than it was in days of yore. But, over the past few years, sharp-eyed rambblers in south Wales may have witnessed an updated version of this ancient pastime. Since 2012, in a project sponsored by the United States Air Force, Caroline Brighton and Graham Taylor of Oxford University have been flying peregrine falcons (see picture) and Harris's hawks over the Black Mountains of Monmouthshire to study how these birds chase their prey. Ms Brighton hopes to gain a doctorate from the research. The USAF hopes the birds may be able to teach it a trick or two about intercepting targets, both in the air (the speciality of peregrines) and on the ground (the speciality of Harris's hawks).

To carry out their research, Ms Brighton and Dr Taylor turned to the technology of wildlife documentaries. They attached miniature cameras and satellite trackers to harnesses worn by their birds. Then they put the birds through a series of tests. These included attacking a dead pheasant on the ground, chasing a dead chick that was dragged along the ground and through a series of tunnels by a winch and cable, and catching a dead chick dropped at altitude from a radio-controlled model aircraft. They fed the images they had recorded into a computer, which worked out the trajectory taken by the bird to intercept its prey.

Their first discovery was that, rather than hunting in the way previous research had suggested—namely, holding the prey at a constant angle while they moved in to intercept it—the birds followed a rule, known as proportional navigation, currently used by many missile-guidance systems. Unlike constant-angle tracking, this requires constant recalculation of speed and bearing, and is considered a hard trick.

What really intrigued the researchers' air-force paymasters, though, was a peregrine's responses if a live pheasant or duck turned up during a test. Then, the bird instantly lost interest in the lure and chased its new quarry using a tracking technique, dubbed optimal guidance, that is fitted only to the most advanced sorts of missiles. Optimal guidance employs optimal-control theory, a branch of maths also used in things like inventory control for manufacturing processes. That has led the air force's experts to hope birds of prey may have other techniques to show off, perhaps including ones that human missile engineers have not yet thought of. ■



动物行为和导弹设计

猎鹰式战机

美国空军正在资助牛津大学的动物学家

驯鹰已经不像很久以前那么流行了。但过去几年，在英国的南威尔士，眼尖的漫步者可能已经目睹了这种古老消遣方式的新版本。2012年以来，在美国空军资助的一个项目中，牛津大学的卡罗琳·布莱顿（Caroline Brighton）和格雷汉姆·泰勒（Graham Taylor）在蒙茅斯郡的黑山山脉上放飞隼（见图）和栗翅鹰来研究这些鸟类如何追逐猎物。布莱顿希望凭借这项研究取得博士学位。美国空军则希望这些鸟儿或许能够教给他们一两个拦截目标的技巧，包括在高空（隼的特长）和在地面（栗翅鹰的特长）。

布莱顿和泰勒博士借用摄制野生动物纪录片的方式开展研究。他们把微型相机和卫星跟踪器绑在鸟佩戴的外出绳上，然后让它们经过一系列测试，包括攻击地上一只死掉的雉鸡、追逐一只死去的小鸡（研究人员用绞盘和缆绳在地面拖着这只小鸡经过一连串隧道）、捕捉无线电遥控模型飞机从高空抛下的一只小鸡。研究人员把录下来的影像输入电脑，描绘出这些鸟拦截猎物行经的路线。

他们的第一项发现是，这些鸟并不是用先前研究所显示的方式捕猎——让自己和猎物保持在一个恒定的角度，靠近并拦截——而是用一种名为比例导引的法则。这种技术目前被运用于许多导弹制导系统中。和恒定角度追踪不同，它需要不断重新计算速度和方位，被认为是一种高难度技巧。

不过，让空军出资方真正感兴趣的是当测试中出现活的雉鸡或鸭子时隼的反应。隼立刻对先前的诱饵失去了兴趣，开始追逐新猎物。这时它使用的是一种被称为最优制导的追踪技术，这种技术只装配在最先进的那类导弹中。最优制导运用了最佳控制理论，这一数学分支也被应用于制造业的库存控制等领域。这让空军专家们希望猛禽还有其他的招数可展示，其中也许有人类导弹工程师尚未想到的技能。 ■



Corporate tax

Going after Google

Britain's tax men struck a poor deal. But the real problem lies with flawed international corporate-tax rules

IT WAS meant to win plaudits for clawing more money out of cunning, tax-shy multinationals. Instead, a deal between Google and the British government, in which the tech giant will pay £130m (\$185m) in back taxes covering a ten-year period, has attracted only opprobrium.

Critics at home and abroad argue that Google has got off lightly. On the European mainland, for example, suspected corporate tax-dodgers face raids and whopping demands: France wants €500m (\$550m) or more from Google. Apple could be on the hook for \$8 billion if the European Commission, which is investigating its Irish operations, concludes that it got a cushy deal from the Emerald Isle. Britain may well have been too generous to Google. But the bigger problem with the deal is what it says about international efforts to crack down on corporate-tax avoidance.

| *Nineteen for me, one for you*

Corporate taxes are a poor way to raise revenue. Since the burden is ultimately borne by people, whether investors, workers or consumers, it would, in theory, be more efficient to tax them directly. But abolishing corporate levies would create its own problems. In poor countries with large informal sectors, big companies are a rare source of reliable tax revenue. In rich countries, wealthy people would doubtless turn themselves into companies to avoid income taxes. For policymakers, therefore, the priority is to make corporate taxes less distorting and less easy to avoid.

The rules governing the taxation of multinationals are a threadbare

patchwork of national laws and bilateral treaties, dating back almost a century and designed for an age of manufacturing, not multimedia. They grow ever more gameable with the spread of e-commerce and companies' increasing reliance on intangible intellectual property (IP). Technology and drug firms, for instance, routinely move their IP to subsidiaries in tax havens, which can then manipulate the fees they charge other parts of the group for access to it in order to suck their profits into the lower-tax country.

These manoeuvres may be legal, but their goal is tax avoidance, often in a way that flouts the spirit of the law. In an era of austerity, that offends the public mood, which is why governments around the world are being pressed to implement dozens of anti-avoidance measures proposed last year by the OECD, a club of mainly rich countries. Many of these measures make sense. They seek to tie tax more closely to economic activity and also to limit some arcane but hugely profitable tricks, such as using internal loans to claim tax deductions. Progress at the OECD is spurring action: indeed, as part of its deal with British tax authorities, Google has agreed to pay tax in future on a chunk of its sales to British advertisers.

The problem is that the OECD approach maintains a damaging fiction which is ingrained in the current system: that a multinational can be seen as a cluster of separate companies to be treated as if they are trading with each other at arm's length. The "transfer pricing" rules that police this system are complex and flawed. Keeping this approach, but toughening up the policing, means creating yet more rules—and loopholes.

Better to think of each firm as a single entity. Then countries could either agree to share the tax on companies' worldwide profits according to a formula that takes account of their sales, employees, assets and so on; or allow the entire worldwide profits to be taxed by the home country, with a tax-credit mechanism for countries where the work actually goes on or

revenue is earned—but, crucially, not brass-plate jurisdictions—in order to avoid double taxation. In both cases, the incentives and opportunities to move profits into tax havens would be greatly reduced.

Instead of this unitary approach, however, the patchwork persists, and with it the likelihood of unco-ordinated national tax policies. This is the context in which Google and the British government forged their deal. The bill presented to the company looks from the outside like a sweetheart deal, but it is impossible to be sure because you cannot know how it was calculated. This lack of transparency will do nothing to increase public confidence that tax avoidance is being curbed. Nor, in the long run, will the Google approach help multinationals. If a lot of countries go their own way, at their own pace, the result could be tax chaos, a bloody battle over countries' taxing rights in which overlapping claims cause the pendulum to swing back from under- to over-taxation.

Tax diplomacy, like politics, is the art of the possible. But failing to push harder for a radical overhaul, at a time when the planets were aligned for change, looks like a costly mistake. ■



公司税

追查谷歌

英国税收人员达成了一项可怜的协议。但真正的问题在于存在缺陷的国际公司税收规则

原本是想从狡猾多端、精于避税的跨国公司那儿多挖出些钱来，博个满堂彩，结果，英国政府和谷歌达成的协议只招来一片骂声。根据这项协议，科技巨头谷歌将补交过去十年拖欠的税款共计1.3亿英镑（1.85亿美元）。

国内外批评人士认为这便宜了谷歌。例如在欧洲大陆，被疑逃税的公司面临突击检查和繁多要求：法国想从谷歌那里征收5亿欧元（5.5亿美元）甚至更多。欧盟委员会正在调查评估苹果在爱尔兰的业务，一旦得出该公司在这个翡翠岛获得轻松交易的结论，苹果可能要为此缴纳80亿美元。英国对谷歌可能太过大方，但是这一协议更大的问题在于它所彰显的打击公司避税的国际行动。

| 给我十九你留一

公司税是增加税收的拙劣手段。既然最终这一负担是由人来承受，无论是投资者、员工还是消费者，理论上说直接从他们那里征税会更高效。然而废除公司税会产生它自己的问题。在拥有庞大非正规产业的贫穷国家，大公司是可靠税收的稀缺来源。在富裕国家，富人无疑会成立公司来避免所得税。因此对于政策制定者来说，重要的是让公司税不那么扭曲，也不那么容易逃避。

管理跨国公司税收的法规由各国法律与双边条约陈腐地拼凑而成，可追溯到近一百年前，是为制造业时代而非多媒体时代所设计。随着电子商务的普及，以及企业越来越依赖于无形的知识产权，这些法规变得越来越可被操控。比如，技术公司和制药公司通常将它们的知识产权转移到设在避税天堂的子公司，然后再操纵它们向集团其他部门收取知识产权的使用费，从而将这些部门的利润吸纳到低税收国家。

这些手段可能是合法的，但目的是避税，而且通常以一种藐视法律精神的方式展开。在经济紧缩的时代，这触犯了民意，因此各国政府迫于压力，不得不执行去年由富裕国家俱乐部经合组织提出的数十条反逃税措施。这些措施中很多合情合理，试图将税收和经济活动联系得更加紧密，同时限制一些神秘晦涩但收益巨大的把戏，例如用内部贷款来申请税收减免。经合组织的进展促成了行动：事实上，作为与英国税务部门达成协议的一部分，谷歌已同意未来为对英国广告客户的一部分销售纳税。

问题是经合组织的方法维护了一个在当前的系统中已经根深蒂固、很有破坏性的假象：一家跨国公司可以被视为一群单独公司的集合，仿佛它们是以彼此独立的形式相互交易。管理这一系统的“转让定价”规定既复杂又有疏漏。延续这一方式但加强监管意味着制定更多的规定——也产生更多的漏洞。

最好是将每家公司都视为一个独立实体。这样一来，各国或可根据一套计入销售额、员工、资产等因素的公式，就分享对公司全球利润的税收达成一致，或可允许由母国来对公司的全球所有利润征税，而在实际发生业务或实际获得收入的国家实行税收抵免机制——但关键是不以名义上的司法管辖地为准，以免重复征税。在这两种情况下，将利润转移到避税天堂的动机和机会都会大大减少。

不过并没有出现这种统一的方式，相反，东拼西凑的大杂烩仍在延续，同样继续的还有各国的税收政策可能相互不协调。谷歌和英国政府正是在这样的背景下达成了协议。在外界看来，开给该公司的罚单好像是一桩甜心交易，然而条件有多优厚却又无法确定，因为你不知道它是如何计算出来的。这种透明度的缺乏对提升公众信心毫无帮助，人们无法相信逃税正在得到控制。而长期来讲，谷歌模式对跨国公司亦无甚助益。如果很多国家以它们自己的方式和节奏进行征税，结果可能是税收混乱，各国针对税收权展开血战，相互重叠的征税要求导致钟摆从税收不足又摆动到了税收过度。

税务外交，一如政治那般，是可能性的艺术。但在各国一心求变之时未能

加大力度推动彻底的改革，看来会是个代价高昂的错误。■



Free exchange

Trade in the balance

Globalisation can make everyone better off. That does not mean it will

THE past two decades have left working-class voters in many countries leery of globalisation. Donald Trump, the billionaire television star who promises to slap a 45% tariff on Chinese goods if elected president of America, has partly based his candidacy on this angst. Economists tend to scoff at such brash protectionism; they argue, rightly, that trade does far more good than harm. Yet new research reveals that for many, the short-term costs and benefits are more finely balanced than textbooks assume.

David Autor of MIT, David Dorn of the University of Zurich and Gordon Hanson of the University of California, San Diego, provide convincing evidence that workers in the rich world suffered much more from the rise of China than economists thought was possible. In their most recent paper*, published in January, they write that sudden exposure to foreign competition can depress wages and employment for at least a decade.

Trade is beneficial in all sorts of ways. It provides consumers with goods they could not otherwise enjoy: without it only Scots would sip lovely Islay single malts. It boosts variety: Americans can shop for Volvos and Subarus in addition to Fords. Yet its biggest boon, economists since Adam Smith have argued, is that it makes countries richer. Trade creates larger markets, which allows for greater specialisation, lower costs and higher incomes.

Economists have long accepted that this overall boost to prosperity might not be evenly spread. A paper published by Wolfgang Stolper and Paul Samuelson in 1941 pointed out that trade between an economy in which labour was relatively scarce (like America) and one in which labour was relatively abundant (like China) could cause wages to fall in the place that

was short of workers. Yet many were sceptical that such losses would crop up much in practice. Workers in industries affected by trade, they assumed, would find new jobs in other fields.

For a long time, they appeared to be right. In the decades following the second world war, rich countries mostly traded with each other, and workers prospered. Even after emerging economies began playing a larger role in global trade, in the 1980s, most research concluded that trade's effects on workers were benign. But China's subsequent incorporation into the global economy was of a different magnitude. From 1991 to 2013 its share of global exports of manufactured goods rocketed from 2.3% to 18.8%. For some categories of goods in America, Chinese import penetration—the share of domestic consumption met through Chinese imports—was near total.

The gain to China from this opening up has been enormous. Average real income rose from 4% of the American level in 1990 to 25% today. Hundreds of millions of Chinese have moved out of poverty thanks to trade. A recent NBER working paper suggests Americans will benefit too: over the long run trade with China is projected to raise American incomes. In parts of the economy less susceptible to competition from cheap Chinese imports, the authors argue, firms profit from a larger global market and reduced supply costs, and should also gain—eventually—from the reallocation of labour away from shrinking manufacturing to more productive industries.

But those benefits are only visible after decades. In the short run, the same study found, America's gains from trade with China are minuscule. The heavy costs to those dependent on industries exposed to Chinese imports offset most of the benefits to consumers and to firms in less vulnerable industries. Economists' assumption that workers would easily adjust to the upheaval of trade seems to have been misplaced. Manufacturing activity tends to be geographically concentrated. So the disruption caused by

Chinese imports was similarly concentrated, in hubs such as America's Midwest. The competitive blow to manufacturers rippled through regional economies, write Messrs Autor, Dorn and Hanson, battering suppliers and local service industries. Such places lacked growing industries to absorb displaced workers, and the unemployed proved reluctant (or unable) to move to more prosperous regions. Labour-market adjustment to Chinese trade was thus slower and less complete than expected.

As a result, the authors found in a 2013 paper, competition from Chinese imports explains 44% of the decline in employment in manufacturing in America between 1990 and 2007. For any given industry, an increase in Chinese imports of \$1,000 per worker per year led to a total reduction in annual income of about \$500 per worker in the places where that industry was concentrated. The offsetting rise in government benefits was only \$58 per worker. In a paper from 2014, co-written with Daron Acemoglu, of MIT, and focusing on America's "employment sag" in the 2000s, the authors calculate that Chinese import competition reduced employment across the American economy as a whole by 2.4m jobs relative to the level it otherwise would have enjoyed.

The costs of Chinese trade seem to have been exacerbated by China's large current-account surpluses: China's imports from other countries did not grow by nearly as much as its exports to other countries. China's trade with America was especially unbalanced. Between 1992 and 2008, trade with China accounted for 20-40% of America's massive current-account deficit; China imported many fewer goods from America than vice versa.

| *Sub-Pareto*

Trade generates enormous global gains in welfare. Generous trade-adjustment assistance, job retraining and other public spending that helps to build political support for trade are therefore sound investments. To make any of these policies work, however, economists and politicians must

stop thinking of them as political goodies designed to buy off interest groups opposed to trade. They are essential to fulfilling trade's promise to make everyone better off.

* Studies cited in this article can be found at www.economist.com/Chinatrade16 ■



自由交流

贸易得失

全球化可以让人们的生活更富足。但未必真能实现

过去的二十年已经让很多国家的工人阶层选民对全球化心生疑虑。亿万富翁、电视明星唐纳德·特朗普（Donald Trump）一定程度上已经将其候选资格建基于此种焦虑之上。他承诺如果当选美国总统，会对中国商品施以45%的关税。经济学家通常对这种自以为是的保护主义嗤之以鼻；他们认为贸易带来的好处远远大过危害，这正确无疑。然而新的研究表明，在很多情况下，短期成本和收益比教科书上所设想的更为均衡。

麻省理工的大卫·奥特尔（David Autor）、苏黎世大学的大卫·多恩（David Dorn）和加州大学圣地亚哥分校的戈登·汉森（Gordon Hanson）提供了令人信服的证据，证明富裕国家的工人从中国崛起过程中所承受的损失大大超过经济学家原本的设想。在1月发表的最新论文里，他们提到，突然面临外国竞争会在至少十年内抑制工资和就业。

贸易的好处多种多样。贸易为消费者提供原本无法享用的商品：不然就只有苏格兰人才能品尝到美妙的艾雷岛单一麦芽威士忌。贸易促进多样化：美国人除了福特汽车还可以购买沃尔沃和斯巴鲁。然而自亚当·斯密以后的经济学家认为，贸易最大的好处是令各个国家更为富裕。贸易催生更大的市场，进而形成更深入的专业化、更低的成本和更高的收入。

长期以来，经济学家一直认为这种总体上对繁荣的促进可能无法平均分布。由沃尔夫冈·斯托尔珀（Wolfgang Stolper）和保罗·萨缪尔森（Paul Samuelson）在1941年发表的一篇论文指出，在劳动力相对稀缺的经济体（如美国）和劳动力相对丰富的经济体（如中国）之间的贸易可能导致前者的工资下降。然而很多人怀疑，认为这种损失在实际上可能不会大量出现。他们假设，受贸易影响行业里的工人可以在其他产业中找到新工作。

很长一段时间里，这仿佛是对的。在二战结束后的十年中，富裕国家主要

在相互间贸易，工人生活红火。即使在上世纪80年代，新兴经济体开始在全球贸易中扮演更重要的角色，大多数研究仍认为贸易对工人的影响是良性的。但随后中国的融入对世界经济的影响程度非比寻常。从1991年到2013年，中国在全球制成品出口中的份额从2.3% 蹿升至18.8%。在美国，一些品类商品的消费几乎完全从中国进口来满足。

中国从这种开放中获得了巨大的好处。平均实际收入从1990年相当于美国4%的水平上升到如今的25%。得益于贸易，亿万中国人已经脱离了贫困。美国国家经济研究局（NBER）最近的一份工作报告表明美国人也将从中受益：长远看来，和中国的贸易预计将提高美国人的收入。该报告的作者认为，在经济中受中国廉价进口商品竞争影响较小的产业里，公司从更大的全球市场、更低的供应成本中获利，而且随着劳动力由萎缩中的制造业向生产力更高的行业中转移，他们最终还是应有获益。

但这些益处要在数十年后方能显现。就短期而言，同一份研究表明，美国在同中国的贸易中获益极小。受中国进口影响的行业所产生的沉重成本，抵消了受影响较小的行业以及消费者的大部分收益。经济学家假设工人可以轻松地适应贸易的剧变，这一假设看来是错的。制造业活动通常集中在特定地区。因此中国进口造成的破坏也同样集中于如美国中西部那样的制造中心。奥特尔、多恩和汉森写到，对制造商的竞争冲击扩散至区域经济，打击了供应商和本地服务业。这些地区缺少增长性行业来吸纳失业工人，而这些工人最终不愿（或是不能）转到更兴旺繁荣的地区。因此，劳动力市场对中国贸易的应对调整比预想的要缓慢而且不够全面。

因此，这几位作者在2013年的一份论文中指出，从1990年到2007年，中国进口商品的竞争造成了美国44%的制造业岗位流失。对于任一特定行业，来自中国的年人均进口额每增加1000美元，就会导致该产业集中地区工人年人均收入总计减少500美元。相应的政府福利增长仅为每人58美元。在2014年与麻省理工的达龙·阿西莫格鲁（Daron Acemoglu）合著的一篇论文中，作者重点研究了美国本世纪前十年的“就业萧条”，他们计算出，相对于其本应该达到的水平，由于中国的进口竞争，美国经济总体上减少了240万个就业岗位。

由于中国庞大的经常账户盈余，中国贸易所产生的成本似乎更加严重了：中国从其它国家的进口没有跟上它对其它国家出口的增长速度。中国与美国的贸易尤其失衡。从1992年到2008年，美国巨量经常账户赤字中的20%至40%源自同中国的贸易。中国从美国的进口比对美国出口要少得多。

| 帕累托次优

贸易在福利方面产生了巨大的全球收益。因此，慷慨的贸易调整援助、工作再培训以及有助建立贸易政治支持的其它公共支出是合理的投资。然而，要使任何这些政策发挥作用，经济学家和政治家必须停止把它们视为政治甜头，用于收买反对贸易的利益集团。要实现贸易让人们更富足的愿景，这些政策必不可少。

*本文所引的研究可见www.economist.com/Chinatrade16 ■



Air quality

Something in the air tonight

Tackling atmospheric pollution is hard. More data will help

SINCE the 1940s, southern California has had a reputation for smog. Things are not as bad as once they were but, according to the American Lung Association, a health group, Los Angeles is still the worst city in the United States for levels of ozone, nitrogen oxides, hydrocarbons and carbon monoxide. Gazing down on the city from the Getty Centre, an art museum in the Santa Monica Mountains, haze can blot out the view of the Pacific Ocean. Nor is the state's bad air restricted to its south. Fresno, in the central valley, comes top of the list in America for year-round particulate pollution. Residents' hearts and lungs are strained as a consequence.

All of which, combined with California's reputation as the home of technological innovation, makes the place ideal for developing and testing systems designed to monitor pollution in detail. And that is just what Aclima, a fledgling firm in San Francisco, has been doing over the past few months. It has been trying out arrays of monitoring stations, some of them mobile, that are intended to yield minute-to-minute maps of outdoor air pollution. Such stations will also be able to keep an eye on what is going on inside buildings, including offices.

The stations in Aclima's arrays are triangular and measure 20cm along a side. Each contains 12 off-the-shelf sensors that detect pollutants such as ozone, carbon monoxide and methane, as well as the small particles of which smog is composed. They also monitor basic data such as temperature and humidity, which affect how pollution forms and lingers. The elements of an array may be fixed and spaced according to what exactly they are trying to measure. Or they can be attached to vehicles, so that entire roads can be sampled routinely.

To this end, Aclima has been collaborating with Google's Street View system, resulting in maps such as the one below. Davida Herzl, Aclima's boss, says they have, as expected, revealed pollution highs on days when San Francisco's transit workers went on strike and the city's inhabitants were forced to take to their cars. Conversely, "cycle to work" days have done their job by creating pollution lows.

Aclima has already, at Google's expense, mapped 20,000km (12,000 miles) of roads in the Bay Area this way. It plans to produce a detailed map of the air quality of California's most populous regions—those around Los Angeles, San Francisco and the Central Valley—sponsored by the Clinton Global Initiative, a large philanthropic organisation, before the year is out. It will then move on to the rest of America and (Ms Herzl hopes) beyond. For such outdoor work, most of its customers are likely to be charitable foundations or governments. But Aclima hopes to make money from the private sector as well, by measuring pollution levels indoors.

Again, Google has acted as a guinea pig. It has been testing Aclima's technology in its offices for the past two years, crunching through more than half a billion data points a day on the air quality within them. The result, according to Ms Herzl, is the world's largest pollution-related database on indoor environments.

Without wind and other weather to move them on, these data show, indoor levels of many nasties can be between two and five times those outside. The Googleplex is in Silicon Valley—a relatively clean part of the state. If such ratios also apply on a smoggy day in LA, watch out. ■



空气质量

今夜空气需关注

大气污染很难解决。更多数据会有帮助

自20世纪40年代开始，南加州就以雾霾而出名。现在的情况虽不像曾经那样糟糕，但健康组织美国肺脏协会（American Lung Association）称，洛杉矶仍然是美国臭氧、氮氧化物、碳氢化合物和一氧化碳污染最严重的城市。从位于圣塔莫尼卡山的艺术博物馆盖蒂中心（the Getty Centre）俯瞰这座城市，雾霾遮目，可能难见太平洋。加州的恶劣空气还不限于南部，中部谷地的弗雷斯诺（Fresno）在全美常年颗粒物污染排名中位列第一。结果是当地居民的肝脏和肺着实堪忧。

凡此种种，加上加州作为科技创新之乡的美誉，让这里成为开发和测试污染详细监测系统的理想之地。而这正是旧金山一家新兴公司Aclima过去数月所做的。它尝试采用一系列监测设备，其中一些进行移动监测，以生成每分钟更新的户外空气污染图。这些站点还能密切关注包括办公室在内的室内空气状况。

Aclima所布的监测设备为三角形，边长20厘米。每个包含12个成品传感器，可以探测如臭氧、一氧化碳、甲烷之类的污染物，以及形成雾霾的微小颗粒。它们也监测影响污染形成和持续的基础数据，如温度及湿度。Aclima能根据具体想要监测的项目固定和排列布点。监测站也可安装在车辆上，如此一来所有的道路都能定期取样。

为了这一目的，Aclima已经和谷歌街景系统合作，生成如下图所示的地图。Aclima的老板达维达·赫兹尔（David Herzl）说这些地图显示，正如人们预期的那样，当旧金山交通系统司机罢工、该市居民不得不开车出行时，污染加重了。相反，“骑车上班”日则成为污染较低的日子。

由谷歌出资，Aclima已经以这种方式绘制了湾区2万公里道路的地图。在大型慈善组织克林顿全球计划（Clinton Global Initiative）的资助下，它

计划在今年内绘制加州人口最多地区空气质量的详细地图，包括洛杉矶、旧金山和中央谷地。之后它将推进到美国其他地区，乃至国外（赫兹尔希望如此）。此类户外监测的客户可能是慈善基金或政府，但Aclima希望也能通过测定室内污染程度从私营部门获利。

这一点上谷歌又已做了小白鼠。过去两年谷歌一直在办公室里试用Aclima的技术，处理每天超过五亿关于室内空气质量的数据点。赫兹尔称，该结果是世界上关于室内环境最大的污染数据库。

这些数据显示，没有风和其他气候条件移走污染物，许多讨人厌的物质在室内浓度可以达到室外的2到5倍。谷歌总部位于硅谷，这是加州相对洁净的地区。倘若这样的比率也适用于洛杉矶的雾霾天气，大家就要小心了。 ■



Bribery

Daft on graft

A hard line on commercial bribery is right. But the system is becoming ridiculous

IN 2008 Siemens, a German conglomerate, was fingered for handing out bribes in emerging markets. It has since spent a staggering \$3 billion on fines and internal investigations to atone for its sins. Half of that has gone to advisers of one sort or another. Walmart, an American retailer, will soon have spent \$800m on fees and compliance stemming from a bribery investigation in Mexico. The most complex bribery probes used to take three years. Now they last an average of seven.

In recent years lots of big economies, from Britain to Brazil, have followed America's lead in tightening anti-bribery enforcement. Offences that once drew a slap on the wrist now attract fines in the hundreds of millions of dollars as well as prison terms for palm-greasing managers. It is right that bribery should be punished. The economic effects of graft are insidious. Bribery distorts competition and diverts national resources into crooked officials' offshore accounts. But the cost and complexity of investigations are spiralling beyond what is reasonable, fed by a ravenous "compliance industry" of lawyers and forensic accountants who have never seen a local bribery issue that did not call for an exhaustive global review; and by competing prosecutors, who increasingly run overlapping probes in different countries.

To stop a descent into investigative madness, enforcement needs to be reformed in four ways. First, regulators should rein in the excesses of the compliance industry and take into account the cost to firms of sprawling investigations. When firms admit to having uncovered bribery among their managers, regulators expect them to investigate themselves. The authorities should tell them what level of investigation they want so that

companies are not overzealous out of fear of seeming evasive. This is slowly starting to happen, with officials telling firms they should not “aimlessly boil the ocean”.

Second, governments should lower costs by harmonising anti-bribery laws and improving co-ordination between national probes. The OECD, whose anti-bribery convention has gained wide acceptance, is the natural body to lead this effort.

| *More justice, please*

Third, more cases should go to court. Too often, prosecutors strong-arm firms into agreeing to settlements based on controversial legal theories (one being peddled by American law enforcers is that hiring relatives of well-connected officials counts as bribery). Taking such matters to court would have the advantage of establishing clear precedents. When firms are loth to go to trial, because they are worried about the financial costs of a criminal charge, the terms of settlements should at least undergo more judicial scrutiny.

Lastly, anti-bribery laws should be amended to offer companies a “compliance defence”. If firms can show that they had sound anti-bribery policies, that they were making reasonable efforts to uphold them, that the wrongdoing did not involve senior managers and that they came forward to the authorities promptly, the penalties should be greatly reduced.

As corrosive as bribery is, the response must be proportionate. Investigations that drag on are a waste of management and public resources. The starting-point for up to half of all cases is a firm’s voluntary disclosure, but if costs continue to rise then firms may be more tempted to bury their bad news. Anti-corruption campaigners would have nothing to cheer if the cure ended up being more harmful than the disease. ■



贿赂

愚蠢的反贿赂

对商业贿赂采取强硬态度是正确的。但反贿赂系统变得越来越荒唐可笑

2008年，德国企业集团西门子被指责在新兴市场行贿。为了弥补自己的过错，西门子在罚款和内部调查上至今已花费了30亿美元，着实令人震惊。其中一半付给了各式各样的咨询公司。为应对在墨西哥的贿赂调查，美国零售商沃尔玛很快要支付八亿美元的费用及合规成本。最复杂的贿赂调查以前一般要耗费三年时间，而现在平均需要七年。

近年来，从英国到巴西的多个大经济体纷纷效仿美国，加强反贿赂力度。以前只会轻罚的违法行为现在将招致数以亿计的罚款，还会给行贿高管带来牢狱之灾。贿赂理应受到惩罚，这点毋庸置疑。贿赂带来的经济影响是隐伏的。贿赂扰乱了竞争，让国家资源流入腐败官员的海外账户。但因为有了贪婪的“合规行业”——律师和法务会计师从不认为哪件本地贿赂案不需要彻底的全球调查，再加上相互冲突的检察官不断在不同国家开展各项重复调查，反贿赂调查的成本和复杂程度急剧上升，超出了合理范围。

为了阻止调查陷入疯狂，执行的方式需要在四个方面进行改革。首先，监管机构应当控制合规行业的过度行为，将公司庞大的调查支出考虑在内。当公司承认发现管理者中有贿赂行为时，监管机构希望公司开展自我调查。有关当局应当告知公司它们希望调查深入到何种程度，这样公司才不会因为害怕看起来像逃避推诿而表现得过分热心。现在这种情况正在慢慢改变，官员们告诉公司它们不应该“面面俱到”。

第二，政府应当协调反贿赂法律，加强各国调查之间的配合以降低成本。经合组织的反贿赂公约已经得到了广泛的认可，理应在这方面起带头作用。

| 请更加公正

第三，更多案件应当诉诸法庭。检察官常常基于有争议的法律理论（其中

一条被美国执法机构广泛宣传，即雇用人脉广泛的官员的亲戚也被视为贿赂），用强硬手段逼迫公司达成和解。将这类事件带上法庭将有建立明确判例的好处。如果公司因为担心刑事指控的财务成本而不肯上庭接受审判，那么和解条款至少应当经过更细致的司法审查。

最后，应当修订反贿赂法，为公司提供“合规辩护”的机会。如果公司能够证明它们具有合理可靠的反贿赂政策、它们做了合理的努力维护这些政策、不正当行为不涉及高管，并且及时向有关当局坦诚相告，那么就应当大大减轻处罚。

贿赂颇具腐蚀性，应对也须恰当。冗长的调查浪费管理和公共资源。高达一半的案件来自公司的自愿揭露，但如果费用持续上涨，公司可能会更倾向于将坏消息掩埋。如果治疗最终比疾病伤害更大，反腐斗士们也没什么可欢呼的。■



Reforming FIFA

SEC as a parrot

Clean up football's governing body with a dose of stockmarket scrutiny

EVERY so often, organisations become bywords for something else. Apple means elegance, Berkshire Hathaway loyalty and BlackBerry decline. Alas, FIFA, the governing body of world football, spells corruption. Sprucing up this most tarnished of brands will take more than a bit of tinkering with the way FIFA is run.

On February 26th FIFA's member associations will hold a secret ballot—what else?—in Zurich to choose a new president who will replace Sepp Blatter. The omens are not good. Mr Blatter bequeathed his successor an organisation in crisis. His fifth term was cut short after the indictment last year of several of the game's biggest-wigs for alleged money-laundering. He has since been suspended from football for eight years for making an undocumented SFr2m (\$2.1m) payment to Michel Platini, then head of Europe's football body. (Mr Platini, once a favourite to succeed Mr Blatter, has also been suspended from the game; both men deny wrongdoing.)

The five candidates left to vie for the top job talk warmly of the need for term limits and better disclosure. But a radical reform would start with an idea put forward by Stefan Szymanski, a sports economist, among others—turning FIFA into a public company. For good measure, the new, cleaner FIFA would be listed in New York.

A public listing would have several benefits. The first is that the level of transparency would shoot up. Scandals afflict listed firms too, but one thing you do not hear from executives at public companies is complaints about the absence of scrutiny.

For FIFA to be under the referee's beady eye would be precisely the point. According to its annual report, an organisation with just 474 employees spent an impressive \$115m on personnel expenses in 2014. A listing would require FIFA to break out how much its executives get. They might expect to face questions from shareholders about the \$35m they spent on meetings expenses that year, too.

Opening FIFA to America's justice system would also have a salutary effect. The reach of the Department of Justice and the FBI is already long: they were behind indictments in 2015 that eventually dethroned Mr Blatter. But a listing in America would bring some of the world's most enthusiastic law-enforcers to the organisation's door. In particular, it would make FIFA subject to the Foreign Corrupt Practices Act. Given the allegations that still swirl around the award of the 2018 and 2022 World Cups to Russia and Qatar, seeking a home with a punitive anti-bribery regime would send a clear statement.

Becoming a public company would also formalise and sharpen FIFA's incentives to make as much money as it can through legitimate means. Of the \$5.7 billion in revenue that FIFA pulled in between 2011 and 2014, the biggest chunk was from the sale of television rights for the 2014 tournament in Brazil. More revenue—from the sale of broadcasting, marketing and licensing rights to World Cups—and tighter cost control ought to be enough both to keep shareholders happy and also to raise money to foster grassroots initiatives worldwide. The profit motive would also encourage faster development of the women's World Cup.

| *Fantasy football*

The beautiful game should not be handed to Wall Street without safeguards. To protect FIFA's mission to develop football, a portion of revenues would have to be ring-fenced for distribution to its member associations, perhaps by a separate charitable arm (which would also be

responsible for the rules of the game). To ensure that some private-equity baron doesn't take FIFA over and load it up with debt, this charitable arm would need to retain majority voting rights over the listed firm. That would still leave plenty of scope for shenanigans as money sloshed between FIFA and football's member associations. But it would also ensure that FIFA received harsher scrutiny.

Sadly, not one of the candidates vying to take over from Mr Blatter is likely to countenance a listing in New York. But when you judge their promises to restore FIFA's integrity, that should be the yardstick. ■



改革国际足联

让证监会治病

来一剂股市监管，帮助整顿足球的管理机构

时不时地，一些机构会变成其他一些东西的代名词。苹果意味着优雅，伯克希尔哈撒韦（Berkshire Hathaway）等同于忠诚，黑莓则代表衰落。可叹的是，国际足联这一世界足球主管机构已经成了腐败的别名。要改造这最为声名狼藉的品牌，不是对其运营方式做一些小修小补就够。

国际足联的成员协会将于2月26日在苏黎世举行一次秘密投票（还会有别的么？），选出接替塞普·布拉特（Sepp Blatter）的新一任主席。目前看来情形不妙。布拉特留给其继任者的是一个深陷危机的机构。去年，该组织的多名最高层人士因涉嫌洗钱而遭起诉，布拉特的第五个任期因此提前结束。此后他因为向时任欧洲足联主席的米歇尔·普拉蒂尼（Michel Platini）违规支付了200万瑞郎（210万美元）而被禁止参与足球事务八年。（普拉蒂尼曾是最被看好的布拉特继任人，同样也遭“禁足”。两人都否认有过失行为。）

其余五名争夺主席之位的候选人都在热切地讨论足联需要限制任期及增加透明度。然而，一次真正彻底的改革应以体育经济学家史蒂芬·西曼斯基（Stefan Szymanski）等人提出的创意为起点——将国际足联变成一家上市公司。此外，变得干净些的新机构应该在纽约上市。

上市会有几大好处。首先是透明度会大增。尽管上市公司也会被丑闻困扰，但你从不曾在上市公司主管那里听到他们抱怨缺乏监督。

将国际足联置于裁判机警的目光下正是关键所在。根据国际足联的年度报告，这家雇员仅474人的机构在2014年的人员开销达到了惊人的1.15亿美元。公开上市将要求它对外公布高管薪酬。他们或许还会被股东们质疑在该年度光开会就花掉的3500万美元。

让国际足联受制于美国的司法系统也将产生益处。美国司法部和联邦调查局的触角已经伸得很长，正是它们在2015年提出的控诉最终把布拉特拉下马。在美国上市将把世界上最卖力的一批执法者带到国际足联的门前，尤其会让该机构受到《反海外腐败法》（Foreign Corrupt Practices Act）的约束。国际足联将2018年及2022年的世界杯主办权分别授予了俄罗斯和卡塔尔，由此引发的质疑和指控还在持续。有鉴于此，在一个具有惩罚性反贿赂机制的国家上市，将会发送一个明确的信号。

变为上市公司也将令国际足联通过合法途径全力牟利的动机正式化也更明确。国际足联在2011年到2014年间获取了57亿美元的收入，其中最大一块来自出售2014年巴西世界杯的电视转播权。通过出售世界杯的播放、营销和许可授权来实现更多营收，同时加大成本控制，这应该会让股东们满意，同时也会筹集资本在全世界范围促进基层创新。创收的动机也会鼓励女足世界杯更快地发展起来。

| 梦幻足球

足球这项美好的赛事不应不加防范地交予华尔街。为保护国际足联发展足球运动的宗旨，其部分收入须被留作其成员协会的经费——或许由一个独立的慈善部门来操作（该部门也将负责制定赛事规则）。为确保国际足联不被某个私募巨头掌控而使其负债累累，该慈善部门将需拥有对上市公司的多数投票权。由于经费会在国际足联和成员协会之间转移，这仍将给不诚实操作留下了不小的空间，但也会确保国际足联受到更严格的监督。

可惜，目前竞争接任布拉特的候选人之中，没一个人有可能会赞成国际足联在纽约上市。但是，当你评判他们信誓旦旦要恢复国际足联廉洁公正的承诺时，应以此为标杆。■



Manufacturing

A hard pounding

A vital chunk of the world economy is beset by weakness

CATERPILLAR is one of the most renowned industrial brands. It makes the kind of heavy machinery—loaders, excavators and off-road trucks—that is used in the construction, mining and transport industries when things need to get dug out or shifted somewhere. But the firm's latest results, released on January 28th, show that it is struggling to shift its own products. "This past year was a difficult one for many of the industries and customers we serve," it said. Revenues in 2015 were nearly 15% lower than they were in 2014, and 29% below the 2012 peak.

The company's woes are emblematic of the problems facing manufacturers worldwide. Although manufacturing is a much smaller part of most developed economies than services—just 12% of output in America, for example—its recent weakness makes many economists nervous about the wider outlook.

Recent data point to the size of the problem. Big jobs cuts have been announced this year by GE, Tata Steel and Bombardier. In December industrial production fell by 0.7% in Italy, 1.1% in Britain, 1.2% in Germany and 1.6% in France. In China both the official purchasing managers' index (PMI) of manufacturing activity and that of *Caixin*, a leading financial magazine, are below 50, the threshold that indicates contraction (see chart 1).

In America, manufacturing output rose by 0.5% in January but only back to its level in October; it has fallen in four of the past six months. The manufacturing PMI, compiled by the Institute for Supply Management, has been below 50 since October. Services-sector PMIs in most countries, by

contrast, indicate continued expansion.

A slowdown in Chinese economic growth, as the authorities try to switch from an investment-led to a consumption-led model, is blamed by many manufacturers in the developed world for their problems. The steel industry is suffering from the effect of past Chinese investment, which has led to massive overcapacity and plunging prices. China's demand for raw materials in the first decade of this century also prompted mining companies to step up production, and shipping companies to build more vessels. As Chinese demand has dropped, both industries have taken a pounding. Bloomberg's commodity index has fallen by 28% over the past 12 months. The Baltic Dry index of shipping rates is down by 98% from its peak. The latest data show that Chinese imports, by value, have fallen by 18.8% over the past year.

Yet China itself is suffering from weak global demand; the value of its exports has fallen by 11.2% over the same period, including declines of 10% to America and 12% to the EU. Before the financial crisis, global trade used to grow faster than GDP, now it is lagging behind. The OECD, a club of mostly rich countries, estimates that trade volumes last year grew by just 2%.

The sluggish nature of trade growth has a disproportionate impact on manufacturing. Around 25% of all American manufacturing jobs are linked to trade, compared with just 6% of jobs in services. Even though overall job growth in America has been strong, there were no net gains in manufacturing employment last year. In trade-intensive American industries, Bank of America Merrill Lynch estimates that output was growing at an annual rate of just 0.1% by the end of 2015.

Falling commodity prices also mean that oil and metals producers are not investing in new plant and equipment, which hurts the companies that

produce such goods. Exxon Mobil, an oil giant, has announced a 25% cut in its capital-expenditure plans for 2016, for example.

American capacity utilisation, a measure of how much productive capacity is not idle, may have peaked at a lower level than in previous cycles (see chart 2). Firms seem to be struggling to sell what they produce: the inventories-to-sales ratio is higher than at any time since the financial crisis. By the time the fourth-quarter reporting season is over, American industrial companies in the S&P 500 are expected to have reported an annual decline of 5.4% in earnings and 7.3% in sales.

The rising dollar is a problem for American firms, as it makes their wares more expensive. On a trade-weighted basis, the greenback is up by 22% since mid-2014. That is painful for companies that make low-margin commoditised goods such as paper or plastics. But currency movements cannot explain the weakness in European manufacturing; the trade-weighted euro has dropped by 11% over the past five years.

The best hope for manufacturers is that this weakness is temporary. Falling commodity prices have had a short-term impact on the energy and materials industries. But in the medium term, lower prices should be good for consumer demand in the developed world, and they will step up their purchases of manufactured goods. Carmakers have already shown that it is possible to buck the trend. Low petrol prices encouraged American car buyers last year, with sales hitting a record 17.6m.

As for China, recent data may be distorted by the effect of the lunar-new-year holiday. Chinese road freight grew last year; officials have started breaking out consumer-focused industries within its official PMI, and those data still seem robust. In a rare interview published by *Caixin*, Zhou Xiaochuan, the head of China's central bank, dismissed worries on the part of developed-world manufacturers that the Chinese would devalue the

yuan to enhance the competitiveness of their exports. He vowed not to pursue a policy of competitive devaluation, and insisted China had more than enough in foreign-exchange reserves to fend off those who were speculating against the currency. His comments sent the beleaguered yuan soaring: it hit its highest level this year on February 15th.

For the moment, however, pessimism reigns. Even the shares of carmakers have taken a battering in the early weeks of 2016, underperforming the rest of the market. Global fund managers polled by Bank of America Merrill Lynch now have their lowest weighting in industrial stocks since 2011. Perhaps the much-larger services sector will pull manufacturing out of its rut. But investors are not counting on it. ■



制造业

一轮重击

世界经济的一个关键部分陷于疲软

卡特彼勒（Caterpillar）是世界最知名的工业品牌之一，专门制造装载机、挖掘机、越野卡车等重型机械，用于建筑、采矿和运输行业，在需要挖掘或转运物资时派上用场。但该公司在1月28日发布的最新业绩显示，其自家产品陷入了滞销。该公司称：“对我们服务的许多行业和顾客而言，过去一年颇为艰难。”该公司在2015年的营收较2014年下降近15%，与2012年的峰值相比低了29%。

卡特彼勒的困境代表了全球各地制造商们正面临的问题。虽然在大部分发达经济体中，制造业所占份额相较服务业已小得多（例如在美国，仅占产出的12%），但制造业最近的疲态使许多经济学家对更广泛的前景感到担忧。

近期的数据指出了问题的规模。今年，GE、塔塔钢铁及庞巴迪相继宣布大规模裁员计划。去年12月，意大利、英国、德国、法国的工业产值分别下降了0.7%、1.1%、1.2%、1.6%。在中国，无论是官方关于制造业活动的采购经理人指数（PMI）还是由主要财经杂志《财新》调研所得的同类指数均低于50，显示出行业收缩（见图表）。

美国的制造业产值在一月份上升了0.5%，但仅恢复到去年10月份的水平；过去六个月中，有四个月呈下降趋势。由美国供应链管理协会（Institute for Supply Management）编制的制造业PMI自去年十月以来一直低于50。相反，大部分国家的服务业PMI显示出持续扩张的走势。

随着中国政府试图让经济发展模式从投资主导转为消费主导，中国经济增长放缓，而许多发达国家制造商都把自己的问题归咎于此。钢铁业正饱受先前中国投资导致产能大量过剩及价格暴跌的苦果。本世纪最初十年，中国对原材料的需求也促使矿业公司加速生产，造船企业增建船只。随着中

国需求下跌，这两个行业大受冲击。彭博的大宗商品指数在过去12个月里已经下降28%。波罗的海干散货运价指数（Baltic Dry index of shipping rates）已从最高峰下跌了98%。最新数据显示，去年中国进口额下降了18.8%。

然而，中国本身也正苦于全球需求疲软。其出口额在同一时期已下降11.2%，其中对美国和欧盟的出口分别减少10%和12%。在金融危机前，全球贸易增长速度往往高于GDP增长，如今则处于落后状态。主要由富裕国家组成的经合组织估计，去年的贸易量增长仅为2%。

贸易增长低迷对制造业的影响尤为严重。在美国，约有25%的制造业职位与贸易相关，相比之下，服务业的相关比例仅为6%。尽管美国整体就业增长一直强劲，但去年制造业就业净增长为零。美银美林（Bank of America Merrill Lynch）估计，截至2015年底，美国贸易密集型行业的产出年增长仅为0.1%。

大宗商品价格下跌也意味着石油和金属生产商不再投资于新的厂房与设备，相关产品的制造商会受到损害。例如，石油巨头埃克森美孚已宣布2016年计划削减25%的资本支出。

美国的产能利用率（衡量非闲置产能的比率）可能已经见顶，而且低于在前一个周期的最高水平（见图表）。企业产品滞销：库存销售比升至金融危机以来的最高位。到第四季度财报结束时，预计标准普尔500指数中美国工业企业的年盈利会下降5.4%，销售额减少7.3%。

美元升值是美国公司面临的一个问题，因为其产品变得更加昂贵。按贸易加权计算，美元汇率自2014年中以来已上升22%。纸或塑料等低利润同质化产品的制造商因而痛苦不堪。但汇率变动并非欧洲制造业疲软的原因。过去五年，欧元汇率按贸易加权计算下降了11%。

对厂商而言，最好的情况是这种疲软只是一时情境。大宗商品价格下跌对能源和材料行业已造成短期冲击。但从中期来看，较低的价格应该有利刺激发达国家消费者的需求，他们也将更多地购买工业制成品。汽车厂商已

显示逆势增长是有可能的。在美国，低油价鼓励人们购车，去年汽车销量创下1760万辆的新高。

至于中国，近期数据可能受农历新年假期的影响而失真。中国公路货运在去年有所增长；官员们开始把消费者主导的行业从官方PMI数字中单列出来，而那些数据似乎依然强劲。最近《财新》杂志刊登了中国央行行长周小川罕有接受的一次专访。对于发达国家制造商忧虑中国可能将贬值人民币以提升出口竞争力，周小川认为是不必要的。他誓言不会推行竞争性的贬值政策，并坚称中国有充足的外汇储备抵御投机人民币的炒家。他的言论促使原本低迷的人民币汇率飙升：在2月15日攀上今年的最高位。

但目前，悲观情绪依然笼罩。连汽车厂商的股价也在2016年初深受打击，弱于整体股市的表现。美银美林对全球基金经理的调查显示，他们的工业股持仓比例是自2011年来最低的。也许规模大得多的服务业将拉动制造业走出泥沼，但投资者对此并不指望。 ■



SoFi

So far, so good

A fintech darling offers a new model—one not without risks

WHEN a financial firm boasts of offering the biggest loans at the lowest rates with the slimmest collateral, it has either devised the underwriting equivalent of a better mousetrap or is setting itself up for an almighty fall. At first glance SoFi, a startup based in San Francisco, looks like it is up to the sort of tricks that would make even a pre-2008 banker blush: lending youthful customers \$975,000 to buy a \$1m house, say. Yet few “fintech” firms seem quite as threatening to America’s incumbent banks.

Social Finance, as it once was, started life in 2011 as a way to match students who needed money to pay for a degree at Stanford with alumni with lots of dough. Engineering graduates from one of America’s grandest universities, the firm’s founders reasoned, were unlikely to welch on their debts, especially with Silicon Valley booming. That allowed SoFi to price student loans below even the notionally discounted rates available under government schemes, attracting lots of customers. Well-to-do alumni, meanwhile, were happy to lend via SoFi’s platform, understanding what a safe bet the borrowers were. The firm also raised money to invest in its own loans, largely to package them as securities it could then sell on, a variant on “marketplace lending”, a crowded field in fintech.

SoFi quickly expanded—to borrowers from other prestigious universities, and to other forms of lending. Having provided many of its customers with their first loans, SoFi then worked to cater to their expanding financial needs after graduation, offering them personal loans and mortgages. Again, the firm’s lending algorithms ignore the rigid credit scores used by banks in favour of common-sense indicators of ability to pay. High Earners Not Rich Yet, or HENRYs, are its main customer base.

To distinguish itself from banks, SoFi smothers customers with personalised service. Its 100,000 or so borrowers are “members”, invited to parties thrown by the firm. Entrepreneurs among them can apply to have their loan repayments suspended, and make use of SoFi’s offices for meetings with investors. Lost your job? Whereas a bank might foreclose, SoFi will tap its network to help you find a new one. Mortgages can be obtained by pecking at a smartphone and sending snaps of required documents. Pen-and-ink signatures are for fuddy-duddies.

The easygoing branding belies an outfit that can hold its own on Wall Street. Mike Cagney, its founder and boss, is a former trader at Wells Fargo. Like many other fintech lending operations, SoFi obtains the money it lends from hedge funds and investment banks. Its balance-sheet is turned over every two to three weeks; some of the loans it issues get sliced, diced and repackaged in much the same way subprime mortgages once did.

Most fintech startups aim to do one thing well and sell that service as widely as possible. SoFi is the opposite: its customer base is focused (though it now lends to graduates of over 2,200 schools) but it is busy diversifying its offering. Beyond student loans and mortgages, it aspires to manage its customers’ wealth and offer them insurance. It even wants to launch something akin to a current account, without officially becoming a deposit-taking institution.

But SoFi faces three obstacles if it is to keep growing fast enough to justify a recent investment that valued it at around \$4 billion (it is not listed). The first is growing without lowering its lending standards. Of the \$6 billion it has lent in total, more than \$4 billion went out the door in 2015. Such rapid growth usually comes with more than a few dud loans. Mortgages seem an obvious concern. Banks like to lend to buyers with a 30% deposit. SoFi is happy with 10%—and now has a scheme to help borrowers raise most of the down payment too, in exchange for a slice of the increase in the value of

the house. Can that be sensible, given that its loans are concentrated in pricey property markets, which are likeliest to deflate?

Mr Cagney says his customers will keep paying even if their houses are worth less than their mortgages. That is placing an awful lot of faith in Americans, who have walked away en masse from underwater mortgages before, and particularly in millennials, a generation often derided for its feckless and unpredictable behaviour. Like other young fintech lenders, SoFi has never had to weather a recession.

The second obstacle is rising interest rates. SoFi has made a packet by refinancing student loans which were in effect mispriced by government programmes. If interest rates rise substantially, the scope for existing borrowers to save money by refinancing will disappear. Mortgage refinancing will also dry up. Mr Cagney says he assumes much higher interest rates are unlikely anytime soon and that the firm will have diversified enough to handle them by the time they appear.

The third is regulation. Especially if it starts gathering something resembling deposits, SoFi will have many of the attributes of a bank while insisting it should not be regulated like one. In part it simply wants to skirt the red tape that comes from accepting deposits, along with the government guarantee they attract. But there is also a libertarian bent to the shaggy-haired Mr Cagney, who clearly believes that governments meddle too much in markets. The brief he received from his biggest investor, SoftBank, which led a \$1 billion funding round in September, is to reach a valuation of \$100 billion or go bust, but not to settle for the status quo. That is the kind of talk that might panic regulators, who prefer financial institutions to be boring. ■



SoFi

目前还好

金融科技业宠儿开创新模式，但不无风险

当一家金融公司声称提供最高额度的贷款，同时收取最低的利率并要求最少的抵押品，它不是早就设计好更诱人的授信陷阱，便是自掘坟墓。乍看之下，总部设在旧金山的创业公司SoFi似乎正在盘算着会让2008年前的银行家们都自愧不如的伎俩：比如，贷款97.5万美元给年轻顾客购买100万美元的房子。然而，SoFi似乎已对美国主流银行构成前所未有的威胁。

SoFi原名Social Finance（社会金融），创立于2011年，为缺钱支付学费的斯坦福大学学生与富裕的校友提供贷款匹配平台。其创始人的理念是，这一美国顶尖名校的工科毕业生不太可能赖账，尤其是在硅谷蓬勃发展的大环境下。这令SoFi发放的学生贷款利率甚至低于名义上有优惠的政府助学贷款利率，从而吸引了大量顾客。同时，经济宽裕的校友认为借款人稳妥可靠，也乐意通过SoFi的平台提供贷款。该公司也募集资金投向自己的贷款业务，大部分打包为证券转售出去，成为金融科技业竞争激烈的“平台贷款”（marketplace lending）市场上的又一产品。

SoFi迅速扩展，为其他名牌大学的借款人服务，也提供其他形式的贷款。在向许多客户发放过人生第一笔贷款后，SoFi努力迎合他们毕业后不断扩大的财务需求，为其提供个人贷款和房贷服务。在这些贷款中，该公司的算法仍然不使用各大银行惯用的严格信用评级体系，而采用常识性指标来判断借款人的还款能力。SoFi的主要客户群是收入高但还不富有的人士，即HENRY（High Earners Not Rich Yet）一族。

有别于一般银行，SoFi极为宠爱客户，为其提供全面的个性化服务。其约10万借款人被视为“会员”，受邀参与SoFi举行的派对。创业会员可申请暂停还贷，还可借用SoFi的办公室与投资者开会。失业了？银行也许会没收贷款抵押品，SoFi却会利用其人际关系网帮你找到新工作。点击智能手机并发送所需文件的照片，便可以获批房贷。“老古董们”才需要白纸黑字的

签名。

该公司虽品牌作风随和，但实际上足以在华尔街独当一面。其创始人兼老板迈克·卡格尼（Mike Cagney）曾是富国银行的交易员。与许多其他金融科技贷款企业一样，SoFi的贷款资金来自对冲基金和投资银行。它的资产负债表每隔两至三周便周转一次，其发放的部分贷款会像当年的次级抵押贷款那样被分割重新打包。

大多数金融科技创业公司的目标是专注做好一件事，然后尽可能地广泛销售这一服务。SoFi则相反：其客户群集中（虽然公司现在已向超过2200所学校的毕业生提供贷款），但它致力于多元化经营。除了学生贷款和房贷，SoFi还希望为客户提供理财及保险服务，甚至想在未正式成为存款机构的情况下推出类似活期存款账户的产品。

在最近一轮融资中，SoFi的估值高达约40亿美元（它还未上市），要保持与此估值相吻合的快速增长，该公司面临三大障碍。首先是不降低其贷款标准而保持规模增长。SoFi已贷出的60亿美元中，超过40亿美元在2015年发放。如此高速增长通常伴随着不少坏账。房贷这一块似乎尤其令人忧虑。银行放贷一般要求30%的首付，SoFi只需要10%，现在更推出方案，替借款人筹募大部分的首付资金，条件是日后从房产升值的收益中分一杯羹。考虑到SoFi的贷款集中在最有可能下跌的高价物业市场，这会是明智之举吗？

卡格尼说，即使房价低于房贷，他的客户还是会继续还款。那是对美国人的一场信心豪赌（要知道美国之前就出现过负资产断供潮），尤其是对常被讥讽不负责任又行事多变的千禧一代。与其他新兴的金融科技贷款机构一样，SoFi从未经历过经济衰退的考验。

第二个障碍是利率上升。SoFi通过把政府实际上错误定价的学生贷款再融资而大发其财。如果利率大幅上升，现有借款人通过再融资省钱的空间将消失，房贷再融资也将枯竭。卡格尼表示，他估计利率不太可能在近期内大幅攀升，等到真出现这一情况时，SoFi的业务也已将足够多元化，可以

应对这一问题。

第三个障碍是监管。特别是如果SoFi开始做类似吸储的业务，它将拥有银行的许多特质，但又坚称不应该像银行那样受到监管。某种程度上，SoFi纯粹是想绕过有关吸储的各种繁琐监管规定，还想避免承担这种储蓄带来的政府担保。而同时，头发蓬乱的卡格尼也崇尚自由主义，他显然认为政府过度干预市场。去年9月由软银领投的一轮融资中，SoFi获得十亿美元。作为其最大投资者的软银给SoFi的指令是：要么把市值推上一千亿美元，要么破产，但不能满足于现状。这类言论也许会令监管机构恐慌，它们更希望金融机构能安分守己些。 ■



Startups in Australia

From lucky to plucky

An entrepreneurial prime minister calls for a culture of innovation

WHEN people call Australia “The Lucky Country”, they often do not realise that Donald Horne, the writer who coined that phrase in a book of the same name in 1964, meant it as a criticism. “Australia is a lucky country run mainly by second-rate people who share its luck,” he wrote. “It lives on other people’s ideas...” Horne intended the phrase as a warning to Australians, and a plea for more curiosity from its leaders.

The country’s good fortune has long rested on wealth from its mineral resources and farmland. Now, however, with the prices of the commodities it exports hitting rock-bottom, Australians are beginning to realise that more must be done to encourage the formation of innovative businesses. Instead of living on other people’s ideas, in other words, it needs to generate its own.

Among Australia’s 2.6m registered businesses, the survival rate compares well with America’s and Canada’s, and is better than New Zealand’s. But a study published last month by the government’s Productivity Commission found that few young Australians start their own firms; that only about 0.5% of newly formed businesses are startups as commonly understood (innovative, ambitious and with high growth potential); and that only 1-2% of existing businesses can be described as innovating. This puts Australia on a par with Canada, say, but behind America and Britain. The commission concluded that one reason why Australia lags is that entrepreneurs need “other entrepreneurs nearby to connect and work with.”

Fortunately, Australia now has both a shining example of a tech startup

becoming a global success, and a former tech entrepreneur as prime minister. Atlassian, a software firm whose products are used by developers and project managers, listed on the NASDAQ exchange in America in December, making its founders, Scott Farquhar and Mike Cannon-Brookes, Australia's first tech billionaires. And in September Malcolm Turnbull, a lawyer and investor turned politician, unseated Tony Abbott as prime minister and leader of the Liberal Party. In the 1990s Mr Turnbull had made a fortune investing in OzEmail, an Australian internet-service provider.

Atlassian's blunt slogan befits its Australian roots: "Open company, no bullshit". Though it has offices in San Francisco, its headquarters remain in Sydney. Its founders, two university friends, started it in 2002 with a A\$10,000 (then \$5,400) credit-card loan. Fourteen years later, Atlassian's customers include NASA, Netflix and Facebook and the company is valued at \$5.6 billion. "When we began, there was no startup culture in Australia to follow," says Mr Farquhar. "The attitude, fear of failure, was a problem." Some say it still is.

Three days before Atlassian's listing, Mr Turnbull gave a speech that Australian business leaders hailed as a welcome change in official attitudes to promoting innovation. Mr Abbott had cut a backward-looking figure, stopping public funding for wind energy and describing coal as "good for humanity". Mr Turnbull called for an "ideas boom" to replace mining booms as the country's new growth source, and told Australians they were falling behind most other rich countries in turning their ideas into commercial ventures. He promised about A\$1 billion (\$720m) in incentives, including tax breaks for investors in startups and venture-capital partnerships.

Mr Turnbull's pitch to brand himself as the leader of the future, and to get his compatriots to rethink their "Lucky Country" attitudes, may take more than tax breaks. To begin to create the sort of community of entrepreneurs

and innovators the Productivity Commission called for, Atlassian tried to buy a 19th-century former railway workshop near Sydney's business district. In November, however, the New South Wales state government sold the site instead to a consortium led by Mirvac, a property company.

Mirvac plans to use much of the site for new offices for the Commonwealth Bank, though it will convert a former locomotive shed into spaces for tech firms and other startups. Even so, Mr Farquhar laments the sale as a lost opportunity to build a larger tech ecosystem that could help spawn more companies like his. Australia, he says, must decide if it wants to be a software producer for the world or a consumer, "missing this whole revolution and left wondering how we are going to pay for it".

Mr Turnbull is putting his faith in a strengthening of links between science and business. He has restored a A\$111m budget cut that Mr Abbott made to the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia's chief science agency, the outfit that invented the technology behind Wi-Fi.

Larry Marshall, the CSIRO's head, was struck by Australia's somewhat timid approach to business risk when he returned to his home country in 2015 after working as an entrepreneur for 26 years in Silicon Valley. He suggests would-be tech pioneers could find a model in Australia's "incredibly risk-tolerant" frontier economy. Facing enormous distances and tough terrain, miners and farmers have survived only by innovating. The CSIRO has, for instance, collaborated with BHP Billiton, Newcrest Mining and others on better ways to drill ores, detect their grades and raise productivity. Cotton farmers now mainly use varieties the CSIRO has developed, which need less water and pesticides to deliver high yields. The challenge, Mr Marshall argues, is to channel the old economy's risk-taking into new industries in which Australia has a good chance to excel: high-value food and biotechnology.

Some are already following in Atlassian's wake. Alec Lynch and Adam Arbolino launched DesignCrowd in Sydney eight years ago after an earlier startup failed. Undeterred, Mr Lynch saw a chance to change the "slow, risky and expensive" way people procure projects from local graphic designers. DesignCrowd lets customers set budgets and receive ideas from designers around the world. After self-funding at first, capital came in from local angel investors and Starfish Ventures, a Melbourne venture-capital firm. DesignCrowd now has revenues of almost A\$20m a year, four-fifths from outside Australia, and has opened offices in San Francisco and Manila.

Mr Lynch foresees a "mini startup boom" emerging in Australia. And he is optimistic that the interventions of the tech-friendly prime minister can only help Australia go from being the Lucky Country to one that makes its own luck. ■



澳大利亚创业公司

从运气到勇气

企业家总理呼吁创新文化

人们常称澳大利亚为“幸运国度”，却往往没有意识到唐纳德·霍恩（Donald Horne）于1964年创造这一说法并以此做书名时实则是批评之意。“澳大利亚是一个幸运的国度，主要由一群同样幸运的庸人管理，”他写道，“它依赖别人的理念生存……”霍恩意图以此说法警醒澳大利亚人，也是恳求领袖们有更多的创新精神。

一直以来，澳大利亚的好运气依赖其丰饶的矿产资源和农业用地。而如今，随着该国出口的大宗商品价格跌至谷底，澳大利亚人逐渐意识到必须进一步努力打造创新企业。换言之，不能再因循他人的理念，而要形成自己的创意。

在澳大利亚注册的260万家企业的存活率可以比肩美国和加拿大的企业，好于新西兰。但上月由政府生产力委员会（Productivity Commission）发表的一份研究报告发现，澳大利亚年轻人很少选择创业；新成立企业中仅有约0.5%为常规意义上的创业公司（创新、进取，并具备高增长潜力）；现有企业中可视为创新型公司的仅占1%到2%。这方面，澳大利亚与加拿大情况相似，但落后于美国和英国。该委员会的结论认为，澳大利亚落后的原因之一是企业家们需要“与其他企业家相邻为伴，沟通合作”。

幸运的是，如今澳大利亚一方面拥有本土科技创业公司成功走向全球的闪亮例子，另一方面还有一位前科技企业家担任总理。软件公司Atlassian的产品为开发人员和项目管理人员所采用，公司12月在美国纳斯达克交易所上市，其创始人斯科特·法夸尔（Scott Farquhar）和麦克·坎农-布鲁克斯（Mike Cannon-Brookes）随即跃升为澳大利亚首批科技亿万富翁。

2015年9月，从律师及投资人转型成为政客的马尔科姆·特恩布尔（Malcolm Turnbull）把阿博特拉下马，成为澳大利亚总理及自由党党魁。在上世纪90年代，特恩布尔投资澳大利亚互联网服务提供商OzEmail

获利致富。

Atlassian直截了当的口号颇具澳大利亚风格：“开放的公司，不扯淡”。虽然在旧金山设有分公司，总部仍设在悉尼。Atlassian的两位创始人是大学好友，他们在2002年凭一万澳元（当年等于5400美元）的信用卡贷款创立公司。14年后，Atlassian的估值为56亿美元，客户包括美国国家航空航天局（NASA）、Netflix及Facebook。“我们创业之初，澳大利亚还没有创业文化可以遵循，”法夸尔说道，“这种害怕失败的态度是个问题。”有人认为这一问题现在依然如故。

特恩布尔在Atlassian上市的三天前发表演说，澳大利亚商界领袖们称赞说，在推动创新这一点上官方的态度出现了可喜的变化。之前阿博特的形象守旧倒退，他禁止公共资金投入风能项目，又称煤炭“有益人类”。特恩布尔则呼吁以“创新思潮”取代采矿热潮成为澳大利亚新的增长点，并告诉国民，在把创意转化为商业企业方面，他们落后于大多数发达国家。他承诺推出约10亿澳元（7.2亿美元）的激励措施，包括为创业公司和风投合伙企业的投资者提供减税优惠。

特恩布尔试图把自己塑造成“未来的”领袖，并促使同胞反思“幸运国度”的态度，他所需的努力也许不止减税那么简单。为着手创建生产力委员会号召的创业创新型社会，Atlassian曾试图买入悉尼商业区附近一座19世纪的火车修理厂旧址。但新南威尔士州政府却在11月把该地块出售给地产公司Mirvac牵头的另一财团。

Mirvac计划将地块主要用于兴建澳联银行的办公大楼，但也会改建一个旧机车库供高科技企业和创业公司使用。即便如此，法夸尔仍然感到惋惜，他认为这本是一个建立更大型科技生态系统的机会，有助于催生更多像Atlassian这样的公司。他表示，澳大利亚必须决定，究竟要成为世界的软件生产者还是消费者，如果是后者那将意味着“错失变革时机而只能踌躇着如何负担得起”。

特恩布尔的信心关键在于加强科研和商业的联系。联邦科学与工业研究组

织（以下简称CSIRO）是澳大利亚的主要科学机构，正是它发明了Wi-Fi的底层技术，之前其经费被阿博特裁减了1.11亿澳元，如今已由特恩布尔恢复发放。

CSIRO的负责人拉里·马歇尔（Larry Marshall）在硅谷经营企业26年后于2015年回到祖国澳大利亚，对本国面对商业风险的怯懦不前感到震惊。他建议有志成为高科技先锋的人士可从澳大利亚“无比包容风险”的边疆经济中寻找典范。面对位置偏远、地形复杂的挑战，矿工及农民唯有创新方能生存。举例说，CSIRO已与必和必拓（BHP Billiton）、纽克雷斯特矿业（Newcrest Mining）等企业合作，寻求用更好的方式钻采矿石、探测其品位并提高生产率。棉农现在主要种植由CSIRO开发的品种，高产且用水及杀虫剂更少。马歇尔认为，挑战是如何把旧经济中的冒险精神导入到澳大利亚很有胜算的新产业中：高价值食品和生物技术。

已有人追随Atlassian的步伐，觉醒创新。亚历克·林奇（Alec Lynch）和亚当·雅博林诺（Adam Arbolino）继一次创业失败后于八年前在悉尼创立DesignCrowd。林奇无惧失败，发现有机会改变人们从本地平面设计师那里采购设计项目那“速度慢、风险大、价格高”的旧有方式。DesignCrowd让顾客设定预算，收到来自世界各地的平面设计师的创意。公司最初以自筹资金创立，后来得到本地天使投资人及墨尔本海星风投公司（Starfish Ventures）的注资。如今DesignCrowd的年收入已达近两千万澳元，其中五分之四来自澳大利亚之外，公司已在旧金山和马尼拉开设分公司。

林奇估计澳大利亚将出现一轮“迷你创业热潮”。他乐观地认为，这位重视技术的总理所采取的的干预措施定会促使澳大利亚从“幸运国度”变为能创造运势的国家。■



Off-price fashion retailing

To the Maxx

Clothes shops that sell famous brands at big discounts are thriving

THE downtown Manhattan store of T.J. Maxx, with its dreary fluorescent lighting and haphazard displays, is about as glamorous as the average petrol station. Yet to retail analysts, and bargain-hunters, it is thrilling. At the end of one bedraggled rack, a red jacket offers a hint of the store's appeal. The coat, from Michael Kors, an American designer, is on sale at \$99.99. A comparable coat would cost \$140 elsewhere, the label boasts.

Using discounts to shift clothes is no novelty in fashion retailing. Indeed, in the current climate, with competition fierce and consumers hesitant, it is hard to avoid. But what marks out T.J. Maxx and other "off-price" retailers is that most of their stock is from habitually pricey designer labels, at drastic reductions. TJX, the parent company of T.J. Maxx and a handful of other off-price chains, rarely gives interviews, like its closest competitor, Ross. But their model is essentially as follows: when the designer labels produce more clothes than normal shops will sell at full price, TJX and Ross buy them at a deep discount, then resell them. As a strategy for global domination, it sounds underwhelming. But TJX and Ross are booming.

TJX has become the top seller of clothing not just in America but, according to some measures, the world. Ross is smaller but, given its room to grow, has become an investor darling. The Dow Jones United States Apparel Retailers Index fell by 6% during 2015 but the shares of Ross and TJX rose by 15% and 4% respectively.

Other American fashion chains are having a harder time. Shoppers are snubbing once-beloved names like Gap, J.Crew and Abercrombie & Fitch. Department stores' habit of ordering their stocks of clothes months in

advance leaves them vulnerable to ever-faster changes in tastes and to unpredictable weather. Last autumn's mild temperatures, for example, left them stuck with unwanted coats and scarves. All are threatened by more agile foreign "fast fashion" retailers, such as Inditex of Spain and H&M of Sweden.

In contrast, the American off-price chains are continuing to expand. In 2014 TJX's sales overtook those of Macy's, a famous department-store chain (which in January announced big job cuts and store closures). They are not at the cutting edge of high-street fashions: many of their lines are last season's. Their skill lies in hunting down surplus batches of stock from well-known brands and negotiating steep reductions. But the wind is at their backs. According to Bryan Gildenberg of Kantar Retail, a consulting firm, it is getting harder for shops to predict which clothes will sell at full price. "If the apparel industry is harder to forecast, there's more inventory at risk, and if there's more inventory at risk, the opportunity for this sort of buying goes up astronomically," he says.

Off-price retailers do not try to offer every size in every colour in every outlet. They buy whatever is available, so their shops have a constantly changing, seemingly random assortment. Ross says its stores typically get fresh stock three to six times a week. They therefore appeal to the sort of shopper who loves to rummage, hoping to stumble across the perfect item at an irresistible price. "It looks like a jumble, but actually it's a very deliberate jumble," says Neil Saunders of Conlumino, another consulting firm.

The shops are spartan and thinly staffed, since customers are happy to hunt for bargains without help, and understand that if it isn't on display, the store doesn't have it. As a result, the overheads at TJX and Ross are, as a percentage of sales, about half those of Macy's or Nordstrom, another department-store chain. The experience of shopping in an off-price store is

hard to replicate online, notes Oliver Chen of Cowen and Company, a financial-services firm, so TJX and Ross are less threatened by the rise of internet retailing than other clothing chains.

It may all sound simple, yet some off-price chains have flopped. The company that owned Filene's Basement, for example, filed for bankruptcy in 2011. Ross and TJX now have the benefits of scale as well as, analysts say, strong management. TJX is spreading across Europe, where it trades as T.K. Maxx.

The two chains are not just admired by industry analysts. They are also appreciated, albeit more discreetly, by the designer labels. An elite brand dare not damage its image by flooding off-price retailers with its products. But TJX and Ross have become an essential part of the retail ecosystem, offering a way for brands to clear their excess stock quickly. The off-price chains may drive a hard bargain but are otherwise easy to deal with. Department-store chains often demand sale-or-return clauses, or retrospective discounts for stock that they were forced to reduce.

The risk for the fashion brands is that they end up a bit like American carmakers before their bail-outs, habitually overproducing and dumping their growing surpluses on the off-price chains and thus gradually losing their ability to sell at full price. As for TJX and Ross, one long-term worry, says Mr Gildenberg, is that younger consumers expect ever less expensive clothes. Forever 21, which specialises in cheap, trendy wear, has grown quickly. Primark of Ireland, which opened its first American branches last year, boasts fashionable clothes for Walmart prices.

For now, though, both of the big off-price chains have room for further expansion. It is no surprise then, that some rivals are seeking to muscle in to the business: Macy's is expanding a new off-price chain, Macy's Backstage, and Nordstrom is opening more branches of its one, Nordstrom

Rack. Off-price is in fashion. ■



减价时装零售

全速发展

名牌服饰折扣店欣欣向荣

曼哈顿下城的T.J. Maxx店内，沉闷的日光灯照明和杂乱的货品陈设令这里像一座普通加油站那般毫无惊艳之处。但对于零售分析师和寻找便宜货的顾客而言，这却是个激动人心的地方。这家店铺的吸引力何在？从一排破旧货架末端的那件红色外套便可窥见一二。这件由美国设计师迈克尔·科尔斯（Michael Kors）设计的大衣正以99.99美元的折扣价出售。标牌显示，同类大衣在别家卖140美元。

打折促销在时装零售业并非什么新鲜招数。事实上在目前的环境下，由于竞争激烈、消费者出手犹豫，减价销售在所难免。但T.J. Maxx和其他“减价”零售店最与众不同的是他们的货品大部分来自通常十分昂贵的设计师品牌，却大幅减价出售。T.J. Maxx及其他几家减价连锁店的母公司TJX很少接受采访，同紧追其后的对手Ross一样。但他们的模式基本如下：当设计师品牌生产的服饰多于常规服装店能全价销售的数量，TJX和Ross会以高折扣购入，然后转售。作为意在称霸全球的商业战略，这听起来索然无味，但TJX及Ross正发展得红红火火。

TJX的服饰销量不仅称冠美国，而且以某些指标看，甚至称霸世界。Ross规模较小，但因为它还有成长的空间，也已成为投资者的宠儿。道琼斯美国服装零售商指数在2015年下跌了6%，但Ross和TJX公司的股价分别上涨了15%和4%。

其他美国时装连锁店的处境则变得更艰难了。Gap、J.Crew、Abercrombie & Fitch这类曾受热捧的牌子如今被人们冷落。消费者的品味愈加善变，加上天气也变幻莫测，百货商店提前好几个月订货的习惯使其容易陷于被动。比如，去年秋天比较温暖，它们购入的大衣和围巾就遭遇滞销。所有这些店铺都受到灵活的外国“快时尚”零售商的威胁，如西班牙的Inditex和瑞典的H&M。

相反，美国这些减价时装连锁店持续扩张。2014年，TJX的销售额超越著名的梅西百货（1月宣布大规模裁员和关闭分店）。它们并没有走在大众时尚的前沿，其出售的众多服饰系列都是上季货品。它们的本领是擅长搜罗知名品牌的过剩库存并以极大的折扣成交。但它们正处在风口上。咨询公司Kantar Retail的布莱恩·吉丹伯格（Bryan Gildenberg）表示，服装店越来越拿不准哪些服饰可以全价卖出。他说：“假如服装业变得更难预测，库存风险就会增大，而如果库存风险增大，这种折价买进的机会将呈天文数字增长。”

减价零售商不会尽力在每家门店为每款服饰备好各种颜色和尺寸。它们是有什麼买什麼，所以卖场里的货品不停变化，好像随机备货一般。Ross表示，其卖场一般每周进货三至六次。因此，它们吸引的是那些喜爱淘货的顾客，他们希望能在无意间觅到完美超值的商品。“虽然看上去商品堆放得杂乱无章，但这其实是故意而为。”另一家咨询公司Conlumino的尼尔·桑德斯（Neil Saunders）表示。

卖场布置简陋，店员不多，因为顾客乐于自己淘货，不需要帮忙，也明白所有货品都在货架上了。结果，TJX和Ross的日常开支占销售额的比例约为梅西百货和另一家连锁百货商店诺斯通（Nordstrom）的一半。金融服务公司Cowen & Co的奥利弗·陈（Oliver Chen）认为，在减价店购物的体验是网购难以复制的，所以相比其他服装连锁店，TJX和Ross受网络零售兴起的威胁较小。

这一切或许听起来简单，但也有一些减价店已经以失败告终。譬如，品牌折扣连锁店Filene's Basement的母公司就在2011年申请破产。分析师说，Ross和TJX不但管理有方，而且也已经享有规模效益。TJX正扩展至欧洲各地，在那里其连锁店名为“T.K.Maxx”。

这两家连锁店不但受到分析师的热捧，还得到设计师品牌的支持——虽然小心翼翼。精英品牌担心损害形象，不敢向减价零售商大量供货。但TJX和Ross已成为零售生态系统中不可或缺的一部分，为品牌提供快速清空过剩库存的渠道。减价连锁店可能会极力讨价还价，但在其他方面则很好打

交道。连锁百货商店往往要求采用寄卖的方式（无法售出的都可以退货），或者对被迫清货的库存提出可追溯的折扣。

时装品牌的风险是，它们最后会变得有点像美国汽车制造商在政府出手纾困前的状态：习惯性地过量生产，然后在减价店倾销不断增加的剩余库存，结果日渐丧失全价销售的能力。吉丹伯格说，对于TJX和Ross，长远的忧虑是年轻消费者会期望服饰越来越低价。专营廉价流行服饰的Forever 21成长迅速。爱尔兰的Primark去年在美国开设了第一批门店，宣称以沃尔玛价位出售时尚服饰。

但目前看来，TJX和Ross这两家大型减价连锁仍有扩展的余地。无怪乎一些对手公司正寻求挤入这一市场：梅西百货正扩大旗下新设的减价连锁店“梅西后台”（Macy's Backstage），而诺斯通百货的减价店“诺斯通货架”（Nordstrom Rack）也有更多分店开张。减价零售正风行一时。■



The biotechnology industry

Clusterluck

Boston's biotech hub is surviving the challenge from Silicon Valley

DISTANCE is not dead. In biotechnology, as in other tech-based industries, the clustering of similar firms is more important than ever. Some American biotech startups are based in the San Francisco and Silicon Valley area, huddled with its many digital and IT startups. But the Boston metropolitan area—and in particular Cambridge, across the Charles river from central Boston—seems to be holding its own as the world's pre-eminent biotech hub.

The San Francisco area's pool of venture capital is beyond compare; and a biotech-industry body there, the California Life Sciences Association, argues that California is the number one state for biomedical employment. But in part that is simply a reflection of the state's large population, which means its health-care business is necessarily big. The Massachusetts Biotechnology Council claims that its state employs more people in biotech research and development than any other.

A study published last December by the Massachusetts Institute of Technology (MIT) found that although, per head, the Boston area had fallen well behind San Francisco and Silicon Valley in creating software and internet startups, it was more or less keeping pace in life sciences. The density of research institutions in Massachusetts means that it receives \$351 per head in funding from the National Institutes of Health, well ahead of the Golden State's \$88. This density of research was a reason cited by General Electric, which has a big medical-technology division, in its announcement in January that it will move its group headquarters to Boston.

The history of the Boston area cluster can be traced to the late 1970s and early 1980s, when Biogen and Genzyme, two biotech drugmakers, were founded by scientists from nearby academic institutions. Other scientists, especially from MIT and Harvard, Cambridge's two internationally renowned universities, followed suit and created innovative startups of their own.

This encouraged global pharmaceutical giants, struggling with poor productivity in their existing research facilities, to set up labs in and around Cambridge. Novartis of Switzerland began work on its outpost in 2002, followed by such names as AstraZeneca of Britain and Baxter of Illinois, which in 2015 spun out its Cambridge labs as Baxalta, a specialist in "orphan" diseases. In January Baxalta agreed a \$32 billion takeover by Shire, an Irish drugs giant.

The cluster lacked a clear focal point until 2010, when MIT, the main landowner around Kendall Square—an area about a mile in all directions from the Kendall/MIT subway station in Cambridge—decided to spruce it up. One report suggests the square currently hosts firms that have absorbed about \$14 billion in venture-capital investments. Silicon Valley's overall pool of capital may be deeper, but much of it flows to areas other than biotech. And the global drug giants with outposts in the Boston area provide an alternative source of finance, and of eventual buyers for startups.

Tom Andrew of Alexandria Real Estate, a property agent specialising in science buildings, notes that the Boston area's universities, teaching hospitals and other institutions are a sink, as well as a source, of talent. Anyone who accepts a risky job at a startup can be sure that if things don't work out there are lots of big employers nearby to fall back on.

The cluster's promising young firms include four—Editas Medicine, CRISPR

Therapeutics, Intellia and Bluebird Bio—that are working on “gene editing”, currently one of the hottest areas of biotech. WuXi NextCODE, another local startup, specialises in analysing genomes. Alnylam concentrates on drugs that interfere with RNA, the messenger molecule through which genes express themselves. Not satisfied with just editing, deciphering or blocking nature’s blueprints, Synlogic is seeking to create medicines through entirely artificial sequences of genes.

Synlogic’s boss, Jose-Carlos Gutiérrez-Ramos, formerly of Pfizer, has worked around the world and praises the “density of intellectuals” in Boston and the opportunities that come from being able to make easy connections. With little travel time between appointments, it is easier to arrange meetings. Dan Budwick of Pure Communications, a public-relations firm which represents some of the area’s startups, says that “You can jump on a bike and see 30 companies in a mile. You can’t do that in San Francisco or Manhattan.”

Boston’s tech cluster has a different vibe from Silicon Valley’s in other ways too. Edward Farmer of WuXi NextCODE says Boston’s biotech crowd are a more formal bunch, who wear proper shirts—and tuck them in. They know which fork is for the salad because salad is not the only thing they eat. Beer is the recreational drug of choice, rather than cannabis.

The cranes sprouting across the skyline suggest more growth ahead. But demand is still running ahead of supply. In the Boston area rents for laboratory space rose by 7% last year to around \$47 a square foot (\$505 a square metre), compared with \$37 in San Francisco. Already, some companies are having to seek space in districts like Alewife or Watertown, on the far side of Harvard’s campus.

Though it is on a roll, the Boston biotech cluster must keep a nervous eye on its West Coast rival, especially if, in future, biotech ventures come to

rely on software, wearable sensors and big-data analysis, areas in which Silicon Valley is strong. At least that is a problem it can try to address. The weather is not. The biggest annual jamboree for investors in biotech, organised by J.P. Morgan, a bank, opened in January in its customary location of San Francisco. The temperature was a balmy 13° Celsius, to Boston's shivering -1° . ■



生物技术产业 集群之幸

波士顿的生物技术中心正从硅谷的挑战中幸存下来

距离并未消亡。与其他以技术为基础的行业一样，在生物技术领域，同类公司的集群比以往任何时候都更为重要。一些美国生物技术创业公司把总部设在旧金山和硅谷地区，跟当地的众多数字及IT创业公司扎堆。然而，波士顿大都会区——特别是与波士顿市中心隔查尔斯河相望的剑桥市——俨然已能与之抗衡而成为世界上卓越的生物技术中心。

旧金山地区的风险投资资源是别处无可比拟的。当地的生物技术行业团体“加利福尼亚生命科学协会”（California Life Sciences Association）认为，加利福尼亚是生物医学就业第一州。但这在某种程度上只是该州庞大人口数量的表现，人口众多意味着其医疗保健产业必然庞大。马萨诸塞州生物技术委员会（Massachusetts Biotechnology Council）声称，该州在生物技术研发领域的就业人数超过其他任何一个州。

去年12月，麻省理工学院公布的一项研究发现，波士顿地区虽然在人均创建软件和互联网创业公司的数量上远落后于旧金山与硅谷，但在生命科学领域不相上下。麻省密集的研究机构使它从美国国立卫生研究院（National Institutes of Health）获得人均351美元的资金，远超过“黄金之州”（加利福尼亚）的人均88美元。拥有庞大医疗技术部门的通用电气1月宣布将把集团总部迁往波士顿，它提到该地区研究机构的高密度是一大原因。

波士顿地区产业集群的历史可以追溯到上世纪70年代末和80年代初。当时，周边学术机构的科学家建立了生物技术制药企业百健（Biogen）和健赞（Genzyme）。其他科学家纷纷效法，创建了自己的创新型创业公司，尤其是来自麻省理工和哈佛的科学家，这两所国际知名大学都位于剑桥市。

这促使那些苦于现有研究设施生产力低下的全球制药巨头在剑桥及其周边建立实验室。瑞士诺华（Novartis）2002年开始在此设点，紧接着是英国的阿斯利康（AstraZeneca）和美国伊利诺伊州的百特（Baxter）。2015年，百特把它的剑桥实验室拆分出来，成立了专攻罕见病的Baxalta公司。今年1月，Baxalta同意被爱尔兰制药巨头Shire公司以320亿美元收购。

这里的产业集群一直缺少一个明确的中心，直到2010年，肯德尔广场（Kendall Square）的主要所有者麻省理工学院决定把这片以肯德尔/麻省理工地铁站为中心、半径约一英里的区域修葺一新。一份报告表明，目前在肯德尔广场设立的公司总共吸收了大约140亿美元的风险投资。硅谷的整体风投资源可能更为深厚，但大部分资金都流向了生物技术以外的领域。在波士顿地区设点的全球制药巨头提供了另一种资金来源，也为创业公司增加了潜在的最终买家。

专注于科学楼宇的房地产经纪公司“亚历山大房地产”（Alexandria Real Estate）的汤姆·安德鲁（Tom Andrew）表示，波士顿地区的大学、教学医院及其他机构既是人才之源，又是人才之库。在创业企业中承担有风险工作的所有人可以放心，如果工作不顺利，附近会有许多大雇主可以转投。

集群中有前途的新兴企业包括Editas医药公司（Editas Medicine）、CRISPR疗法公司（CRISPR Therapeutics）、Intellia和蓝鸟生物（Bluebird Bio）。这四家公司正致力于研究“基因剪辑”，这是当今生物技术中最热门的领域之一。另一家本地创业公司明码生物科技（WuXi NextCODE）专门从事基因组分析。奥尼兰姆公司（Alnylam）专注研究干扰RNA的药物，RNA是基因自我表达的信使分子。Synlogic公司不满足于只是剪辑、解码或者阻断基因组这一自然的蓝图，还试图通过合成完全人工的基因序列来开发药物。

Synlogic的老板、原辉瑞公司的何塞-卡洛斯·古铁雷斯-拉莫斯（Jose-Carlos Gutiérrez-Ramos）曾在世界各地工作过，他称赞波士顿“知识分子密集”，能够很容易地建立人脉关系并从中找到机会。由于约会之间花费

在交通上的时间很短，安排会议比较容易。代表该地区一些创业企业的公关公司“单纯沟通”（Pure Communications）的丹·布德威克（Dan Budwick）说：“你可以跳上一辆自行车，在一英里内见到30家公司。这在旧金山或曼哈顿就不行。”

在其他方面，波士顿的高科技集群也与硅谷的氛围不同。明码生物科技的爱德华·法默（Edward Farmer）表示，波士顿的生物科技从业者举止更规矩，他们穿合适的衬衫，还把下摆塞进裤子里。他们知道哪一个叉子是吃沙拉的，因为他们不只吃沙拉。首选的休闲毒品是啤酒而不是大麻。

穿越天际线不断涌现的起重机表明，未来将有更多发展。但目前依然是供不应求。在波士顿地区，实验室的租金去年上涨了7%，达到每平方英尺47美元（每平方米505美元），相比之下，旧金山的租金为37美元。已有一些公司在哈佛校园另一边的埃尔维夫（Alewife）和沃特敦（Watertown）等区域寻找办公地点。

尽管顺风顺水，波士顿的生物技术产业集群还是必须紧张地关注它在西海岸的竞争对手，尤其是假如生物技术企业今后要开始依赖软件、可穿戴传感器和大数据分析等硅谷强项的话。至少，这个问题是它可以试图解决的。但天气就不是了。生物科技投资者最大的年度盛会已于1月按惯例在旧金山举行，活动由摩根大通银行（J.P. Morgan）组织。当地气温13摄氏度，温暖宜人，而波士顿为零下1度，冷得让人直打寒颤。 ■



Roll-ups

Serial thrillers

The agonies and ecstasies of firms that are addicted to doing takeovers

IN MAY 2015 Bill Ackman, a hedge-fund manager, spoke at the Ira Sohn conference, a charity do at which Wall Street investors bat around ideas. Mr Ackman tried to rehabilitate an old concept, that of “platform” companies, which grow by continually buying others, finding their targets in the unloved and musty corners of the economy. Roll-ups, as they used to be known, were all the rage in the mid-1990s, before a series of blow-ups brought them into disrepute. Mr Ackman highlighted two firms that he said were modern masters of the strategy. Their fortunes have diverged widely since his speech, confirming that roll-ups are an enduring enigma.

One of Mr Ackman’s exemplars was Valeant, which buys up obscure drugs. It is now reeling, after accusations in October of creative accounting (which it rejected). The other was Jarden, which owns a motley collection of brands, straddling baseball, angling and plastic cutlery, that seems barmy until you realise it has delivered shareholders a compound annual return of 28% since 2010. On December 14th Jarden said it would be taken over for a tidy premium by Newell Rubbermaid, which makes pens and household goods. The combined firm will be worth \$23 billion. From a mouse a decade ago, an elephant has grown.

As Potter Stewart, a Supreme Court justice, once said of pornography, roll-ups are hard to define, but you know them when you see them. Plenty of big firms have dealmaking in their blood: think of Vodafone, a British mobile-telecoms operator, or Pfizer, a drugmaker. Some investment vehicles repeatedly buy whole companies. Berkshire Hathaway, Warren Buffett’s outfit, or Blackstone, a private-equity fund, are examples. And many industrial firms continually make “bolt-on acquisitions” to gain new

expertise or to gain market share in a particular product. Honeywell, an industrial conglomerate, aims to spend \$10 billion on such acquisitions over the next five years.

Roll-ups combine elements of all these approaches. Frequent dealmaking is an explicit objective. The cumulative size of these deals will ideally dwarf the roll-up's original value. They aim to integrate what they buy, to gain the benefits of shared overheads. Their targets are usually in similar industries. A roll-up is presented to investors not as a diversified investment fund, to be measured by such yardsticks as its net asset value, but as a unitary business, whose performance should be judged by its profits and cashflow.

Defined in this way, roll-ups in America today have an aggregate value of perhaps \$100 billion. Some famous firms began as roll-ups and graduated to become giant multinationals. John Malone's Liberty, a media empire with a market value of \$65 billion, started out buying tiny cable-TV networks in rural America in the 1970s. AB InBev, a Belgian brewer which is buying its British rival, SABMiller, is arguably the greatest roll-up in history. It began with the marriage of two midsized Brazilian brewers in 1999 and has carried on buying beer brands faster than its customers neck pints. If the SAB deal goes through it will have wheeled and dealt its way to being the world's 13th-most-valuable firm.

In the 1970s and 1980s corporate swashbucklers such as Sir James Goldsmith created conglomerates through a succession of audacious takeover bids. But roll-ups came of age in the 1990s. Between 1994 and 1998, 90-odd such firms floated in America, using the funds raised from outside investors to buy other businesses. They ventured into the corners of the economy where Wall Street did not deign to tread: hairdressing, funeral homes, vending machines, buses, video-rental stores and dustbin-emptying were all fertile territory for deals. This made sense on one level: fragmented industries were consolidated, and economies of scale achieved.

But the 1990s also demonstrated the dark side of roll-ups. Many played a dangerous game, stoking up investors' expectations so that their shares traded on high valuations. By using those highly rated shares (or debt) to buy the lowly rated stock of small firms, they could get an immediate boost to earnings per share, giving the illusion of growth. The game ended when their shares fell out of favour. Many roll-ups struggled with the sheer complexity of executing and then integrating a dizzying number of acquisitions.

Some were caught up in allegations of accounting shenanigans and fraud. Waste Management, a waste-disposal firm, was accused by regulators of inflating its profits by \$1.7 billion. Its alleged sins included neglecting to depreciate the value of its bin lorries. A study of corporate deals in the 1990s by Keith Brown, Amy Dittmar and Henri Servaes, three scholars, found that, overall, roll-ups lost investors money—but that there was a huge divergence between winners and losers.

So is there any way of discerning between roll-ups? It is surprisingly hard, as the cases of Valeant and Jarden show (see table). In some ways Valeant appears to be the superior firm. So far it has achieved faster underlying sales growth, after stripping out the benefit of acquisitions—though its increases in the price of drugs it has bought may provoke a backlash. For every dollar of sales it converts more into cashflow than Jarden—though in part it has done so by buying businesses that are already strongly cash-generating. Both firms have similar leverage and have been similarly acquisitive relative to their size. The big difference is the number of acquisitions and the price that they have paid for them. Jarden has been selective and disciplined on price, whereas Valeant has been frantic and sloppy. It helps that Jarden is in simple industries, whereas Valeant is in pharmaceuticals, a complex business.

Jarden's co-founder, Martin Franklin, clearly believes in the formula.

Though he is selling his biggest roll-up, he has started others, including Platform Specialty Products, which operates in the chemicals industry. There will always be a steady supply of targets for roll-ups. Big firms are always rethinking their strategies and shedding subsidiaries. Many industries are fragmented—think of the plethora of technology startups that may one day need a bigger home, or America’s shale-energy industry, in which thousands of embattled, smallish firms need shelter from the storm. There are always entrepreneurs willing to sniff around underneath capitalism’s carpet for bargains—and who love the thrill of the next deal. ■



滚雪球

惊悚片系列

并购上瘾者的痛苦与狂喜

2015年5月对冲基金经理比尔·阿克曼（Bill Ackman）在伊拉·索恩大会（the Ira Sohn conference）上发言，这是供华尔街投资者交流想法的一场慈善活动。阿克曼试图重塑一个老概念：“平台型”公司。这些公司通过不断买进其他公司而成长，在不受整体经济垂爱的发霉角落里找到目标。20世纪90年代中期，曾经被称作“同行并购（roll-ups）”的整合风行一时，直到一系列失败让这一做法声名扫地。阿克曼点出了两家公司，称其为这一策略的当代大师。阿克曼的演讲之后，这两家公司的命运却大相径庭，证实了同行并购始终是个未解之谜。

阿克曼所举范例之一是Valeant，它大量收购籍籍无名的制药公司。自10月被指控伪造账目（Valeant否认这一指控）以来，公司现在举步维艰。另一个范例是Jarden，它旗下拥有各类品牌，横跨棒球、渔具和塑料餐具等行业，这看似愚蠢，但自2010年以来公司已经给股东带来了28%的年复合回报率。12月14日Jarden称它将被钢笔和家居用品制造商纽威乐柏美公司（Newell Rubbermaid）收购，对方所付的溢价可观。合并后的公司市值将达230亿美元。十年前的一只小鼠如今已经长成一头大象。

正如最高法院大法官波特·斯图尔特（Potter Stewart）曾经对色情物品所做的评价一样，同行并购很难定义，但是当你看到它们时就能一眼认出来。很多大公司都流淌着做交易的血液：想想英国移动通信运营商沃达丰和辉瑞制药。有些投资载体多次购买整个公司。巴菲特的伯克希尔·哈撒韦公司（Berkshire Hathaway）和私募基金黑石（Blackstone）正是例子。很多工业企业不断实行“补强型并购”，以获取新的专长或者抢夺某种产品的市场份额。未来五年工业集团霍尼韦尔（Honeywell）计划投入100亿美元用于这类收购。

同行并购综合了以上方式的所有元素。频繁交易是一个明确的目标。理想

情况下，这些交易的累积规模将大大超过同行并购之前公司的原始价值。这些公司的目的是整合它们买下的企业，享受管理费用分摊的益处。它们的目标通常是类似的行业。呈现在投资者面前的同行并购公司并非一个以资产净值之类的标准衡量的多元化投资基金，而是一家统一的公司，其业绩应当以利润和现金流来评判。

按照这一定义，美国目前的同行并购公司总值可能达1000亿美元。有些知名公司以同行并购起步，逐渐成长为跨国巨头。如今市值650亿美元的媒体帝国、约翰·马龙（John Malone）的自由传媒集团（Liberty Media）自20世纪70年代开始在美国乡村地区买进微型有线电视网络。正在收购其英国对手南非米勒（SABMiller）的比利时啤酒酿造商百威英博（AB InBev）堪称史上做得最好的同行并购公司。它起步于1999年巴西两家中等规模酿造商的联姻，之后继续买进各种啤酒品牌，比客户豪饮的速度还快。如果这次南非米勒的交易完成，百威英博将凭借不断并购，在全球最有价值的公司中名列第13位。

20世纪70年代和80年代像詹姆斯·戈德史密斯爵士（Sir James Goldsmith）这样的公司流氓通过一个接一个大胆鲁莽的收购行动创造了企业集团。但是同行并购公司在20世纪90年代渐趋成熟。1994年到1998年间，美国有大约90家这样的公司上市，它们用从外部投资者处募集的资金购买其他公司。它们冒险进入华尔街还未屈尊涉足的经济角落：美发、殡仪馆、自动售货机、公共汽车、租碟店和垃圾清理等盛产交易的领域。从某个层面来说这是合理的：碎片化的行业得以整合，取得了规模经济。

但是20世纪90年代也展现出同行并购公司的黑暗面。很多公司玩起了危险游戏，挑动投资者的期望，这样它们的股票估值能被推高。通过用这些估值高的股票（或债务）购买估值低的小公司股份，它们能迅速提升每股收益，给人以公司发展的假象。当它们的股票失宠时，游戏就结束了。面对多到令人眼花缭乱的收购，很多同行并购公司在并购的执行及随后的整合这一复杂的漩涡中苦苦挣扎，力不从心。

有些公司陷入了会计花招和欺诈的指控。监管机构指控废弃物处理公司

Waste Management夸大利润达17亿美元。该公司被指控的罪名还包括未将其大型货车价值折旧。20世纪90年代，三位学者基斯·布朗（Keith Brown）、艾米·迪特马尔（Amy Dittmar）和昂利·塞尔瓦（Henri Servaes）对公司交易展开研究后发现，整体而言，同行并购公司令投资者亏钱，但是赢家和输家还是天差地别。

那么有没有办法从同行并购公司中慧眼识金？正如Valeant和Jarden的例子所示（见图表），要做到这一点难度大得惊人。就某些方面而言Valeant看似更为优秀。到目前为止，剔除收购收益，它已经取得了更快的基本销售额增长，尽管它对买进的药物涨价可能会引起反弹。每销售一美元，它转化的现金流比Jarden更多，虽然它能做到这一点部分是因为它买下的公司赚取现金的能力本来就很强。两家公司的杠杆相当，相对于其规模而言，对收购的野心也类似。最大的差别是收购的数量以及买进的价格。对于价格，Jarden精挑细选、坚守原则，而Valeant则疯狂且草率。此外，对Jarden有利的一点是它涉足的行业都很简单，而Valeant所在的医药行业则非常复杂。

Jarden的联合创始人马丁·富兰克林（Martin Franklin）显然相信并购做大的法则。尽管他正在出售自己最大的同行并购公司，但他已开始兴办其他公司，包括在化学品行业运营的Platform Specialty Products。对于同行并购公司来说，总有稳定数量的目标公司备选。大公司始终在重新思考它们的策略，出售下属公司。很多行业仍零零散散，例如过多的科技创业公司有朝一日可能需要一个更大的平台，再如美国的页岩能源产业中，成千上万身处困境的小公司需要栖身之所躲避风暴。总有企业家愿意在资本主义的地毯底下嗅来嗅去，寻找价廉物美的好买卖，他们热爱下一次交易带来的刺激。 ■



Auction houses

House pride

The art world is changing faster than Sotheby's and Christie's are adapting their business model

BETWEEN them Sotheby's and Christie's, the Western world's two largest auction houses, have been in business for 522 years. They display many of the characteristics of old men: a gouty gait that makes them slow to adapt; and a fixation on ancient rivalries that leads them to butt heads repeatedly rather than focus on reviving their businesses for the rapidly changing world around them.

Striving to stay on top is hard work. Christie's, a private company owned by a French luxury-goods billionaire, François Pinault, gives little away. But in a brief overview of its 2015 results, released on January 26th, it admitted that sales were down by 5% compared with 2014, to £4.8 billion (\$7.4 billion). "This is a blip," its deputy chief executive, Stephen Brooks, insists. More worrying was the news that the slump was not just in Old Master paintings, in which buyers have for some time been losing interest. Sales also slipped in the areas that have been the engines of recent growth: watches, wine, even post-war and contemporary art, which has captured the imagination of the global new rich but which fell by 14% in sterling terms and 20% in dollars.

Four days earlier, Sotheby's new chief executive, Tad Smith, told analysts in New York that its sales were flat compared with 2014's, that the firm would post fourth-quarter losses of up to \$19m and that it was scrapping its dividend. Sotheby's shares have fallen by more than half in the past six months.

In part the weakness of the big two's sales is because of the world's wealthy,

Russians especially, drawing in their horns. But in part it is because their business model is looking outdated, leaving them vulnerable to sprightlier rivals.

Although Christie's clocked up more auction sales than Sotheby's, \$6.5 billion against \$6 billion (the rest comes from private sales they broker), the two firms have broadly similar overheads. Each employs between 1,600 and 2,000 people. Between them they hold nearly 750 auctions a year in more than 80 categories—some significantly less profitable than others. Together they run more than 140 offices in 40 countries, and have 22 salerooms.

Under pressure from activist shareholders who want to see a better return on capital, Sotheby's has made a high-profile (if costly) effort to reduce its head count by 5% over the past few months. Christie's, too, has been quietly shedding staff for over a year. But neither feels it can afford to cut back too far for fear of weakening itself compared with the other.

| *Expensive promises*

The high cost of protecting this duopoly is most visible in guarantees that the auction houses make to sellers about the price they can expect if they sell their treasures. In deciding where to consign their works, rich collectors play off one auction house against the other to force up the guarantee. Often they also demand a slice of the buyer's premium (the fee charged to buyers on top of the hammer price) and a reduction in the commission that sellers have to pay, thereby cutting the auctioneer's margin.

Sotheby's has had its manicured fingers burned by a generous guarantee it gave to the heirs of its late chairman, Alfred Taubman, on the sale of his collection. Christie's says it pushed up its offer to the Taubman family to well over \$400m. So as not to lose face, Sotheby's, which had estimated the

collection's worth at \$500m, offered a guarantee of nearly \$515m. On the items sold by the end of 2015, Sotheby's reckons, it was \$12m out of pocket including its marketing expenses.

On January 27th it auctioned off a batch of the Taubman collection's Old Masters, reducing its overall loss to \$9m, though 17 of the 67 lots on offer, including Ligozzi's "The Abduction of the Sabine Women" (pictured), did not sell. More than 200 other works will be sold in the spring.

Sotheby's is not alone in making foolhardy decisions to win or keep business. Last year Christie's offered a guarantee of about \$45m on a silk-screen by Andy Warhol called "Four Marilyns", from 1962. The offer caused surprise, as the picture had been knocked down at auction, just two years earlier, at \$34m. The deal was complicated. The seller was Kemal Has Cingillioglu, a scion of a prominent Turkish banking family who sits on Christie's European advisory board. He owed the auction house money for a work by Cy Twombly that he had contracted to buy privately.

The market was less than impressed. The Warhol picture, it judged, was being "flipped"—returned for sale too quickly—and the auction estimate of \$40m-60m was viewed as over-optimistic. In the event its hammer price was \$32m, resulting in a considerable loss for Christie's.

This is not the only source of pressure on the auction houses. In the past decade the contemporary-art world has ballooned, with new fairs, biennials and exhibition spaces opening everywhere. According to a recent report by Clare McAndrew, a respected art-market analyst, \$33.1 billion-worth of art and antiques were sold at auction in 2014, half of all sales. An increasing amount is being traded in undisclosed private deals arranged by brokers.

| *Information is power*

Time was when the big auction houses had a near-monopoly on information about the art market, which gave them an edge over customers as well as potential rivals. But now buyers, sellers and dealers are much better informed, and the mystique of the auction room has faded. Many collectors regard their contemporary art as an alternative asset class, which has prompted the launch of new businesses offering market data, tax advice and analysis of the investment potential of art.

Sotheby's and Christie's have been trying to grab a larger slice of this pie. Earlier in January Sotheby's paid \$85m for Art Agency Partners (AAP), which was set up less than two years ago by a former Christie's specialist, Amy Cappellazzo, and two other founders. Left out of the deal was a \$125m art-investment fund AAP had set up with seven of its clients. ("It was clear we could have raised much, much more," says one partner, Adam Chinn.)

The fund, now the second-largest in the world, has spent only half of the money it had raised, but has already managed to return an impressive \$15m to investors. Such funds, like the burgeoning art-advice business, are a promising area that the big two auction houses have been slow to move into.

The two houses realise there is much that they must do to protect their dominance. They need to consolidate their expansion into growing markets in Asia and elsewhere. They must draw new buyers into the art market by first enticing them to buy watches, wine and other luxuries. They need to improve their online-auction platforms, in the face of rising competition. And they must expand their share of the middle market—lots with a value of up to \$2m—where there is no need to offer guarantees or discounts to attract sellers, thus making it more profitable than selling more valuable works. Most important, the auction houses must do more to please buyers, expanding what they call "demand-led curation" by creating

more imaginative, well-timed sales, and by collating and digitising the information they hold on sellers, to help buyers find what they want.

If they do not do all this, others will. Phillips, a smaller auction house, may have been founded in 1796 but it has recently showed the ambitions of a startup. Just over 18 months ago its two owners, Leonid Fridlyand and Leonid Strunin, the founders of Mercury Group, a Russian retailer of luxury goods and cars, appointed a former boss of Christie's, Edward Dolman, to start snapping at the heels of the big two.

Phillips's elegant new headquarters, with its carefully curated contemporary-art exhibitions, in Berkeley Square in London, mask a lean operation: two offices and a staff of just 225 compared with seven or eight times as many at each of the other two houses. The focus is on getting the new rich hooked on buying, first, watches and then contemporary art; and on finding out what such clients want and providing it.

The strategy is working. From a standing start, Phillips sold \$80.3m-worth of watches in 2015. Total auction sales, at \$523m (mostly of contemporary art), were 34% higher than in 2014. Mr Dolman expects Phillips to reach \$1 billion within three years. Although the bosses of Sotheby's and Christie's are telling investors that last year's weak figures were just a temporary setback, the market is changing fast. The big two need to sharpen up. ■



拍卖行

傲慢拍卖行

艺术品界正迅速变化，而苏富比和佳士得未能及时调整业务模式加以适应

苏富比和佳士得这两家西方最大的拍卖行合计已经经营了522年。它们已显示出很多老迈的症状：僵化的组织使它们应变迟缓；执着于旧恩怨让它们反复地针锋相对，而不是专注于振兴业务以应对周围快速变化的世界。

奋力保持领先殊为不易。私人公司佳士得为法国奢侈品亿万富翁弗朗索瓦·皮诺特（François Pinault）所有，几无公开信息。但在1月26日发布的2015年业绩简报里，该公司承认，相比2014年，销售额下跌5%至48亿英镑（74亿美元）。“这是暂时的波动。”佳士得的副首席执行官斯蒂芬·布鲁克斯（Stephen Brooks）坚称。引发更多担忧的是，不仅早期绘画大师的作品成交下滑——买主对此失去兴趣已有一段时间，那些成为近期拍卖增长引擎的领域——手表、红酒，甚至是战后和当代艺术品的销售也出现下滑。它们曾经令全球新富阶层着迷，但按英镑计算交易额下跌了14%，按美元计算下跌了20%。

佳士得发布该简报的四天前，苏富比的新任首席执行官塔德·史密斯（Tad Smith）在纽约向分析师表示，相比2014年，公司销售额持平，第四季度将公告最高达1900万美元的亏损，公司已取消分红。过去六个月里，苏富比的股价已经下跌超过一半。

两大拍卖行销售疲软的原因之一是全球的富人，特别是俄罗斯富豪，正在勒紧钱袋。但另一原因则是它们的业务模式看起来已经过时，令它们容易遭受富有活力的竞争对手的冲击。

尽管佳士得65亿美元的拍卖额高于苏富比的60亿美元（销售额的其余部分来自它们经纪的私人交易），这两家公司的日常开支大体相近。它们各自雇用了1600到2000名员工。两家公司每年总共在80多个品类里举行近750次拍卖——其中一些品类交易的盈利明显低于其他品类。合在一起，它们

在40个国家有140多个分公司，并拥有22个拍卖场。

维权股东想要看到资本有更好的回报，在他们的压力下，苏富比已经进行了引人注目的（也许也是代价高昂的）努力，在过去数月里裁减了5%的员工。佳士得也在过去一年多里悄悄进行了裁员。但是两家公司都感到不能承受过度的裁员，因为担心自己会弱于另一家。

| 昂贵的承诺

要保持双寡头的局面代价高昂，这在担保上体现得最为明显。如果买家出售藏品，拍卖行向他们担保可望达成的售价。在决定向谁委托拍卖时，富有的收藏家挑动两家拍卖行相争，以迫使它们推高担保额。他们还经常要求在买家佣金（在成交价之外向买家收取的费用）中分一杯羹，而且还要求降低卖家所必须支付的佣金，这样就减少了拍卖行的利润。

精明如苏富比，也曾在担保上吃过苦头——在拍卖其前董事长阿尔弗雷德·陶布曼（Alfred Taubman）的藏品时，该公司向他的后人支付了巨额担保。佳士得称，它曾向陶布曼家族提高报价至远超4亿美元。所以，为了不丢面子，苏富比提出了近5.15亿美元的担保，尽管它对藏品的估价为5亿美元。苏富比预计，这批藏品在2015年底前售出的部分，包括营销开支在内，已经导致了1200万美元的亏损。

1月27日，苏富比拍卖了陶布曼一批早期绘画大师的藏品，将整体损失减少到900万美元，尽管67件拍品中有17件未能成交，包括利格齐（Ligozzi）的“强掳萨宾女人”（The Abduction of the Sabine Women，见图）。超过200件其他作品将在春季出售。

为了赢得或保持业务而做出鲁莽决策的并非只苏富比一家。去年，面对安迪·沃霍尔（Andy Warhol）创作于1962年、名为“四个玛丽莲”（Four Marilyns）的绢印版画，佳士得给出了约4500万美元的担保。这一出价引起震惊，因为仅仅两年前，这幅画在拍卖中以3400万美元成交。这一交易很复杂。卖主是凯末尔·哈斯·辛吉里格鲁（Kemal Has Cingillioglu），他是土耳其著名银行家族的后裔，也是佳士得欧洲咨询委员会的成员。他

曾签约私下购买赛·托姆布雷（Cy Twombly）的一幅作品，因此欠拍卖行一笔款项。

市场并不那么折服。人们认为，沃霍尔的作品是短期内再度转手拍卖，4000至6000万美元的拍卖估价过于乐观。在拍卖中，这件作品以3200万美元成交，佳士得承受了重大亏损。

这并非拍卖行唯一的压力来源。过去十年里，当代艺术品领域迅速膨胀，新的博览会、双年展和展示中心遍地开花。备受尊敬的艺术市场分析师克莱尔·麦克安德鲁（Clare McAndrew）最近发表的报告指出，2014年经拍卖成交的艺术品和古董价值331亿美元，占总成交额的一半。越来越多的藏品通过经纪商安排的非公开私人交易买卖。

| 信息就是力量

大拍卖行一度几乎垄断了艺术品市场的信息，这令它们面对客户和潜在竞争对手时占有优势。但现在，买主、卖主和交易商的信息都大为灵通，拍卖行的神秘色彩已经消退。很多收藏家把当代艺术品作为另类资产，这催生了新的业务来提供市场数据、税务咨询以及艺术品投资潜力分析。

苏富比和佳士得力图攫取更大的市场份额。一月初，苏富比花费8500万美元收购了Art Agency Partners（AAP），AAP由佳士得前专家艾米·卡佩拉索（Amy Cappellazzo）和另外两位创始人于不到两年前创立。未包括在交易内的是AAP联合7位客户建立的1.25亿美元的艺术投资基金。（“当时很明显，我们本能够募集到多得多的资金。”一位合伙人亚当·钦[Adam Chinn]说道。）

这一基金规模位居世界第二，只花出了所融得资金的一半，但已经向投资者回报了1500万美元，表现出色。这类基金同迅速发展的艺术品咨询业务一样，都是前景光明的领域，而两大拍卖行在这些方面的发展却很缓慢。

两大拍卖行认识到必须采取很多行动来保护自己的支配地位。它们需要把扩张整合到亚洲及其他地方的增长市场中。它们必须吸引新买主进入艺术品市场，首先引诱他们购买手表、红酒和其他奢侈品。面对日益激烈的竞

争，它们需要改进在线拍卖平台。它们还必须提升在中端市场（拍品价值不超过200万美元）的份额，这一市场不需要提供担保或折扣来吸引卖主，因而比拍卖更高价值的藏品利润更高。最重要的是，拍卖行必须做更多工作取悦买主，通过创造更有想象力、更合时宜的拍卖来扩展它们所谓的“需求导向策划”，通过将卖主的信息整理并数字化，帮助买主找到心仪的藏品。

如果它们做不到这一切，其他人会做到。一家较小的拍卖行菲利普斯（Phillips）可能在1796年就已建立，但它最近展示出了创业公司般的雄心。它的两位所有人里奥尼德·弗里德兰（Leonid Fridlyand）和里奥尼德·斯特鲁宁（Leonid Strunin）是俄罗斯奢侈品和豪车零售商“水星集团”的创始人。18个月前，两人任命了佳士得的前老板爱德华·多尔曼（Edward Dolman），开始紧追两大巨头。

在伦敦伯克利广场（Berkeley Square），菲利普斯优雅的新总部以及其精心策划的当代艺术展掩盖了其精简的运营：两个办公室，仅仅225名员工。相比之下，两大巨头的员工数量分别是它的7或8倍。重点是让新富人士先迷上竞拍手表，然后是当代艺术品，此外还要找出这些客户的喜好并加以满足。

这一战略正在发挥作用。从零起步，菲利普斯在2015年卖出了价值8030万美元的手表。总拍卖额为5.23亿美元（大多为当代艺术品），比2014年高出34%。多尔曼期望菲利普斯在3年内实现10亿美元的拍卖额。尽管苏富比和佳士得的老板向投资者表示去年的疲弱数字只是暂时挫折，但市场确实在迅速变化。两大拍卖行亟需变得更敏锐。 ■



Japanese entrepreneurship

Thinking inside the box

Furniture for the introverted

IT STARTED in a cosy *izakaya*, or pub, in Fujieda, in Shizuoka prefecture, when a gathering of furniture-makers dreamed of marking out some space for themselves in their cramped family homes. The result was an *otoko no kakureya*, or “hiding place for men”, a tiny, cockpit-like wooden room with a desk, shelves and reclining chair. Sales are taking off.

Another popular Japanese product offering the illusion of personal space is the Solo Theatre (pictured), a cardboard box that users put over their heads, which has a slot for Apple’s iPhone. Inside there is a black cut-out of a row of heads, as if the user is at a cinema.

The product’s surrealism has tickled thousands of Japanese social-media users. It is a selfish product that appeals to the need to get into a small womblike space of one’s own and watch films and other content, explains Satoshi Aoyagi, of Lucy Alter Design, who fashioned it with a colleague.

Another factor is shrinking living-space. The average Japanese apartment has dwindled from 70 to 60 square metres over the past decade, so that people are even more on top of each other. Cultural forces are powerful too, notes Masahiro Abe, a sociologist at Konan University. Japanese must don a public mask for their hierarchy-bound, open-plan offices, and a second face for their families. Turning to small, private boxes at home is their way of searching for a “third space”, he says.

Hayato Kasai, a subculture expert at Bibi Lab, a design firm, went so far as to bring a tent to the office as a way of tucking himself away and avoiding interaction with colleagues. His company quickly spotted a new product in

it, and designed an indoor “Bocchi Tent”. *Bocchi* is a sarcastic word for “alone”, but now it is becoming a brand.

There is also a new “Danbocchi” soundproofed cardboard box for karaoke from Bandai Namco Entertainment, a video-game company, so that singers no longer have to record under blankets at home. Bibi Lab’s tent for loners now far outsells the firm’s regular ones for camping outdoors.

Despite the success of such products at home, it remains unclear if there is much demand outside Japan from people hankering for privacy. They are also examples of the introversion of Japanese product designers, who nowadays tend to think more of the home market, and struggle to create world-beating ideas like the Sony Walkman. They are also often unwilling to compromise. One enthusiastic customer asked the makers of the Solo Theatre to produce a double-sized cardboard box so that he could watch films in it with another person. The answer was a firm “no”. ■



日本的企业家精神

箱中思考

内向者的家具

事情的开端是一群家具制造商聚集在静冈县藤枝市一家舒适的居酒屋（日本酒吧）内，梦想着能在他们拥挤的家中创造出一点私人空间。结果就搞出了“男人的藏身小屋”（*otoko no kakureya*），这是一间设有书桌、书架和躺椅的驾驶舱式小木屋。如今它的销量不断攀升。

日本另一款带来私人空间错觉的热销产品是“个人电影院”（Solo Theatre）（如图）。这是用户带在头上的纸板箱，设有苹果iPhone插槽。箱内还有一排黑色的头像剪纸，使用户仿佛置身于电影院之中。

这款超现实主义的产品深得成千上万日本社交媒体用户的欢心。设计公司 Lucy Alter Design 的青柳聪（Satoshi Aoyagi，音译）与另一位同事共同制作了这款产品。他表示，这是一款自私的产品，迎合了人们渴望进入一个子宫般狭小的私人空间、观看电影和其他内容的需要。

另一个因素是生活空间在不断缩小。过去十年里，日本公寓的平均面积已经从70平方米下降到60平方米，人们的住所因而更加拥挤不堪。甲南大学（Konan University）的社会学家阿部真大（Masahiro Abe）指出，文化的力量也很强大。在日本等级森严的开放式办公室里，人们必须带上一副对外的面具，而面对家人时又换上另一副面孔。他表示，回到家退居至私密的小箱子是他们寻找“第三空间”的方式。

设计公司“毕比实验室”（Bibi Lab）的亚文化专家笠井勇人（Hayato Kasai，音译）更为出格，他居然把帐篷带到办公室里，用这种方式躲藏起来，避免与同事互动。他的公司很快就意识到这可以成为一种新产品，进而设计出一种室内的“博基帐篷”（Bocchi Tent）。博基是“单独”的讽刺说法，如今却成了一个品牌。

电子游戏公司万代南梦宫娱乐（Bandai Namco Entertainment）还生产了一款名为“一个人纸箱屋”（Danbocchi）的新型隔音纸板箱，供卡拉OK之用，让在家唱歌的人无需再躲到毛毯下面录音。“毕比实验室”为孤僻之人设计的帐篷如今销量远超该公司的常规野外露营帐篷。

尽管这类产品在日本国内很成功，但尚不确定国外渴望隐私的人们对它们的需求有多大。它们也体现了日本产品设计师的内向倾向。如今，设计师们往往更多地考虑国内市场，而难以创造出像索尼随身听这样能称霸全球的金点子。他们也往往不愿意妥协。一位热情的顾客曾请“一个人剧院”的制造商生产一个两倍大的纸板箱，这样他就能和另一个人在里面一起看电影了。回答却是一个坚定的“不”。■



Room rentals v hotels

Buffett's revenge

Services like Airbnb are altering the economics of the hotel business

FOR those exhausted by the festive season, now is the time to book a holiday. Hotels in New York's Times Square cost four times more on New Year's Eve than they do just a week into 2016; a room at the cheapest four-star property in Cancún in Mexico on December 31st was half as dear by January 7th.

The economics behind this price crash are simple: hotels are expensive to build and staff, and demand for them is seasonal. Only by ramping up prices at peak times can they be run profitably. But seasonality inflicts wider economic costs than eye-watering bills. Tourists find other destinations because rooms are full on their desired dates and, despite lower prices, inventory goes unused during the off-season. One-off events like sports tournaments, concerts and conferences can exacerbate the problem of mismatched supply and demand, by flooding cities with visitors for just a few days.

The advent of the "sharing economy" should offer a solution. Just as Uber's surge pricing draws part-time taxi drivers onto roads at rush hour, room-rental services like Airbnb, HomeAway and Onefinestay should allow a city's supply of temporary accommodation to expand when more people want to stay there. Airbnb recently released data to support this hypothesis, showing that many of the site's hosts list their homes specifically to cash in on periods of high demand (see chart).

The shareholders' meetings in Omaha, a Midwestern American city, of Berkshire Hathaway, a financial conglomerate, provide a good illustration. In 1980 12 people showed up to the first one, including the firm's boss,

Warren Buffett. These days, the gathering draws some 40,000, the equivalent of nearly 10% of the city's population. Omaha's few hotels have built their business models around this surge, jacking up prices to as much as \$400 a night and imposing three-day minimum stays around the one-day event. This has outraged the frugal Mr Buffett, who has threatened to move the conference to Dallas.

Happily, home-sharers have begun to offer some competition. In the three weeks before the 2015 meeting, 1,750 Omaha residents added new properties to Airbnb—the equivalent of three Omaha Hiltons, the city's biggest hotel. That brought the number of Airbnb listings in the city to 5,000, of which 76% were occupied on May 1st at an average price of \$209. Moreover, Airbnb hosts only charged 60% more during the meeting than in days before and after. The surge at hotels was 200% or more.

Omaha may be an exceptional case, but it reflects a trend. Across the 31 specific events for which Airbnb shared data, the number of listings rose by 19% in the three preceding weeks. Three times as many stays occurred during the period of the events as in the weeks before and after. Even cities where supply has expanded slowly are seeing more stays. Airbnb bookings during the Volta art fair in Basel, Switzerland, last year were 268% higher than during the neighbouring weeks, even though listings rose by only 6%.

The Airbnb figures do not spell the end of extortionate hotel prices. Spare-room rentals and hotels are not perfect substitutes: many visitors want the service and convenience of a hotel. Room rentals, naturally, have more of an impact in smaller cities than in big ones, which can more easily absorb an influx of visitors. Airbnb's turnover in Paris during the 2015 French Open tennis tournament rose by a mere 4%.

But by easing temporary supply squeezes, room rentals may change the economics of the hotel business, at least in smaller cities. If hotels can no

longer double their prices when demand peaks, that could drive weaker properties out of business. Those that stay afloat may need to increase rates at other times of year, which could further depress off-season travel and hurt complementary businesses such as restaurants and taxis. Conversely, more room rentals should also mean that more money flows directly to residents every time small cities stage a tourist-magnet event. (Airbnb passes on around 85% of guests' total payments to hosts, whereas hotels spend just 30-35% on labour.) At the margin, that might increase municipal governments' appetite to host such events. Omaha 2024, anyone? ■



客房出租对阵酒店

巴菲特的报复

Airbnb这类服务正在改变酒店业背后的经济规则

对那些因节日而疲惫不堪的人而言，现在是时候预定一次假期了。纽约时代广场的酒店跨年夜房价比2016年第一周要贵四倍；墨西哥坎昆（Cancún）最便宜的四星级酒店的房价到1月7日已降至12月31日的一半。

这种价格暴跌背后的经济规则很简单：建造酒店和配备人员都代价不菲，而对酒店的需求则呈季节性。酒店只有在旺季提价才可能盈利。但是，季节性带来的经济成本不只是让人心痛的账单。如果游客想要出游的日子房间全部订满，他们只得换到其他目的地。同样，尽管淡季房价较低，酒店房间还是闲置。体育赛事、音乐会和会议等一次性活动可能会加剧供求不匹配的问题，因为它们令城市在短短几天里人满为患。

“共享经济”的出现应该可以提供一种解决方案。就像优步的动态提价（surge pricing）能吸引兼职出租车司机在高峰期上路，当更多的人想在某座城市逗留时，Airbnb、HomeAway和Onefinestay等房间出租服务应该能让城市的临时住宿供应增加。Airbnb最近为支持这种假设而公布的数据表明，许多房东在其网站上发布自家房源，就是专门为了在需求高峰期获利（见图表）。

金融集团伯克希尔哈撒韦公司在美国中西部城市奥马哈（Omaha）举办的股东大会是一个很好的例子。包括公司老板巴菲特在内，仅有12人参加了1980年的第一届会议。如今，这一聚会吸引到大约4万人，相当于这座城市人口的近10%。奥马哈为数不多的几家酒店都围绕这种需求激增建立了自己的商业模式，提价至高达400美元一晚，并硬性规定要求最少住三天，尽管这场活动仅为期一天。这激怒了节俭的巴菲特，他威胁要把会议搬去达拉斯。

令人高兴的是，分享住房的房东们已经开始构成一些竞争。2015年大会前

的三个星期里，1750位奥马哈居民在Airbnb上登记了新房源——相当于该市最大酒店希尔顿客房数量的三倍。这使奥马哈在Airbnb发布的房源增加到5000个，5月1日的入住率达76%，平均房价为209美元。此外，Airbnb的房东们在大会期间只收取比平时高60%的房费，而酒店则至少要提价200%。

奥马哈的情况或许是个特例，但它反映了一种趋势。纵观Airbnb分享了数据的31项具体活动，房源数量在活动前三周内上升19%，活动当周的入住率是平时的三倍。即使在房源增长缓慢的城市，入住率也提高了。去年瑞士巴塞尔VOLTA艺术展（Volta art fair in Basel）期间，Airbnb的预订量比前后几周增加了268%，尽管发布的房源只增加了6%。

Airbnb的数字并不意味着过高的酒店房价即将终结。空房出租并非酒店的完全替代品：许多游客需要酒店的服务与便利。相比大城市，客房出租自然会对较小的城市影响更大，因为大城市更容易消化大量涌入的游客。2015年法国网球公开赛期间，Airbnb在巴黎的营业额只增长了4%。

但是，通过缓解临时供应的压力，客房出租或许会改变酒店业背后的经济规则，至少在小城市是这样。在需求达到高峰时，酒店如果再也不能把价格翻倍，较弱的酒店就可能会被挤垮。那些尚可维持的酒店或许需要在一年中的其他日子提价，而这可能会进一步抑制淡季旅行，并损害餐馆和出租车等互补性业务。反过来说，客房出租的增多也应该意味着小城市每举办一次吸引游客的活动，就会有更多资金直接流向居民。（Airbnb把房客付费总额的85%返还给房东，而酒店只在劳工上花费30%至35%。）存在如此大的差额，这也许会增加市政府举办此类活动的兴趣。2024年奥马哈申办奥运会，有人感兴趣吗？ ■



Klarna

Getting more ambitious

A payments unicorn seeks to become a dray-horse bank

THERE is a through-the-looking-glass quality to the blue-lit tunnel that leads into the headquarters of Klarna, a Swedish online-payments firm. And there is something back-to-front about the company itself. It is a startup firm that grew up in Europe, and is now seeking to expand into America—the reverse of the usual pattern. Unlike most tech unicorns galloping to expand their market share, it already makes a profit. Even more strikingly, it plans to move from an area of financial ferment—mobile payments—into the sterile old business of retail banking. Investors are giddy about its plans, however unusual: a funding round last year valued the firm, whose name is Swedish for “getting clearer”, at \$2.25 billion, up by almost a billion on the year before.

Klarna’s business “is quite basic”, says Sebastian Siemiatkowski, its founder and boss. Some 65,000 online merchants have so far hired it to run their checkouts. Its main appeal, for both retailers and their customers, is the simplicity of its system. Shoppers do not have to dole out credit-card details or remember a new password. Instead, they can simply give an e-mail and a delivery address, and leave the payment to be sorted out later. (Klarna pays the retailer in the meantime, and bears the risk that shoppers will not stump up in the end—something few other payment firms do.) Customers who have previously used one Klarna-run checkout are recognised when they visit another, further reducing the need to fill out online forms. All this hugely increases the “conversion” rate—the proportion of customers who actually make a purchase after putting an item into their online “basket”.

Like many fintech firms, Klarna believes that its algorithms do a better job

of identifying creditworthy customers than the arthritic systems used by conventional financial firms. It relies on the e-mail and delivery addresses supplied, as well as the size and type of purchase, the device used, time of day and other variables. This not only allows it to bear the risk that customers fail to pay when Klarna bills them, but also to offer them extended payment plans, for a fee. These loans have higher margins than the cut-throat online-payment business—although the giants of the industry, such as PayPal, are experimenting with similar offerings.

Klarna handled sales of roughly \$10 billion in 2014 (compared with PayPal's \$235 billion), generating \$300m in revenue, all in Europe. (It has not yet made public figures for last year.) It handles 40% of online payments in Sweden. In 2014 it bought a German firm, Sofort, expanding its presence there. It thinks it can continue to grow in Europe, but its main focus now is America, where it launched in September.

Klarna has not been signing up American retailers as quickly as it had anticipated. But it hopes two global trends will speed its expansion. The more that online shopping moves to phones, the more pressing it is for all online traders to make their checkouts quick and easy to use, but still safe. Customers particularly detest typing in credit card numbers on their phones, especially if asked to do so in public—while riding a busy bus, say. Klarna reckons over 60% of its business today involves mobile shopping, compared with less than 10% two years ago. Some retailers, such as sellers of shoes and clothes, report an especially rapid shift to mobile.

The other broad trend is for shopping across national borders. Online markets, such as Wish.com, connect bargain-hungry consumers in rich countries to producers of clothes, watches, toys or jewellery in, for example, China. Klarna works with Wish on European sales, letting customers pay for goods ordered cross-border only after getting them, which can take weeks. That reassures shoppers not ready to trust an

anonymous Chinese T-shirt firm to deliver. Many sellers are appalled by the prospect of having to comply with different countries' financial laws, say on extending credit, so they readily outsource payments.

Klarna, in contrast, is a glutton for regulatory punishment. In fact, it is entering the most regulated bit of finance: retail banking. It is licensed as a bank in Sweden, which allows it to collect deposits from all over Europe. Mr Siemiatkowski sees this as a cheap source of financing, but also as a big opportunity. Just like online shoppers, he argues, bank customers are desperate for a safe-but-simple mobile interface like the one Klarna offers in payments. The firm's 45m users provide it with a big and growing pool of potential banking customers who already have an inkling of the sort of service it can provide. "In the longer term we need to reimagine what banks really are," he says, sounding like a typical fintech boss at last. ■



Klarna

雄心愈壮

独角兽支付公司欲成传统零售银行

通过那蓝光照亮的隧道进入瑞典网络支付公司Klarna的总部时，颇有走进《艾丽斯镜中奇遇》的感觉。这家公司还有几分颠倒行事的味道。作为在欧洲成长的创业公司，Klarna正努力扩展至美国——与通常的模式相反。有别于一心扩展市场份额的大多数高科技独角兽，Klarna已实现盈利。更引人注目的是，该公司计划从移动支付这一金融热土转移至零售银行这项贫瘠的传统业务。无论该计划有多么不同寻常，投资者却为之兴奋若狂：这家在瑞典语中名为“愈加清晰”的公司去年一轮融资的估值为22.5亿美元，较前年上升近十亿。

Klarna的业务“相当简单”，其创始人及总裁塞巴斯蒂安·西米亚特科夫斯基（Sebastian Siemiatkowski）表示。迄今已有约6.5万网上商户利用Klarna收款。对于零售商及其顾客而言，该平台的引人之处主要是系统简便。购物者无需输入信用卡的详细信息或记住新密码，而仅需提供电子邮箱和送货地址，余下的支付过程平台会自行处理。（Klarna会立即向零售商支付货款，承担购物者不一定最终付款的风险——其他支付公司很少这么做。）曾使用Klarna支付的顾客在光顾利用此平台的其他商户时会被识别出来，进一步减免填写在线表格的手续。所有这一切大大提升了“转化率”——顾客把商品放入网上“购物车”后实际购买的比率。

跟许多金融科技公司一样，Klarna认为其算法比传统金融机构采用的僵硬体系更能辨别信誉良好的客户。除了客户提供的电邮及收货地址，该算法还运用顾客购物的金额和种类、所用设备、时段及其他变量作分析。因此，Klarna不但能承担风险，无惧寄送账单时顾客赖账，还可向顾客收取一定费用以提供延期付款的服务。相比竞争激烈的网上支付业务，这类贷款的利润率更高，但该行业的各巨头，如PayPal，也正尝试提供同类产品。

2014年，Klarna处理的交易额约为100亿美元（PayPal的数字为2350亿美元），创造了三亿美元的收入，全部来自欧洲。（公司去年的数据尚未公开。）Klarna处理瑞典40%的在线支付。在2014年购入德国公司Sofort后，Klarna把业务扩展至德国。该公司认为可继续在欧洲拓展，但目前的主要焦点是美国。它已于去年9月登陆美国市场。

Klarna招揽美国零售商的速度不如预期，但公司寄望全球的两大趋势帮助其加速扩张。越多的网络购物转向手机，所有网络商家就越迫切地要把支付程序变得快捷易用，而且还要保证安全。顾客尤其讨厌在手机上输入信用卡号，特别是在公众场合（比如在拥挤的公交车里）被要求这么做。Klarna估计目前其60%的业务涉及移动购物，而两年前这一数字不足10%。服装和鞋履等一些零售商表示，其业务向移动端的转移尤为快速。

另一大趋势是跨境购物。Wish.com这类在线市场为爱买便宜货的富裕国家顾客寻觅到成衣、手表、玩具或珠宝制造商，比如各类中国厂商。Klarna与Wish.com合作处理其欧洲的支付业务，让顾客在收到跨境订购的货物后才付款，过程可能历时数周。购物者不一定信任中国某家不知名的T恤厂商能诚信交货，而这样的安排使其放心。许多商家对必须满足不同国家金融法规的合规要求不胜其烦，比如提供消费信贷，所以他们乐于把支付环节外包。

相反，Klarna全然不怕监管处罚。事实上，Klarna正步入金融业内监管最严的领域：零售银行业务。该公司在瑞典已获得银行牌照，可从欧洲各地吸储。西米亚特科夫斯基将此视为廉价的融资来源，同时也是巨大的机会。他认为，银行顾客和网上购物者一样，都极希望找到像Klarna支付平台那样安全而简单的移动界面。该公司的4500万用户为其提供了大量潜在的银行客户，而且数目还在不断增加，他们多少已体验过Klarna所能提供的服务。“长远来看，我们需要重塑银行的实质。”他说道，这听起来终于像金融科技老板的惯用口吻了。■



The first venture capitalists

Fin-tech

Before there were tech startups, there was whaling

FEW industries involve as much drama and risk as whaling did. The last voyage of the *Essex*, which inspired Herman Melville's classic, "Moby Dick", and is the subject of a new film, "In the Heart of The Sea", gives a sense of the horrors involved. The ship left Nantucket in 1819 and sailed for over a year before being destroyed by a whale it was hunting. The 20 crew members survived the sinking, but found themselves adrift in the Pacific in three longboats, with little food and no water. Three opted to stay on a desert island, from which they were rescued three months later, on the verge of starvation. The others sailed on, hoping to reach South America but dying one by one. At first the survivors buried the dead at sea; then they resorted to eating the corpses of their crewmates. When they ran out of bodies, they drew lots to decide whom to shoot and eat. Only five of the 17 were eventually rescued. By then, they were so delirious that they did not understand what was happening.

The only reason that anyone could be induced to take part in such a dangerous business was the fabulous profit that could be made. Gideon Allen & Sons, a whaling syndicate based in New Bedford, Massachusetts, made returns of 60% a year during much of the 19th century by financing whaling voyages—perhaps the best performance of any firm in American history. It was the most successful of a very successful bunch. Overall returns in the whaling business in New Bedford between 1817 and 1892 averaged 14% a year—an impressive record by any standard.

New Bedford was not the only whaling port in America; nor was America the only whaling nation. Yet according to a study published in 1859, of the 900-odd active whaling ships around the world in 1850, 700 were

American, and 70% of those came from New Bedford. The town's whalers came to dominate the industry, and reap immense profits, thanks to a novel technology that remains relevant to this day. They did not invent a new type of ship, or a new means of tracking whales; instead, they developed a new business model that was extremely effective at marshalling capital and skilled workers despite the immense risks involved for both. Whaling all but disappeared as an industry after mineral oil supplanted whale oil as a fuel. But the business structures pioneered in New Bedford remain as relevant as they ever were. Without them, the tech booms of the 1990s and today would not have been possible.

Most historians trace the origins of the modern company back to outfits like the Dutch East India Company and its British equivalent. These were given national monopolies on trade in certain goods or with certain places. This legally buttressed status allowed them to fund themselves by selling shares to the public, helping to get stockmarkets off the ground. The managers of these multinational enterprises were professionals with only small ownership stakes. Lower-level employees generally had no shareholding at all.

By eliminating dependence on individual owners or managers, these entities became self-perpetuating. But their monopolies also embroiled them in politics and led inevitably to corruption. Both the British and Dutch versions ended up requiring government bail-outs—a habit giant firms have not yet kicked.

The whaling industry involved a radically different approach. It was one of the first to grapple with the difficulty of aligning incentives among owners, managers and employees, according to Tom Nicholas and Jonas Peter Akins of Harvard Business School. In this model, there was no state backing. Managers held big stakes in the business, giving them every reason to attend to the interests of the handful of outside investors. Their stakes were

held through carefully constructed syndicates and rarely traded; everyone was, financially at least, on board for the entire voyage. Payment for the crew came from a cut of the profits, giving them a pressing interest in the success of the voyage as well. As a consequence, decision-making could be delegated down to the point where it really mattered, to the captain and crew in the throes of the hunt, when risk and return were palpable.

At the top of the New Bedford hierarchy was an agent or firm of agents like Gideon Allen, responsible for the purchase and outfitting of the ship, the hiring of the crew and the sale of the catch. To give them an incentive to cut the best deals possible, the agents put up a big share of the investment. Those with the best reputation received better terms from the other investors. Captains, who ran the show while the ship was at sea, often put up capital as well. A similar system of incentives is used in the riskier reaches of the investment-management business today, notes Mr Nicholas.

Investors received half to two-thirds of the profits. The rest was divided among the crew in what was known as the “lay” system. A captain might get a 12th lay (one-twelfth of the remaining profit). In Melville’s novel, Ishmael, who was new to the business, was originally offered a 777th lay but managed to haggle a 300th. Although that would probably have proved a paltry amount, it was a stake nonetheless, and set a benchmark for future pay. Ishmael’s friend Queequeg, a cannibal from the South Sea islands, got a 90th lay because he had experience with a harpoon. Demand for experienced crewmembers was so high that the *Essex*’s ill-fated captain, George Pollard, was immediately given a second command on the ship that rescued him (which sank as well).

Every participant wanted to bring in returns quickly, but there were no artificial deadlines—nothing resembling what is now called “quarterly capitalism”. When whales became rare in accessible places, the crews from New Bedford extended their search to every corner of every ocean, however

many years that took.

| *Safety in numbers*

To ensure that they were not ruined by a few disastrous voyages, the whaling firms invested in multiple expeditions at the same time, much as the venture capitalists of today “spray and pray”. A study published in 1997 concluded that, of the 787 boats launched from New Bedford during the 18th century, 272 sank or were destroyed. The firm that belonged to George Howland was not atypical: of its 15 ships, between four and nine were at sea at any given moment. One was sunk by a whale, three lost at sea, two burned by their crews, one destroyed by a Confederate gunboat during America’s civil war and five abandoned in Arctic ice. Yet Howland died a millionaire in 1852.

It helped that most of the whalers of New Bedford were strict Quakers, who prized frugality and shunned ostentation. This helped them not only husband their own capital, which was needed to finance voyages, but also to win over other investors. Hetty Howland Green, one of the richest agents, was said to have made her own shoes and to have owned only one dress.

It also helped that they were open-minded: they readily employed anyone who could contribute to their ventures. Perhaps the single most important technological innovation used by New Bedford’s whaling fleet was the “Temple Toggle”, a harpoon tip devised by Lewis Temple, a former slave from Virginia.

But the whalers’ main asset was their business model. In the 1830s, the legislatures of six American states approved charters for whaling corporations giving them the right to raise capital by selling shares to the public—much the same corporate structure as the Dutch and British East India Companies. None of the six survived the 1840s. “The diffuse

ownership structure of the corporations, and the reduced stakes held by their managers, likely diminished the incentives for the managers to perform their role diligently,” concludes Eric Hilt of Wellesley College. Given the expense of buying, outfitting and launching a boat into the perilous ocean, the link between risk and reward needed, it seems, to be tighter.

The lay system could work to the crew’s disadvantage, however. In an effort to reduce claims on the crew’s share of the profits, ruthless captains were said to abandon men on the trip home. (Similar shedding of employees is not unheard of at contemporary tech startups before a big payout.) Other schemes existed to cheat crew members, such as forcing them to buy clothing at inflated prices or to pay usurious interest on advances on their pay. And open-mindedness went only so far: although black sailors were not discriminated against in terms of pay, they were treated less well in other respects, receiving less food and worse quarters.

Yet the New Bedford system was undeniably effective. It soon emptied the oceans of whales, even as other lucrative opportunities emerged for daredevils determined to strike it rich, such as the California gold rush. “The same industrial growth that initially supplied markets and profits for whaling activity ultimately yielded opportunities more attractive than whaling to local capital,” wrote David Moment, a student at Harvard Business School, in 1957. In short, with returns dwindling, the crews and the capitalists turned to other ventures. But the business practices they developed are used in high-risk, high-return industries to this day. ■



第一批风险资本家

捕鲸业透视金融科技创业

今有高科技创业公司，昔有高风险捕鲸业

很少行业像捕鲸那样充满戏剧性和风险。埃塞克斯号（Essex）的最后一次航行让人一瞥其中的恐怖。这次航行曾经为赫尔曼·麦尔维尔（Herman Melville）创作的经典小说《白鲸》（Moby Dick）提供灵感，如今又成了新片《海洋深处》（In the Heart of The Sea）的主题。这艘捕鲸船1819年离开美国楠塔基特岛（Nantucket）后航行了一年多，最终被它捕猎的一条鲸鱼摧毁。20名船员在沉船后幸存下来，不过他们只能坐上三条救生艇漂流在太平洋上，食物稀少，滴水全无。其中三名船员选择留在一座荒岛上，并在三个月后濒临饿死之际获救。其他人继续航行，希望能到达南美洲，却一个接一个地死去。刚开始，幸存者把死者葬于大海，后来，他们不得不开始吃同伴的尸体。尸体吃完之后，他们抽签决定把谁射杀吃掉。最终，17个人中只有5人获救，而那时他们都已神志混乱，不知发生了什么。

会有人被吸引参与如此危险的一个行当，唯一的原因是可以获取惊人的利润。19世纪的大部分时间里，位于美国马萨诸塞州新贝德福德（New Bedford）的捕鲸辛迪加“吉迪恩·艾伦父子公司”（Gideon Allen & Sons）资助的捕鲸航行每年获利60%，这可能是美国历史上最高的公司回报了。它是一批已然非常成功的公司中最成功的一家。1817年至1892年，新贝德福德捕鲸业的年均总体回报率为14%——无论用什么标准衡量，这都是一个可观的数字。

新贝德福德不是美国唯一的捕鲸港，而美国也不是世界上唯一的捕鲸国家。但1859年发表的一项调查显示，1850年全球活跃的捕鲸船共计约900艘，其中700艘来自美国，而这些美国的船只中有70%来自新贝德福德。多亏了一种时至今日仍然重要的新技术，该镇的捕鲸者得以主导整个行业并获得巨大利润。他们并没有发明新型船只或跟踪鲸鱼的新奇手段，而是开发出了一种新型商业模式，能极为有效地安排资本和组织熟练工人，尽

管这两方面都涉及巨大的风险。随着矿物油取代鲸油成为燃料，捕鲸作为一个行业几乎消失。但在新贝德福德率先发展出的这种商业结构依然一如既往地重要。没有它们，20世纪90年代以及今天的科技繁荣就不可能实现。

大多数历史学家把现代公司的起源追溯到像荷兰东印度公司和英国东印度公司这样的机构。这些公司有国家授予的对某些货物或者对某些地方的贸易垄断权。这种有法律支撑的地位使它们能够通过向公众发售股票来筹资，从而催生了股票市场。这些跨国企业的管理者是专业人士，只拥有少量股权。较低级别的员工一般不持有任何股份。

通过消除对个别所有者或管理者的依赖，这些实体变得自我永续。但垄断地位也将它们卷入政治，并不可避免地导致腐败。英国和荷兰的东印度公司最后都需要政府纾困——巨头企业至今仍未戒除这个习惯。

捕鲸业则使用了一种完全不同的方法。根据哈佛商学院的汤姆·尼古拉斯（Tom Nicholas）和乔纳斯·彼得·埃金斯（Jonas Peter Akins）的研究，它是最早解决协调激励所有者、管理者和员工这一难题的行业之一。在这一模式中没有任何政府支持。管理者在企业中持有大量股份，这让他们有充分理由来照顾为数不多的几位外部投资者的利益。其股份通过精心构筑的辛迪加持有，很少易手。至少在财务上，每个人都参与到整个捕鲸航行之中。船员的报酬来自利润分成，这使他们的利益也与航行的成败紧密相关。因此，决策权可以下放到真正重要的地方，即下放给辛劳追捕鲸鱼的船长和船员，因为那时的风险和收益都显而易见。

在新贝德福德等级制度的顶端是像吉迪恩·艾伦（Gideon Allen）这样的代理人或代理公司，他们负责采购和装备船只、雇用船员，并销售捕获的鲸鱼。为了激励他们尽可能达成最好的协议，代理人提供投资的很大一部分。名声最好的代理人从其他投资者处得到更好的条件。出海后全权负责的船长往往也会出资。尼古拉斯特别指出，当今投资管理业务中风险较高的部分也运用了类似的激励机制。

投资者获得利润的一半至三分之二。其余利润用所谓的“渔获收益”制度（lay）在船员中分配。船长或许能获得剩余利润的十二分之一。在梅尔维尔的小说中，刚入行的以实玛利（Ishmael）最初拿到的开价是收益的七百七十七分之一，但设法讨价还价到三百分之一。虽然这最终可能是微不足道的收益，但它仍是一种利益，而且为未来的薪酬设定了基准。以实玛利的朋友、来自南太平洋岛上食人族的魁魁格（Queequeg）的开价是九十分之一，原因是他有使用鱼叉的经验。对有经验船员的需求非常高，因而埃塞克斯号的船长、命运多舛的乔治·波拉德（George Pollard）刚被救上船就立刻又被任命为船长（这艘船后来也沉没了）。

每一位参与者都想迅速得到回报，但当时并没有人为设定的最后期限——不像现在所谓的“季度资本主义”（quarterly capitalism）。当容易到达的海域里鲸鱼变得稀少时，新贝德福德的水手们把搜索扩展到每个海洋的每个角落，不管耗费多少年。

| 数字上的安全

为了确保不被几次灾难性的航行所拖垮，捕鲸公司会同时投资多个探险，就像如今风险资本家“撒钱然后祈祷”那样。1997年出版的一份研究总结说，18世纪从新贝德福德下水的787艘船中，有272艘最终沉没或被摧毁。乔治·豪兰（George Howland）的公司并非个案：在任何时刻，它的15艘船里总会有4到9艘在海上航行。最后，1艘被鲸鱼撞沉、3艘在海上失踪、2艘被船员烧毁、1艘在美国南北战争期间被南军的炮艇击毁、5艘被遗弃在北极冰层中。然而，1852年豪兰去世时依然身家百万。

新贝德福德的捕鲸者大多数都是虔诚的贵格会教徒，他们珍视节俭、避免炫耀，这有所裨益。不仅令他们节俭地使用自己的资本（资助航行所需），还帮助他们吸引到其他投资者。最富有的代理人之一赫蒂·豪兰·格林（Hetty Howland Green）据说给自己做鞋，只有一套礼服。

他们思想开明，乐意雇用任何能为自己的冒险事业出力的人，这也有所帮助。新贝德福德捕鲸船队使用的最重要的一项技术创新也许就是“坦普尔套捕鲸枪头”（Temple Toggle）了，这是来自弗吉尼亚、曾做过奴隶的刘

易斯·坦普尔（Lewis Temple）设计的一种鱼叉尖。

但捕鲸者的主要财富是其商业模式。在19世纪30年代，美国有六个州的立法机构批准向捕鲸公司颁发许可证，给予它们通过向公众出售股份来融资的权利——公司结构与荷兰东印度公司和英国东印度公司大致相同。这六个州的相关立法都没能熬过40年代。韦尔斯利学院（Wellesley College）的埃里克·希尔特（Eric Hilt）总结道：“企业所有权结构分散，企业管理者所持股份降低，有可能都削弱了他们勤勉履职的积极性。”考虑到购买和装备一艘船并放船下水进入危险海域的费用，风险与回报之间的联系似乎需要变得更为紧密。

但是，渔获收益制度也可能对船员不利。为了努力减少船员对利润的瓜分，无情的船长据说会在返航时把船员遗弃。（现代的高科技创业公司在大发奖金前进行类似的裁员，也不是没听说过。）还有其他用来欺骗船员的把戏，如强迫他们以高价购买衣服，或为预支工资开出高额利息。而且，思想开明的程度也有限：虽然黑人船员在薪酬方面不受歧视，但在其他方面的待遇并不太好，分到的食物较少、住处也较差。

然而，新贝德福德的制度无疑非常有效。它很快就让海洋里的鲸鱼被捕光了，尽管对一心致富的冒失鬼而言，同时还出现了加利福尼亚淘金热等其他赚大钱的机会。1957年，哈佛商学院的学生戴维·莫门特（David Moment）写道：“最初为捕鲸活动提供了市场和利润的产业发展，最终为本地资本带来了比捕鲸更具吸引力的机会。”总之，随着利润不断减少，船员和出资者转向了其他冒险。但是，他们发展出的一套商业惯例直至今日仍被应用于高风险、高回报的行业。■



E-commerce in emerging markets

India online

The battle for India's e-commerce market is about much more than retailing

EVERY second three more Indians experience the internet for the first time. By 2030 more than 1 billion of them will be online. In June last year one in four mobiles used in India was a smartphone, up from one in five just six months earlier. Add in two more facts—India boasts the world's fastest-growing large economy, and the planet's biggest population of millennials—and you can see why the likes of Facebook, Uber and Google are falling over themselves to establish footholds there.

No battle for the online future of India is more intense than the one now being waged in e-commerce. Sales are still tiny, at \$16 billion last year, but the country is the world's fastest-growing e-commerce market and is prized by America's and China's internet titans. India has become the biggest test of Amazon's international ambitions. Jeff Bezos, Amazon's founder, wants it to be his second-largest market, after America, and has backed his plans with billions of dollars of investment. His opponents are platforms like Flipkart and Snapdeal, founded by locals and funded by some of the biggest names in tech, among them Alibaba, China's e-commerce champion.

As these companies jostle for market share, they are spending feverishly on logistics and discounts to lure consumers online. Capital may dry up for some; in February a Morgan Stanley mutual fund sharply lowered the valuation of its stake in Flipkart. But whoever wins or loses in this frenzied contest, the importance of e-commerce stretches beyond individual firms and into the wider economy. In the West e-commerce companies piggybacked on an existing infrastructure of shops, banks and logistics firms. In India the game being played by the e-commerce pioneers is leapfrog. It could become a model for emerging markets around the world.

Indian e-commerce has such potential because it can bring three changes more profound than convenience and keen prices. The first is faster financial development. China already provides one example. Alipay, an arm of Alibaba, overcomes mistrust between buyers and sellers by holding on to customers' money until they have safely received their goods. Now run by an affiliate called Ant Financial, Alipay has more than 400m accounts that let consumers buy products, pay bills and transfer money. The torrent of information that Alibaba gathered on merchants and consumers was the basis for a lending business.

Something similar is under way in India. Paytm, which provides digital wallets and is itself backed by Ant Financial, has 120m accounts, nearly six times the number of credit cards in India. E-commerce companies are also helping small businesses obtain loans that they would otherwise have struggled to raise. Amazon India rolled out such a programme for its sellers last month. In January Snapdeal announced a partnership to streamline loans from the State Bank of India.

Second, e-commerce firms could help overcome India's rropy infrastructure and vast geography. Where roads are clogged and infrastructure is decrepit, the rival firms are melding warehouses and local outposts into idiosyncratic distribution networks. About half of Flipkart's and Snapdeal's customers are outside India's biggest cities. Some are still farther afield: Amazon claims to be helping more than 6,000 Indian businesses sell abroad. China again shows what can be done. Alibaba is connecting remote rural areas to the online economy; there are now 780 "Taobao villages", rural communities in which at least 10% of households are shopping or selling over the internet.

The third big impact of e-commerce in India is on retailing itself. Shopping malls and chain stores account for only about one-tenth of total retail sales.

Already, the combined sales of India's top three e-commerce sites, Flipkart, Snapdeal and Amazon, surpass those of the ten largest offline retailers.

Two-thirds of Indians are below the age of 35. For these young people, armed with smartphones, shopping is likely to be very different from what it was for their parents. Malls and chains will not disappear, but they may never be as prevalent as they are in the West.

That in turn will stimulate the rise of other digital firms. India's tech scene is thriving. Tiger Global, a Flipkart investor, also backs an Indian online classified business and a messenger app that helps users avoid data costs. SoftBank, which backs Snapdeal, funds a mobile-advertising platform. In 2014 only America, Britain and Israel saw more new tech startups.

| *Platform boost*

Simply to assume that e-commerce will conjure up growth—particularly of the labour-intensive sort that India needs—would be a mistake. The market in China had a very different starting-point, for instance. When the likes of Alibaba got going, it helped that China was already home to many manufacturers looking for new ways to sell excess inventory. India's manufacturing base is much smaller, especially for electronics, e-commerce's best-selling category. India is also poorer. A smaller share of its population is online—32% last year, compared with 52% in China. Indians speak more than 20 languages, which complicates marketing. The budget unveiled by Narendra Modi's government this week includes plans to upgrade 50,000km of roads, but India is not about to possess a gleaming motorway network to rival China's. Mr Modi's continued failure to install a harmonised goods and services tax blunts the benefits of e-commerce.

Yet in its heft, governance and manufacturing clout, China is also an outlier. India is a better template for the e-commerce battle in other emerging markets. Its logistical woes provide a test of firms' ingenuity. If

they find a way to deliver goods profitably there, they may succeed elsewhere. If they falter, their stumbles will provide lessons. That is all the more likely because India's e-commerce is so international. Naspers, a Flipkart investor, backs ventures in Nigeria, South Africa and Egypt, among other places. E-commerce in India is a local battle for customers, but it is also a battle for the future. ■



新兴市场的电子商务

印度在线

印度电子商务市场争夺战远超零售业范畴

每秒钟都会有三个印度人第一次体验互联网。到2030年，将会有超过十亿印度人在线。到去年六月，在印度使用的手机有四分之一是智能手机，仅半年前这一比例还仅为五分之一。再加上两个事实：印度是世界上发展最快的大型经济体，该国千禧一代的人口为全球之冠，你就知道为何Facebook、优步和谷歌等公司正千方百计要在印度立足了。

关于印度未来的网络市场，以目前电子商务领域的争夺最为激烈。在线销售额仍然很小，去年只有160亿美元，但印度是世界上增长最快的电子商务市场，美国和中国的互联网巨头都对其极为看重。印度已成为亚马逊国际化雄心的最大考验。亚马逊创始人杰夫·贝佐斯（Jeff Bezos）想让印度成为他继美国之后的第二大市场，并且已经投入几十亿美元支持他的计划。他的对手是诸如Flipkart和Snapdeal等由当地人创建的平台。这些平台背后都有一些科技业最如雷贯耳的大腕企业投资，其中就有中国电子商务的领头羊阿里巴巴。

这些公司因为要争夺市场份额，所以狂热地投资物流，并给出慷慨的折扣以吸引在线消费者。其中一些公司的资本可能会枯竭。2月，摩根士丹利（Morgan Stanley）的一支共同基金大幅调低其对Flipkart公司投资的估值。不过无论这场疯狂的竞赛最后谁赢谁输，电子商务的重要性已经超越了单个公司，扩展到更广泛的经济中。在西方，电子商务公司构建在由商店、银行和物流公司组成的既有基础设施之上。在印度，电子商务先行者们玩的是跨越式游戏。这可能为全球新兴市场树立一个典范。

| 为成长付费

印度电子商务之所以有如此潜能，是因为它能够带来三大变革，其意义远超方便和廉价。第一是更快的金融发展。中国已经提供了一个范例。阿里巴巴旗下的支付宝通过暂时托管买家的资金，直到他们安全收到货物才付

款，解决了卖家和买家间的信任问题。支付宝现由阿里巴巴关联公司蚂蚁金服运营，拥有超过4亿账户，消费者可以通过它购买产品、支付账单和转账。阿里巴巴收集的关于商户和消费者的海量信息成为其贷款业务的基础。

类似的情况在印度也有。提供电子钱包、由蚂蚁金服投资的Paytm拥有1.2亿账户，接近印度信用卡总数的六倍。电子商务公司还帮助小公司获得它们本来很难筹集的贷款。亚马逊印度上个月为其卖家开展了这样的服务。1月，Snapdeal宣布一项合作，简化从印度国家银行（State Bank of India）贷款的流程。

第二，电子商务公司可能帮助解决印度基础设施糟糕与幅员辽阔的问题。道路拥堵、基础设施破旧不堪，参与竞争的公司正将仓库和当地边远分部合并成独特的配送网络。Flipkart和Snapdeal的客户中约一半位于印度最大几个城市之外。有些客户甚至更遥远：亚马逊称它将帮助6000多家印度公司将产品销往国外。中国再次展现出可为之处。阿里巴巴正将偏远地区连入在线经济；现在有780个“淘宝村”，这些偏远的社区中有至少10%的家庭通过互联网购物或开店。

印度电子商务的第三大影响是对于零售业本身。大型商场和连锁店只占零售总额的约十分之一。印度三大电商网站Flipkart、Snapdeal和亚马逊的营业额之和已经超过了十大线下零售商的总和。

印度有三分之二人口在35岁以下。这些年轻人使用智能手机，购物对他们来说可能跟上一辈人非常不同。商场和连锁店不会消失，但可能永远无法像在西方一样普遍。

这进而会激励其他数字公司的崛起。印度科技业正如火如荼地发展。Flipkart的投资者之一老虎环球基金（Tiger Global）也投资了一家印度在线分类广告公司，以及一个帮用户节省数据费用的短讯应用。支持Snapdeal的软银同样投资了一个移动广告平台。2014年，只有美国、英国和以色列新成立的科技创业公司数量超过印度。

| 平台推进

仅仅假定电子商务会凭空促进增长，尤其是印度需要的那种劳动密集型增长，可能是个错误。例如，中国的市场起点就完全不同。阿里巴巴之类的公司创建时，中国已经有很多制造商在寻找新途径出售多余的库存，这一点助力不少。印度的制造业基础则弱得多，尤其是电商最好卖电子产品。印度也更贫穷。网民人口比例更小，去年为32%，而中国为52%。印度人说的语言超过20种，这让市场营销变得更复杂。穆迪政府本周公布的预算包括计划升级5万公里的公路，即使如此印度也无法很快就拥有能和中国匹敌的光鲜的高速公路网。穆迪在建立协调统一的货物和服务税方面屡屡失败，这减弱了电子商务的优势。

不过就体量、治理和制造业影响而言，中国也是异类。对于其他新兴市场里的电子商务竞争而言，印度是一个更好的模板。它在物流上的痛苦对公司的创新能力提出了考验。如果能在这里配送货物并且获利，它们将无往而不利。如果步履蹒跚，它们跌的跟头也会成为教训。这或许更有可能，因为印度的电子商务非常国际化。Flipkart的投资者Naspers也投资了尼日利亚、南非和埃及等地的公司。在印度，电子商务是争夺客户的本土战，也是争夺未来之战。 ■



Artificial intelligence and Go

Showdown

Win or lose, a computer program's contest against a professional Go player is another milestone in AI

TWO : NIL to the computer. That was the score, as *The Economist* went to press, in the latest round of the battle between artificial intelligence (AI) and the naturally evolved sort. The field of honour is a Go board in Seoul, South Korea—a country that cedes to no one, least of all its neighbour Japan, the title of most Go-crazy place on the planet. To the chagrin of many Japanese, who think of Go as theirs in the same way that the English think of cricket, the game's best player is generally reckoned to be Lee Sedol, a South Korean. But not, perhaps, for much longer. Mr Lee is in the middle of a five-game series with AlphaGo, a computer program written by researchers at DeepMind, an AI software house in London that was bought by Google in 2014. And, though this is not an official championship series, as the scoreline shows, Mr Lee is losing.

Go is an ancient game—invented, legend has it, by the mythical First Emperor of China, for the instruction of his son. It is played all over East Asia, where it occupies roughly the same position as chess does in the West. It is popular with computer scientists, too. For AI researchers in particular, the idea of cracking Go has become an obsession. Other games have fallen over the years—most notably when, in 1997, one of the best chess players in history, Garry Kasparov, lost to a machine called Deep Blue. Modern chess programs are better than any human. But compared with Go, teaching chess to computers is a doddle.

At first sight, this is odd. The rules of Go are simple and minimal. The players are Black and White, each provided with a bowl of stones of the appropriate colour. Black starts. Players take turns to place a stone on any

unoccupied intersection of a 19x19 grid of vertical and horizontal lines. The aim is to use the stones to claim territory. In the version being played by Mr Lee and AlphaGo each stone, and each surrounded intersection, is a point towards the final score. Stones surrounded by enemy stones are captured and removed. If an infinite loop of capture and recapture, known as Ko, becomes possible, a player is not allowed to recapture immediately, but must first play elsewhere. Play carries on until neither player wishes to continue.

| *Go forth and multiply*

This simplicity, though, is deceptive. In a truly simple game, like noughts and crosses, every possible outcome, all the way to the end of a game, can be calculated. This brute-force approach means a computer can always work out which move is the best in a given situation. The most complex game to be “solved” this way is draughts, in which around 10^{20} (a hundred billion billion) different matches are possible. In 2007, after 18 years of effort, researchers announced that they had come up with a provably optimum strategy.

But a draughts board is only 8x8. A Go board’s size means that stones can be placed on it in an enormous number of ways: a rough-and-ready guess gives around 10^{170} . Analogies fail when trying to describe such a number. It is nearly a hundred of orders of magnitude more than the number of atoms in the observable universe, which is somewhere in the region of 10^{80} . Any one of Go’s hundreds of turns has about 250 possible legal moves, a number called the branching factor. Choosing any of those will throw up another 250 possible moves, and so on until the game ends. As Demis Hassabis, one of DeepMind’s founders, observes, all this means that Go is impervious to attack by mathematical brute force.

But there is more to the game’s difficulty than that. Though the small board and comparatively restrictive rules of chess mean there are only around

10^{47} different possible games, and its branching factor is only 35, that does, in practice, mean chess is also unsolvable in the way that draughts has been solved. Instead, chess programs filter their options as they go along, selecting promising-looking moves and reserving their number-crunching prowess for the simulation of the thousands of outcomes that flow from those chosen few. This is possible because chess has some built-in structure that helps a program understand whether or not a given position is a good one. A knight is generally worth more than a pawn, for instance; a queen is worth more than either. (The standard values are three, one and nine respectively.)

Working out who is winning in Go is much harder, says Dr Hassabis. A stone's value comes only from its location relative to the other stones on the board, which changes with every move. At the same time, small tactical decisions can have, as every Go player knows, huge strategic consequences later on. There is plenty of structure—Go players talk of features such as ladders, walls and false eyes—but these emerge organically from the rules, rather than being prescribed by them.

Since good players routinely beat bad ones, there are plainly strategies for doing well. But even the best players struggle to describe exactly what they are doing, says Miles Brundage, an AI researcher at Arizona State University. “Professional Go players talk a lot about general principles, or even intuition,” he says, “whereas if you talk to professional chess players they can often do a much better job of explaining exactly why they made a specific move.” Intuition is all very well. But it is not much use when it comes to the hyper-literal job of programming a computer. Before AlphaGo came along, the best programs played at the level of a skilled amateur.

| *Go figure*

AlphaGo uses some of the same technologies as those older programs. But its big idea is to combine them with new approaches that try to get the

computer to develop its own intuition about how to play—to discover for itself the rules that human players understand but cannot explain. It does that using a technique called deep learning, which lets computers work out, by repeatedly applying complicated statistics, how to extract general rules from masses of noisy data.

Deep learning requires two things: plenty of processing grunt and plenty of data to learn from. DeepMind trained its machine on a sample of 30m Go positions culled from online servers where amateurs and professionals gather to play. And by having AlphaGo play against another, slightly tweaked version of itself, more training data can be generated quickly.

Those data are fed into two deep-learning algorithms. One, called the policy network, is trained to imitate human play. After watching millions of games, it has learned to extract features, principles and rules of thumb. Its job during a game is to look at the board's state and generate a handful of promising-looking moves for the second algorithm to consider.

This algorithm, called the value network, evaluates how strong a move is. The machine plays out the suggestions of the policy network, making moves and countermoves for the thousands of possible daughter games those suggestions could give rise to. Because Go is so complex, playing all conceivable games through to the end is impossible. Instead, the value network looks at the likely state of the board several moves ahead and compares those states with examples it has seen before. The idea is to find the board state that looks, statistically speaking, most like the sorts of board states that have led to wins in the past. Together, the policy and value networks embody the Go-playing wisdom that human players accumulate over years of practice.

As Mr Brundage points out, brute force has not been banished entirely from DeepMind's approach. Like many deep-learning systems, AlphaGo's

performance improves, at least up to a point, as more processing power is thrown at it. The version playing against Mr Lee uses 1,920 standard processor chips and 280 special ones developed originally to produce graphics for video games—a particularly demanding task. At least part of the reason AlphaGo is so far ahead of the competition, says Mr Brundage, is that it runs on this more potent hardware. He also points out that there are still one or two hand-crafted features lurking in the code. These give the machine direct hints about what to do, rather than letting it work things out for itself. Nevertheless, he says, AlphaGo’s self-taught approach is much closer to the way people play Go than Deep Blue’s is to the way they play chess.

One reason for the commercial and academic excitement around deep learning is that it has broad applications. The techniques employed in AlphaGo can be used to teach computers to recognise faces, translate between languages, show relevant advertisements to internet users or hunt for subatomic particles in data from atom-smashers. Deep learning is thus a booming business. It powers the increasingly effective image- and voice-recognition abilities of computers, and firms such as Google, Facebook and Baidu are throwing money at it.

Deep learning is also, in Dr Hassabis’s view, essential to the quest to build a general artificial intelligence—in other words, one that displays the same sort of broad, fluid intelligence as a human being. A previous DeepMind paper, published in 2015, described how a computer had taught itself to play 49 classic Atari videogames—from “Space Invaders” to “Breakout”—simply by watching the screen, with no helpful hints (or even basic instructions) from its human overlords. It ended up doing much better than any human player can. (In a nice coincidence, *atari* is also the name in Go for a stone or group of stones that is in peril of being captured.)

Games offer a convenient way to measure progress towards this general

intelligence. Board games such as Go can be ranked in order of mathematical complexity. Video games span a range of difficulties, too. Space Invaders is a simple game, played on a low-resolution screen; for a computer to learn to play a modern video game would require it to interpret a picture much more subtle and complicated than some ugly-looking monsters descending a screen, and in pursuit of much less obvious goals than merely zapping them. One of DeepMind's next objectives, Dr Hassabis says, is to build a machine that can learn to play any game of cards simply by watching videos of humans doing so.

| *Go tell the Spartans*

For now, he reckons, general-purpose machine intelligence remains a long way off. The pattern-recognising abilities of deep-learning algorithms are impressive, but computers still lack many of the mental tools that humans take for granted. A big one is "transfer learning", which is what AI researchers call reasoning by analogy. This is the ability to take lessons learned in one domain and apply them to another. And machines like AlphaGo have no goals, and no more awareness of their own existence than does a word processor or a piece of accounting software.

In the short term, though, Dr Hassabis is optimistic. At a *kiwon*, or Go parlour, in Seoul, the day before the match, the 30 or so players present were almost unanimous in believing that the machine would fall short. "Lee is a genius who is constantly creating new moves; what machine can replicate that?" asked one. At a pre-match press conference Mr Lee said he was confident he would win 5-0, or perhaps 4-1.

He was, plainly, wrong about that, although it is not over yet. "He's a very good player," said a diplomatic Dr Hassabis before the match. "But our internal tests say something different." Even if Mr Lee does manage to pull off an improbable victory, though, humans are unlikely to stay on top for long. As AlphaGo's algorithms are tweaked, and as it gathers more data

from which to learn, it is only going to get better. Asked whether there was a ceiling to its abilities, Dr Hassabis said he did not know: “If there is, we haven’t found it yet.” ■



人工智能和围棋

一决胜负

不论最后是赢是输，一项计算机程序和一位专业围棋手的博弈是人工智能的另一座里程碑

计算机以2:0领先。这是人工智能和人类之战的最新战报。决斗场是位于韩国首尔的一张围棋棋盘。这个国家从不屈服于别国，尤其是它的邻国日本——地球上对围棋最为狂热的地方。日本人认为围棋是他们的游戏，就像英国人视板球为他们的运动那样。但令日本人懊恼的是，韩国人李世石才是这项游戏公认的头号选手。不过，这可能不会维持太久。李世石正和机器程序AlphaGo进行一场五轮围棋赛。AlphaGo由伦敦人工智能软件公司DeepMind研发，这家公司于2014年被谷歌收归旗下。虽然这并非一场官方的冠军系列赛，但从比分上看，李世石正在输掉比赛。

围棋是一种古老的游戏，据传是中国神话中最早的帝王为教育儿子而发明。东亚各地都玩这种游戏，其地位就如同西方国家的国际象棋。计算机科学家也很熟悉这种游戏，人工智能研究人员尤其执迷于攻克围棋。多年来，其他游戏已纷纷被拿下，其中最受瞩目的事件发生于1997年，历史上最佳国际象棋手之一的加里·卡斯帕罗夫（Garry Kasparov）输给了机器深蓝（Deep Blue）。现代的国际象棋计算程序已经优于任何人类。但和围棋相比，教计算机下国际象棋就变成了小菜一碟。

乍一眼看，这很奇怪。围棋的规则堪称极简。博弈者为黑、白两方，各拿到一盒全黑或全白的棋子。黑先白后。棋盘由纵横各19条线交叉形成方格，两方轮流在交叉点上各落一子，目标是用棋子圈地。在李世石和AlphaGo使用的游戏版本中，每颗棋子和每个被包围的交叉点都被计入最后得分。被对手棋子包围的棋子会被提走（即“提子”）。而当有可能形成提子和回提的无限循环（即“劫”）时，棋手不能立刻回提对方的棋子，而必须先到其他地方落子。比赛持续直至双方都不愿继续为止。

| 无尽繁衍的棋局

然而这种简单具有欺骗性。在一项真正简单的游戏中，比如圈叉游戏（译注：二人轮流在井字形九格中画O或X，先将三个O或X连成一线者获胜），从一开始直到最后结束，每一步可能导致的后果都能通过计算推导出来。这种蛮力算法意味着计算机总能推算出在某种局面中哪步棋是最佳选择。用这种方法来攻克的最复杂的游戏是国际跳棋，它可能产生的棋局约为10的20次方（万亿亿）。2007年，在经过18年努力后，科研人员宣布他们已经获得了一种可验证的最佳策略。

但国际跳棋的棋盘仅为8x8。围棋棋盘的规模意味着可能出现的棋局数量极多——粗略估算约为10的170次方。已经找不到类比来描述如此大的体量。它大概要比已观测到宇宙中原子的数量多100个数量级，后者仅为10的80次方左右。在围棋的几百个回合中，每一步都有约250种可能的合规走法，这个数目被称作分支因数。而每下一步又会再导致250种可能的走法，如此继续直到游戏结束。DeepMind的创始人之一杰米斯·哈萨比斯（Demis Hassabis）评论称，这意味着围棋无法被数学蛮力所攻克。

但这种游戏的难度还不止于此。尽管国际象棋小小的棋盘和相对而言更具约束性的规则使得它可能产生的棋局仅为约10的47次方，且分支因数仅为35，但实际上，这已经使得它不能用攻克跳棋的方法来解决。国际象棋机器人在比赛过程中对手头的选项做出筛选，挑出看起来更可能赢得比赛的走法，并留出数字统计能力来模拟所选出的少数几步会产生的成千上万种可能后果。之所以能做到这一点，是因为国际象棋具有一些固有的结构，可以帮助计算机程序理解某种局面是好是坏。比如说，马通常比兵更有价值，而皇后又更甚于它们（标准价值分别为三分、一分和九分）。

哈萨比斯说，在围棋比赛中推算哪方会胜出则要困难得多。一个棋子的价值只由它相对于棋盘上其他棋子的位置而定，而这种相对性又随着每一步而发生改变。与此同时，每个下围棋的人都知道，小的战术策略可能在之后导致巨大的战略性后果。围棋中有大量战术，如征、立、假眼等，但它们都是在规则之上自然派生，而非由规则所制定。

既然好棋手常打败糟糕的棋手，就说明确实存在有用的战略。但即使是最佳棋手都难以清楚描述出为何自己要那么走，亚利桑那州立大学人工智能研究员迈尔斯·布伦戴奇（Miles Brundage）说。“专业围棋手大谈一般原则甚至直觉，”他说，“但如果同专业国际象棋手聊天，你会发现他们在解释自己为何下某一步棋时说得要清楚得多。”直觉是好东西，但对极为刻板一板的计算机编程而言，它并没有什么用处。在AlphaGo降生前，最好的围棋机器人水平只相当于熟练的业余棋手。

| 好好深思

AlphaGo使用的一些技术和旧有的围棋程序相同，但其大创意是结合以新的方法，试图让计算机就下棋发展出自己的直觉——让它们自行发现人类棋手理解却无法解释的规则。它使用名为深度学习的技术来做到这一点。该技术不断向计算机提供复杂的统计数字，让计算机想办法从大量的干扰数据中分离出一般法则。

深度学习需要两样东西：大量的处理能力和海量的可学习数据。

DeepMind从汇聚业余和专家棋手的网站中摘选出三千万个棋局样本来训练AlphaGo。他们还AlphaGo稍作改动，制造出它的一个分身，让两者互搏，从而更迅速地生成更多的训练数据。

这些数据被灌入两种深度学习的算法中，其一是“决策网络”（policy network），它接受训练来模仿人类下棋。在观看了数百万局比赛后，它已经学会提炼特征、原则和经验法则。在比赛过程中，它的任务是审视当前的局势，推荐出一些看起来不错的走法，让第二种算法来考虑。

这第二项算法叫“值网络”（value network），它评估一步棋的优劣。机器人会演绎由“决策网络”推荐的棋步，并就它们可能导致的成千上万种子棋局推演出双方棋手的应对。因为围棋如此复杂，要把所有可预见的棋局都通盘演算一遍绝无可能。因而“值网络”所做的是审视几步棋之后可能出现的棋局，并将它们与那些它之前见过的例子做比对。其目标是找出那个就统计学而言与那些曾经导向胜利的棋局最为相像的棋局。“决策网络”和“值网络”共同运作，展现出人类棋手通过多年训练积累的智慧。

正如布伦戴奇所指出的，DeepMind的方法并没有完全排除蛮力计算。和许多深度学习系统一样，AlphaGo的表现会随着其处理能力的提升而改善，至少在一定程度上是如此。和李世石对弈的AlphaGo版本使用了1920个标准处理芯片和280个特殊芯片。这些特殊芯片原先是用以为视频游戏生成图像，这是一种挑战特别大的任务。布伦戴奇说，AlphaGo在此次比赛中遥遥领先的原因之一是它在更为强大的硬件上运行。他还指出，编程中仍潜藏一两则人工撰写的功能，它们对机器下一步该怎么做给出直接的提示，而不是让它自行摸索。不过，他说，AlphaGo的自学法与人类下围棋的方法接近的程度要远高于“深蓝”和人类在下国际象棋上的接近度。

深度学习在商业和学术上都引起了人们的兴奋，部分原因是它具有广泛的应用空间。AlphaGo使用的技术可被用于人脸识别、翻译、向互联网用户推送定向广告，以及从粒子加速器中寻找亚原子粒子的数据。深度学习因而是一门繁荣发展的生意。它让计算机获得日益高效的图像和声音识别能力，而谷歌、Facebook和百度等公司正在这个领域内大举砸钱。

在哈萨比斯看来，打造一种一般人工智能（能展现和人类同样宽泛而流畅的智力的人工智能）时，深度学习至关重要。DeepMind于2015年发表的一份报告描述了一台计算机如何通过自我学习来玩49种经典的雅达利（Atari）电子游戏——从“太空侵略者”（Space Invaders）到“打砖块”（Breakout）。计算机只是看着屏幕，并没有从其人类主人那里获得有用的提示（甚至连基本的玩法说明都没有）。但结果它的表现却胜过任何人类玩家。（这里有一个有意思的巧合：Atari正好也是围棋中的一个术语，即“打吃”，指代一颗棋子或一批棋子有被提子的危险）。

游戏是衡量这种一般智能进展的便捷方式。围棋等棋盘游戏可根据数学上的复杂度来排名。电子游戏的难度也有很大的差异。“太空侵略者”是一个在低分辨率的屏幕上进行的简单游戏。而如果计算机要学会玩一种现代的电子游戏，它要看懂的图远比丑八怪巨兽复杂，而它寻求的目标也远不是打败它们那么简单。哈萨比斯说，DeepMind接下来的目标之一是打造出一台机器，它只要观看人类打牌的视频，就能学会玩任何纸牌类游戏。

| 胜利在望

他认为，目前来说，一般机器智能还有很长的路要走。深度学习算法的模式识别能力已令人惊艳，但计算机仍然缺乏对人类而言理所当然的智力工具。其中一大工具是“转化学习”，这是人工智能研究人员对推理的类比称法。这种能力是把从一个领域里获得的经验教训应用到另一个领域。而像AlphaGo这样的机器没有目标或对自身存在的意识，同一个文字处理器或会计软件并无差别。

不过，短期来说，哈萨比斯很乐观。比赛前一天，在首尔的一座围棋棋院内现身的约30名棋手几乎一致认为机器将落败。“李是个天才，他不断创造新的棋步，有哪台机器能学到这个？”其中一人问道。在比赛前的一个新闻发布会上，李世石说，他很有信心将以5:0或4:1赢得比赛。

但他显然错了，尽管比赛尚未结束。“他是一个很好的棋手，”言语圆滑的哈萨比斯在比赛前说道，“但我们的内部测试显示出一些不同的看法。”不过，即使李世石真能想办法翻身而获得不大可能的胜利，人类称霸的日子也不会太长久了。随着AlphaGo的算法做出调整，收集更多的数据并从中学习，它只会变得越来越强大。在被问到AlphaGo的能力是否有极限时，哈萨比斯说他并不知道，“如果有，我们还没有发现它。”■



Business in America

The problem with profits

Big firms in the United States have never had it so good. Time for more competition

AMERICA used to be the land of opportunity and optimism. Now opportunity is seen as the preserve of the elite: two-thirds of Americans believe the economy is rigged in favour of vested interests. And optimism has turned to anger. Voters' fury fuels the insurgencies of Donald Trump and Bernie Sanders and weakens insiders like Hillary Clinton.

The campaigns have found plenty of things to blame, from free-trade deals to the recklessness of Wall Street. But one problem with American capitalism has been overlooked: a corrosive lack of competition. The naughty secret of American firms is that life at home is much easier: their returns on equity are 40% higher in the United States than they are abroad. Aggregate domestic profits are at near-record levels relative to GDP. America is meant to be a temple of free enterprise. It isn't.

| *Borne by the USA*

High profits might be a sign of brilliant innovations or wise long-term investments, were it not for the fact that they are also suspiciously persistent. A very profitable American firm has an 80% chance of being that way ten years later. In the 1990s the odds were only about 50%. Some companies are capable of sustained excellence, but most would expect to see their profits competed away. Today, incumbents find it easier to make hay for longer.

You might think that voters would be happy that their employers are thriving. But if they are not reinvested, or spent by shareholders, high profits can dampen demand. The excess cash generated domestically by American firms beyond their investment budgets is running at \$800 billion

a year, or 4% of GDP. The tax system encourages them to park foreign profits abroad. Abnormally high profits can worsen inequality if they are the result of persistently high prices or depressed wages. Were America's firms to cut prices so that their profits were at historically normal levels, consumers' bills might be 2% lower. If steep earnings are not luring in new entrants, that may mean that firms are abusing monopoly positions, or using lobbying to stifle competition. The game may indeed be rigged.

One response to the age of hyper-profitability would be simply to wait. Creative destruction takes time: previous episodes of peak profits—for example, in the late 1960s—ended abruptly. Silicon Valley's evangelicals believe that a new era of big data, blockchains and robots is about to munch away the fat margins of corporate America. In the past six months the earnings of listed firms have dipped a little, as cheap oil has hit energy firms and a strong dollar has hurt multinationals.

Unfortunately the signs are that incumbent firms are becoming more entrenched, not less. Microsoft is making double the profits it did when antitrust regulators targeted the software firm in 2000. Our analysis of census data suggests that two-thirds of the economy's 900-odd industries have become more concentrated since 1997. A tenth of the economy is at the mercy of a handful of firms—from dog food and batteries to airlines, telecoms and credit cards. A \$10 trillion wave of mergers since 2008 has raised levels of concentration further. American firms involved in such deals have promised to cut costs by \$150 billion or more, which would add a tenth to overall profits. Few plan to pass the gains on to consumers.

Getting bigger is not the only way to squish competitors. As the mesh of regulation has got denser since the 2007-08 financial crisis, the task of navigating bureaucratic waters has become more central to firms' success. Lobbying spending has risen by a third in the past decade, to \$3 billion. A mastery of patent rules has become essential in health care and technology,

America's two most profitable industries. And new regulations do not just fence big banks in: they keep rivals out.

Having limited working capital and fewer resources, small companies struggle with all the forms, lobbying and red tape. This is one reason why the rate of small-company creation in America has been running at its lowest levels since the 1970s. The ability of large firms to enter new markets and take on lazy incumbents has been muted by an orthodoxy among institutional investors that companies should focus on one activity and keep margins high. Warren Buffett, an investor, says he likes companies with "moats" that protect them from competition. America Inc has dug a giant defensive ditch around itself.

Most of the remedies dangled by politicians to solve America's economic woes would make things worse. Higher taxes would deter investment. Jumps in minimum wages would discourage hiring. Protectionism would give yet more shelter to dominant firms. Better to unleash a wave of competition.

The first step is to take aim at cosseted incumbents. Modernising the antitrust apparatus would help. Mergers that lead to high market share and too much pricing power still need to be policed. But firms can extract rents in many ways. Copyright and patent laws should be loosened to prevent incumbents milking old discoveries. Big tech platforms such as Google and Facebook need to be watched closely: they might not be rent-extracting monopolies yet, but investors value them as if they will be one day. The role of giant fund managers with crossholdings in rival firms needs careful examination, too.

| *Set them free*

The second step is to make life easier for startups and small firms. Concerns about the expansion of red tape and of the regulatory state must

be recognised as a problem, not dismissed as the mad rambling of anti-government Tea Partiers. The burden placed on small firms by laws like Obamacare has been material. The rules shackling banks have led them to cut back on serving less profitable smaller customers. The pernicious spread of occupational licensing has stifled startups. Some 29% of professions, including hairstylists and most medical workers, require permits, up from 5% in the 1950s.

A blast of competition would mean more disruption for some: firms in the S&P 500 employ about one in ten Americans. But it would create new jobs, encourage more investment and help lower prices. Above all, it would bring about a fairer kind of capitalism. That would lift Americans' spirits as well as their economy. ■



美国商业

利润问题

美国大公司从未有过如此好的光景。是时候多些竞争了

美国曾经是充满机会与乐观主义的土地。现在机会则被视为精英们的保留地：三分之二的美国人相信有人在幕后操控经济以偏向既得利益者。乐观主义已转变成愤怒。选民的暴怒助长了唐纳德·特朗普（Donald Trump）和伯尼·桑德斯（Bernie Sanders）的反叛，并削弱了希拉里这样的圈内人士。

选战已经发掘出许多可被指责的问题，从自由贸易协定到华尔街的轻率鲁莽。但是美国资本主义的一个问题却被忽略了：腐蚀性地缺乏竞争。美国公司顽皮的小秘密便是它们在本国的日子要好过得多：其股本收益率在美国国内比在国外高出40%。累计国内利润占GDP比例已接近历史最高水平。美国本应是自由企业的神殿，而实则不然。

| 由美国承受

如果不是如此持久而令人生疑，高利润本可能是杰出创新或者明智长期投资的表现。目前，一家获利非常丰厚的公司在十年后仍能一如既往的可能性为80%，而在上世纪90年代这种概率仅为50%左右。有些公司能够保持卓越，但大部分公司预期自己的利润会因竞争而减少。今天，既有企业发现自己更容易长久地保持高利润。

你或许认为选民们会因为自己的雇主兴旺发达而欢天喜地，但如果利润不用于再投资，或者被股东消费，高利润反而会抑制需求。美国公司在国内产生的超出其投资预算的富余现金已达每年八千亿美元，相当于GDP的4%。税收机制鼓励它们把海外利润留在国外。不正常的高利润如果是价格持续走高或者工资低迷的结果，则会恶化不平等状况。如果美国公司降低价格，让它们的利润降至历史正常水平，那么消费者的账单可能会降低2%。如果高昂的收益没有吸引到新来者加入，那也许意味着各公司在滥用垄断地位，或是利用游说扼杀竞争。游戏的确可能被人操控了。

面对超高利润率时代，应对的方法之一就是耐心等待。创造性破坏需要时间：之前的利润高峰时期，比如上世纪60年代后期，都戛然而止。硅谷的狂热信徒相信大数据、区块链和机器人的新时代即将吃掉美国企业的丰厚利润。过去六个月上市公司的盈利略降，因为低油价打击了能源公司，而强劲的美元使得跨国公司受损。

不幸的是，有迹象显示既有企业正变得更加根深蒂固，而不是更易遭到动摇。与2000年反垄断机构盯上微软时相比，这家软件公司现在的利润是当时的两倍。我们对普查数据的分析表明，自1997年以来，美国900多个行业中三分之二变得更为集中。少数公司控制了美国经济的十分之一，从狗粮、电池到航空、电信与信用卡。从2008年掀起的10万亿美元的并购浪潮更进一步提升了集中度。涉及这些交易的美国公司已承诺削减1500亿美元乃至更多的成本，这将使整体利润增加十分之一。然而鲜有公司计划将这些收益让渡给消费者。

扩大规模并不是挤压竞争者的唯一方法。从2007到2008年的金融危机以来，监管之网越收越紧，能够在官僚体系中纵横捭阖对公司的成功已更为关键。过去十年里，游说支出增长了三分之一，达到30亿美元。在医疗和科技这两大美国最赚钱的行业里，对专利规则的精通已变得至关重要。新的规则不仅仅为大型银行加上了准入门槛，也将竞争对手拒之门外。

营运资本有限，又缺乏资源，小公司在各种表格、游说和官僚操作中苦苦挣扎。上世纪70年代以来，美国小公司创建的比率已经降到了最低点，以上即是原因之一。机构投资者信奉这样的正统观念：公司应当专注于一项活动，保持高利润。这抑制了大公司进入新市场并挑战既有企业。巴菲特说，他喜欢拥有“护城河”来保护自己免于竞争的公司。美国（公司）已经为自己挖了一条巨大的护城河。

在政客拿出的解决美国经济困境的措施里，大部分都只会让情况变得更糟。提高税收会抑制投资。调高最低工资会限制雇用。贸易保护主义会给国内企业更多的庇护。而更好的方法是发起一波竞争浪潮。

第一步是要把矛头朝向备受宠溺的既有企业。让反垄断机制与时俱进会有帮助。制造高市场份额和过强定价权的并购案仍需要监督。但公司有很多方法抽租。应当放宽版权法和专利法，防止既有企业从老旧的发明中榨取利润。像谷歌和Facebook这类大型科技平台需要密切注意：它们可能还没有成为抽租的垄断企业，但投资者对它们的估值则是基于它们有朝一日会成为那类公司。在对手企业间交叉持股的大型基金公司也需要小心审视。

| 让它们自由

第二步是要让创业企业和小公司日子更好过一些。对官僚程序和管制型政府扩张的担忧必须被正视为问题，不能将其当作反政府茶党的胡言乱语而嗤之以鼻。如奥巴马医改这样的法律已经给小企业加上了沉重的负担。限制银行的法规促使它们减少了对盈利较少的小型客户的服务。职业注册制度的恶性扩张阻碍了创业。约有29%的职业需要许可，包括发型师和大多数医护职位，而上世纪50年代这一比例仅为5%。

竞争之风将颠覆一些公司：雇用了约10%美国人的标普500企业。但它也将创造新工作，鼓励更多投资，并帮助拉低价格。尤其重要的是，它将带来一种更公平的资本主义。这将振奋美国人的精神，并复兴美国的经济。





Robots v humans

Machine earning

Jobs in poor countries may be especially vulnerable to automation

BILL BURR, an American entertainer, was dismayed when he first came across an automated checkout. “I thought I was a comedian; evidently I also work in a grocery store,” he complained. “I can’t believe I forgot my apron.” Those whose jobs are at risk of being displaced by machines are no less grumpy. A study published in 2013 by Carl Benedikt Frey and Michael Osborne of Oxford University stoked anxieties when it found that 47% of jobs in America were vulnerable to automation. Machines are mastering ever more intricate tasks, such as translating texts or diagnosing illnesses. Robots are also becoming capable of manual labour that hitherto could be carried out only by dexterous humans.

Yet America is the high ground when it comes to automation, according to a new report* from the same pair along with other authors. The proportion of threatened jobs is much greater in poorer countries: 69% in India, 77% in China and as high as 85% in Ethiopia. There are two reasons. First, jobs in such places are generally less skilled. Second, there is less capital tied up in old ways of doing things. Driverless taxis might take off more quickly in a new city in China, for instance, than in an old one in Europe.

Attracting investment in labour-intensive manufacturing has been a route to riches for many developing countries, including China. But having a surplus of cheap labour is becoming less of a lure to manufacturers. An investment in industrial robots can be repaid in less than two years. This is a particular worry for the poor and underemployed in Africa and India, where industrialisation has stalled at low levels of income—a phenomenon dubbed “premature deindustrialisation” by Dani Rodrik of Harvard University.

Rich countries have more of the sorts of jobs that are harder for machines to replicate—those that require original ideas (creating advertising), or complex social interactions (arguing a case in court), or a blend of analysis and dexterity (open-heart surgery). But poorer countries are not powerless. Just because a job is deemed at risk from automation, it does not necessarily mean it will be replaced soon, notes Mr Frey.

The cheapness of labour in relation to capital affects the rate of automation. Passing laws that make it less costly to hire and fire workers is likely to slow its advance. Scale also matters: farms in many poor countries are often too small to benefit from machines that have been around for decades. Consumer preferences are a third barrier. Mr Burr is hardly alone in hating automated checkouts, which explains why 3m cashiers are still employed in America.

* “Technology At Work v2.0: The Future is Not What It Used to Be”, by the Oxford Martin School and Citigroup ■



机器人对阵人类

机器收益

贫穷国家的工作岗位可能尤其容易受到自动化的影响

第一次碰到自动收银机时，美国艺人比尔·伯尔（Bill Burr）惶恐无措。“我原以为自己只是位喜剧演员，但显然我在杂货店里还有份工作，”他抱怨道，“我不敢相信自己竟然忘了穿围裙。”那些工作有可能被机器取代的人和他一样充满怨气。牛津大学的卡尔·贝内迪克特·弗雷（Carl Benedikt Frey）和迈克尔·奥斯本（Michael Osborne）2013年发表的一项研究引发了焦虑。研究发现，美国47%的工作岗位容易受到自动化的威胁。机器正在掌握日益复杂的任务，比如翻译文本或诊断疾病。机器人也变得能够胜任那些迄今为止只能由灵巧的人类所进行的手工劳动。

但是，根据上述两位专家连同其他作者发布的一份新报告*，美国工人在自动化问题上占有优势。贫穷国家受到威胁的工作岗位比例还要大得多：印度为69%，中国为77%，埃塞俄比亚高达85%。原因有二：首先，上述地区的工作岗位通常不需要太多技能；其次，旧有的做事方法捆绑的资本较少。例如，无人驾驶出租车在中国的一个新城市也许会比在欧洲的一座老城市能更快地一炮走红。

在包括中国的许多发展中国家，吸引投资进入劳动密集型制造业带来了财富。不过，拥有过剩的廉价劳动力对制造商的吸引力越来越小。投资于工业机器人可以用不到两年的时间就收回成本。这就是非洲和印度的贫困及失业人口特有的担忧，那里的工业化在低收入阶段已止步不前——这种现象被哈佛大学的丹尼·洛迪克（Dani Rodrik）称为“过早的去工业化”。

富裕国家有更多机器比较难以复制的工作岗位——那些需要原创想法（广告创意）、复杂的社会互动（在法庭上为案件辩论）或者分析和灵巧相结合（开胸手术）的工作。不过，比较贫穷的国家也并非无能为力。一种工作岗位被认为受到自动化威胁，并不一定意味着它很快就将被取代，弗雷这样指出。

劳动力相对于资本的廉价程度会影响自动化的速度。通过一些法律来降低雇用和解雇员工的成本可能会减缓自动化的进程。规模也很重要：许多贫穷国家的农田往往太小，无法利用业已存在几十年的机器而获益。消费者的偏好是第三个障碍。讨厌自动收银机的人想必不只伯尔一人，这解释了为什么美国目前还有300万名收银员。

*牛津马丁学院（Oxford Martin School）与花旗集团共同完成的《工作中的技术2.0版：未来不再是过去的样子》（Technology At Work v2.0: The Future is Not What It Used to Be） ■



China's economy

Ore-inspiring

In leaning towards stimulus rather than reform, China's leaders are storing up trouble

IN DECEMBER an adviser to China's government predicted that GDP growth would soon rebound. Now was a good time, he said, to buy shares in companies that mined copper, nickel and coal—though even he drew the line at investing in iron ore, whose supply was simply too abundant. The adviser sounded insanely bullish back then; he might now rue his caution. On March 7th the price of iron ore jumped by 19%, a record one-day rise, in a sign of renewed optimism about China's growth.

The spike in the iron-ore price came hard on the heels of a speech by Li Keqiang, China's prime minister, to the annual National People's Congress in Beijing. In it, Mr Li announced a punchy GDP growth target of 6.5-7% for 2016, along with the means he hoped would secure it: a bigger budget deficit than had been planned for last year and faster credit growth.

With sufficient stimulus China will avoid a sharp economic slowdown. But Mr Li did not simply open the macroeconomic spigots. He hinted that the fiscal boost would be designed to help rebalance the economy: China is aiming for just 3% growth in government revenue this year, suggesting that more of the deficit will come from tax cuts to private firms. He made clear that reforms to reduce overcapacity in low-end and inefficient industries were a priority. And by switching from a single-figure growth target to a range, Mr Li gave himself more flexibility in trading off some GDP growth for more reform.

Look closer, though, and there is little sign of any real commitment to reform. Promises to slim industries such as steel and coal sound tough—the government expects nearly 2m workers will be laid off—but the

planned reduction would make only a small dent in oversupply. Instead the government seems to be doubling down on its well-worn recipe of debt- and investment-fuelled growth.

Reaching the goal of 6.5-7% GDP growth will require either a fudging of the figures or investment in projects of dubious worth. A second train line to remote and mountainous Tibet is planned. Banks are being leant on to juice up the economy. Credit is growing at twice the rate of nominal GDP, in a country already overburdened by private debt. A big increase in the money supply will put downward pressure on China's currency, which in turn will lead either to a rapid rundown in foreign-exchange reserves or a devaluation.

In theory, China's capital controls can ease the pressure, by making it harder for money to leave the country. And the latest figures suggest they are becoming more effective. Reserves dropped by just \$29 billion in February, to \$3.2 trillion, after three months of heavier falls. But even if China can successfully police its financial borders, rapid credit growth will fuel asset prices at home. Wary of the stockmarket, investors with cash to spare see property as the safest bet. Unregulated online lenders are helping them pile on leverage, skirting rules requiring minimum down-payments on homes. There are worrying signs of a bubble in several big cities: house prices in Shenzhen have risen by 53% in the past year.

Supporting a sagging economy with cheap money and tax cuts is sensible. But China also needs to put in place the structural reforms that will make such stimulus both more effective and less destabilising.

| *The mañana strategy*

The default of a few of the most hopeless state-owned enterprises, something Mr Li again promised in his speech, would set a useful precedent. It might also nudge banks into lending to profitable businesses

instead of firms they expect to be bailed out by government. New homes with few ready buyers in lower-tier cities should be turned into social housing; better that than trying to pump up a broader property bubble to clear unsold stocks. In places where house prices are soaring, the government should summon the courage to introduce a long-discussed property tax to cool speculation. And now would be a good time to recapitalise China's banks in readiness for a write-down of the latent bad debts on their balance-sheets.

Yet the Chinese president, Xi Jinping, apparently wishes to avoid even mild turbulence in the economy, at least until he has appointed his own nominees to the Standing Committee of the Politburo, a key decision-making body, in 2017. (Many suspect that reform will remain elusive even after that date.) Mr Xi is scarcely alone among world leaders in setting policy with an eye on the political calendar. But financial markets cannot be relied on to play along with this schedule. At some point, China must deal with its excess debts and industrial overcapacity. By taking bolder steps on reforms now, China would do more to entrench faith in its longer-term economic outlook than stimulus measures ever could. ■



中国经济

铁矿可畏

中国领导人依赖刺激手段而非改革推动经济，这正积攒弊病

去年12月，中国政府的一位顾问预测GDP将很快反弹。他表示，现在正是购入铜、镍和煤矿企业股份的好时机，但他认为不该投资铁矿石，因为供应太充足了。当时，这位顾问听起来似乎乐观得昏了头；现在看来，他应该会后悔过于谨慎了。3月7日，铁矿石价格上涨了19%，创下单日涨幅新高，中国经济增长重现乐观迹象。

铁矿石价格飙升紧随中国总理李克强在北京召开的全国人大会议上的讲话而来。在讲话中，李克强公布了2016年中国GDP增长目标为强有力的6.5%至7%，以及他希望能够确保目标实现的手段：比去年更高的预算赤字及更快的信贷增长。

只要有足够的刺激，中国将可避免经济急速放缓。但李克强并非只是打开了宏观调控的闸门。他还暗示，会以促进经济协调发展为目标，推出相应的财政刺激手段：中国今年政府收入的增长目标仅为3%，表明预算赤字中更多将源自对私营公司的减税政策。他明确指出，首要任务是推行改革解决低端低效产业的产能过剩问题。通过把经济增长目标从单一数字变为一定区间，李克强给了自己更大的灵活性，可以牺牲部分GDP增长以推行更多改革。

但细看之下，鲜见对改革的真正投入。削减钢铁及煤炭等行业规模的承诺听起来掷地有声（政府预计将有近200万工人下岗），但此番裁减计划对改变供过于求的现状作用甚微。相反，政府似乎在加倍重蹈“负债及投资驱动型增长”的覆辙。

要达到6.5%至7%的GDP增长目标，如果不在数字上做手脚，就得向价值存疑的项目投资。政府已规划兴建通往偏远多山省份西藏的第二条铁路线。银行成为赖以激活经济的工具。中国目前的私人债务负担已相当沉

重，信贷还在以名义GDP增速两倍的速度增长。货币供应的大幅增加将对中国货币带来下行压力，继而导致外汇储备快速消耗或者人民币贬值。

理论上，中国的资本管制措施能让资金难以从国内流出，从而缓解压力。而且最新数据显示，这些措施的成效正在加大。在之前三个月大幅下跌之后，二月份外汇储备只下降了290亿美元，期末总额为3.2万亿美元。但即使中国能成功限制资金外流，信贷快速增长将推高国内资产价格。拥有闲散资金的投资者对股市存有戒心，而视投资房地产为万全之策。缺乏监管的网络贷款机构帮助他们大举借债，规避购房最低首付的规定。在多个大城市，楼市已出现令人忧心的泡沫迹象：去年深圳房价已上涨53%。

以低息资金及减税来支撑疲软的经济合情合理。但中国也需要推行结构性改革，令这些刺激手段变得更有效，也能降低其不稳定性。

| “明日复明日”策略

李克强在讲话中再次承诺对一些最无希望的国企进行破产清算，这将形成有力的先例，也可能促使银行日后选择向盈利企业贷款，而非那些指望政府救助的公司。在买家寥寥的二三四线城市，应将新建住宅改为社会福利房：这好过试图吹起更广大范围的房地产泡沫来去库存。在房价飙升的地方，政府应鼓起勇气推出讨论已久的房产税为投机炒作降温。而且现在正是一个好时机来重组中国的银行资本结构，减少其资产负债表上的潜在坏账。

然而，中国国家主席习近平显然希望避免经济出现哪怕是轻微的震荡，至少在2017年他任命自己人进入关键决策机构“政治局常务委员会”之前是如此。（许多人怀疑即便在那之后改革仍会遥遥无期。）各国领导在制订政策时多少会考虑到自己的政治日程，习近平也不例外。然而不能依赖金融市场也会按照这一安排发展。到了某个节点，中国必须处理过度负债及产能过剩的问题。现在更大胆地改革比任何刺激手段都更能巩固人们对中国经济长期前景的信心。 ■



After Moore's law

The future of computing

The era of predictable improvement in computer hardware is ending. What comes next?

IN 1971 the fastest car in the world was the Ferrari Daytona, capable of 280kph (174mph). The world's tallest buildings were New York's twin towers, at 415 metres (1,362 feet). In November that year Intel launched the first commercial microprocessor chip, the 4004, containing 2,300 tiny transistors, each the size of a red blood cell.

Since then chips have improved in line with the prediction of Gordon Moore, Intel's co-founder. According to his rule of thumb, known as Moore's law, processing power doubles roughly every two years as smaller transistors are packed ever more tightly onto silicon wafers, boosting performance and reducing costs. A modern Intel Skylake processor contains around 1.75 billion transistors—half a million of them would fit on a single transistor from the 4004—and collectively they deliver about 400,000 times as much computing muscle. This exponential progress is difficult to relate to the physical world. If cars and skyscrapers had improved at such rates since 1971, the fastest car would now be capable of a tenth of the speed of light; the tallest building would reach half way to the Moon.

The impact of Moore's law is visible all around us. Today 3 billion people carry smartphones in their pockets: each one is more powerful than a room-sized supercomputer from the 1980s. Countless industries have been upended by digital disruption. Abundant computing power has even slowed nuclear tests, because atomic weapons are more easily tested using simulated explosions rather than real ones. Moore's law has become a cultural trope: people inside and outside Silicon Valley expect technology to get better every year.

But now, after five decades, the end of Moore's law is in sight. Making transistors smaller no longer guarantees that they will be cheaper or faster. This does not mean progress in computing will suddenly stall, but the nature of that progress is changing. Chips will still get better, but at a slower pace (number-crunching power is now doubling only every 2.5 years, says Intel). And the future of computing will be defined by improvements in three other areas, beyond raw hardware performance.

| *Faith no Moore*

The first is software. This week AlphaGo, a program which plays the ancient game of Go, beat Lee Sedol, one of the best human players, in the first two of five games scheduled in Seoul. Go is of particular interest to computer scientists because of its complexity: there are more possible board positions than there are particles in the universe. As a result, a Go-playing system cannot simply rely on computational brute force, provided by Moore's law, to prevail. AlphaGo relies instead on "deep learning" technology, modelled partly on the way the human brain works. Its success this week shows that huge performance gains can be achieved through new algorithms. Indeed, slowing progress in hardware will provide stronger incentives to develop cleverer software.

The second area of progress is in the "cloud", the networks of data centres that deliver services over the internet. When computers were stand-alone devices, whether mainframes or desktop PCs, their performance depended above all on the speed of their processor chips. Today computers become more powerful without changes to their hardware. They can draw upon the vast (and flexible) number-crunching resources of the cloud when doing things like searching through e-mails or calculating the best route for a road trip. And interconnectedness adds to their capabilities: smartphone features such as satellite positioning, motion sensors and wireless-payment support now matter as much as processor speed.

The third area of improvement lies in new computing architectures—specialised chips optimised for particular jobs, say, and even exotic techniques that exploit quantum-mechanical weirdness to crunch multiple data sets simultaneously. There was less need to pursue these sorts of approaches when generic microprocessors were improving so rapidly, but chips are now being designed specifically for cloud computing, neural-network processing, computer vision and other tasks. Such specialised hardware will be embedded in the cloud, to be called upon when needed. Once again, that suggests the raw performance of end-user devices matters less than it did, because the heavy lifting is done elsewhere.

| *Speed isn't everything*

What will this mean in practice? Moore's law was never a physical law, but a self-fulfilling prophecy—a triumph of central planning by which the technology industry co-ordinated and synchronised its actions. Its demise will make the rate of technological progress less predictable; there are likely to be bumps in the road as new performance-enhancing technologies arrive in fits and starts. But given that most people judge their computing devices on the availability of capabilities and features, rather than processing speed, it may not feel like much of a slowdown to consumers.

For companies, the end of Moore's law will be disguised by the shift to cloud computing. Already, firms are upgrading PCs less often, and have stopped operating their own e-mail servers. This model depends, however, on fast and reliable connectivity. That will strengthen demand for improvements to broadband infrastructure: those with poor connectivity will be less able to benefit as improvements in computing increasingly happen inside cloud providers' data centres.

For the technology industry itself, the decline of Moore's law strengthens the logic for centralised cloud computing, already dominated by a few big

firms: Amazon, Google, Microsoft, Alibaba, Baidu and Tencent. They are working hard to improve the performance of their cloud infrastructure. And they are hunting for startups touting new tricks: Google bought Deepmind, the British firm that built AlphaGo, in 2014.

For more than 50 years, the seemingly inexorable shrinking of transistors made computers steadily cheaper and more capable. As Moore's law fades, progress will be less metronomic. But computers and other devices will continue to become more powerful—just in different and more varied ways. ■



摩尔定律之后 计算的未来

计算机硬件进步可预测的时代正在走向尾声。接下来是什么？

1971年，世界上最快的汽车是法拉利代托纳（Daytona），时速可达280公里。世界上最高的建筑物是纽约的双子塔，高415米。同年11月，英特尔推出了第一款商用微处理器芯片4004，由2300个微小的晶体管组成，每个有红血球大小。

从那以后芯片的进步与英特尔联合创始人高登·摩尔（Gordon Moore）的预测一致。根据他的经验法则，即摩尔定律，随着越来越小的晶体管被更紧密地封装到硅片上，性能提升、成本下降，芯片处理能力约每两年提升一倍。英特尔现在的Skylake处理器由约17.5亿个晶体管组成，4004芯片上一个晶体管的大小相当于50万个最新芯片上的晶体管，它们的整体运算能力是4004芯片的四十万倍。现实世界很难实现这样这样指数级的增长。如果自1971年起汽车和摩天大楼以这样的速度发展，那么现在最快的汽车速度已经能达到光速的十分之一；最高的建筑物再高一倍就要触到月球了。

摩尔定律的影响在我们周围随处可见。今天30亿人口袋里装着智能手机：每个手机都比20世纪80年代房间大小的超级计算机能力更强。无数行业因数字化的剧变而被颠覆。强劲的计算能力甚至已经减少了核试验的次数，因为比起实际试验，原子武器更容易通过模拟爆炸测试。摩尔定律已成为一种文化指代：硅谷内外的人都期盼着技术每年有进步。

然而五十年后的现在，摩尔定律已走到了尽头。将晶体管做得更小不再能保证它们会更便宜或更快。这并不是说计算能力的提升会突然停滞，但是这种提升的本质正在改变。芯片还会更好，但提升的速度会放缓（英特尔称，运算能力目前要每两年半才翻一倍）。计算的未来将由其他三方面的进步定义，而不再只是单纯的硬件性能提升。

| 摩尔不再可信

首先是软件。本周一款围棋软件AlphaGo在首尔如期举行的五番棋比赛的头两盘中击败了人类最优秀的棋手之一李世石。由于围棋的复杂性，计算机科学家对它特别感兴趣：棋盘上落子位置的可能性比宇宙中的粒子数量还要多。因此，要取得胜利，围棋软件不能简单地依靠由摩尔定律提供的计算蛮力。相反，AlphaGo依靠的是“深度学习”技术，在一定程度上模仿人类大脑的工作方式。它本周的成功表明通过新的算法可以取得性能的巨大进步。实际上，硬件提升放缓将为开发更加智能的软件提供更强劲的推动力。

第二个进步领域是“云”，即通过互联网提供服务的数据中心网络。当计算机是单机设备时，无论是大型主机还是台式电脑，它们的性能首先取决于处理器芯片的速度。今天的计算机无需改变硬件就能变得更为强大。它们可以利用云端庞大（且灵活）的运算资源来搜索电子邮件或者计算最佳出游路线。互联性增强了计算机的能力：智能手机的功能如卫星定位、运动传感器和无线支付等现在与处理器速度同等重要。

第三个进步领域是新的计算架构，如为特殊工作优化的特制芯片，甚至利用量子力学这种新技术的超凡力量来同时处理多个数据集。当通用微处理器能快速提升运算速度时，不那么需要追求这些途径，但是现在的芯片特为云计算、神经网络处理、计算机视觉和其他任务而设计。这些专用硬件将被装在云端，需要时可以随时调用。这再一次表明终端用户设备自身的性能不如以前那么重要，因为繁重的工作已经在别处完成了。

| 速度并非所有

这在实际中意味着什么呢？摩尔定律绝非物理法则，而是自我应验的寓言，是科技行业齐心协力达成的集中规划的胜利。它的消亡会让技术进步的速度更难预测；提升性能的新技术的出现有早有晚，因此这条路可能会时起时落。但是考虑到大多数人依赖功能与特性的有无而非处理速度来评价他们的计算设备，消费者可能对发展减速感触不大。

对公司而言，向云计算的转向将掩盖摩尔定律的终结。公司升级台式电脑

的频率已经降低，也不再运营自己的邮件服务器。不过这一模式依赖的是快速可靠的连通性。这会加强对宽带基础设施提升的要求：随着云提供商的数据中心内部计算能力的不断提升，连通性差的公司将越来越无法从中受益。

对于科技行业自身而言，摩尔定律的衰落强化了集中式云计算的逻辑，这已经由少数几家大公司主导：亚马逊、谷歌、微软、阿里巴巴、百度和腾讯。它们正努力提升自己云基础设施的性能，同时也在搜罗别具创意的创业公司：谷歌2014年收购了Deepmind，正是这家英国公司开发了AlphaGo。

半个多世纪以来，晶体管不断缩小，看似无可阻挡，让计算机价格稳步降低、性能持续提升。随着摩尔定律的消亡，进步不再那么有时间规律。但计算机和其他设备会不断变得更强大，只是以不同的、更多元化的方式。





Immunology

Mr T-cell

Boosting the immune system to fight cancer

TO DEFEAT the enemy, you must first know the enemy. In the immune system, that job is done by T-cells, which recognise the molecular signatures of threats to their owner's well-being. In February, at the AAAS conference, researchers explained how turbocharging these cells can boost the immune system's ability to fight cancer, and possibly other illnesses, too.

The technology they use merges gene therapy, synthetic biology and cell biology. First, a batch of T-cells is extracted from the blood. A custom-built virus is used to implant them with new genes. The modified cells are then returned to the body, where their new DNA gives them a fresh set of targets to attack.

Stanley Riddell, at the Fred Hutchinson Cancer Research Centre in Washington state, creates cells that target a molecule, called CD19, that is found on the surfaces of some cancers. A firm called Juno Therapeutics is exploring whether the technique can be used to treat cancers that affect B-cells, another part of the immune system.

Dr Riddell has meanwhile been refining the technology. He told the meeting of his attempts to isolate and modify certain types of T-cells that are known to respond best to a given disease. In a trial of 31 patients with acute lymphoblastic leukaemia (ALL), that approach brought about a complete remission in 93% of cases—something Dr Riddell described as unprecedented.

Another refinement has been dealing with the toxic effects that these

treatments can trigger. Sometimes, boosted T-cells can prove too eager for their owner's good. As their numbers double, roughly every 12 hours, they can trigger a runaway immune reaction called a cytokine storm. This can be fatal: two of the patients in the ALL trial died in that way.

The biggest cytokine storms, though, seem to come from the patients with the most advanced cancers. Dr Riddell's solution is to give the sickest patients the lowest dose. This means that the T-cells multiply more slowly, reducing the chances of an immune-system overreaction.

Although the ALL results are impressive, it is difficult to expand the approach to other cancers. To prime a T-cell to attack, it needs to be given precise co-ordinates. Otherwise it may lock onto, and destroy, something else in the body. But besides CD19, which is found in only a few cancers, scientists know of no other chemical target that is specific to cancer alone.

In a paper published on January 28th in *Cell*, Kole Roybal and his colleagues at the University of California, San Francisco propose a solution: tweaking cells to attack when they sense two different target chemicals instead of one. In isolation, neither target may be unique to cancer cells—but the combination might be. That could allow the immune system to be unleashed on tumours whilst sparing healthy tissue.

It is a long way from the lab to the clinic. But the technology is moving fast, and researchers hope that, one day, engineered T-cells might be used to treat a wide range of diseases, including HIV, immune deficiencies, and autoimmune disorders. Besides the elegance of the idea of boosting the body's own defences, the technology offers another big advantage over traditional drugs: once they have done their job, the engineered T-cells stick around in the body. That could offer protection against re-infection or the recurrence of a cancer. Chiara Bonini, of the San Raffaele Scientific Institute in Milan, told the meeting she had found that some modified cells

were so durable that they might be able to protect their owners for a decade or more. ■



免疫学

T细胞先生

增强免疫系统对抗癌症

要想打败敌人，必须首先了解敌人。在免疫系统中，这项任务由T细胞完成。T细胞能识别对人体健康构成威胁的分子特征。2月，科研人员在美国科学促进会（AAAS）年会上阐释了如何通过增强这类细胞来提升免疫系统对抗癌症或其他疾病的能力。

他们使用的技术结合了基因疗法、合成生物学和细胞生物学。首先在血液中分离出一批T细胞，然后使用定制的病毒在这些细胞中植入新的基因，再将经基因改造的细胞重新植入人体。在那里，它们新的DNA给予了它们一批全新的攻击目标。

华盛顿州福瑞德·哈金森肿瘤研究中心（Fred Hutchinson Cancer Research Centre）的斯坦利·里德尔（Stanley Riddell）研制出了会定向瞄准CD19分子的细胞。这种分子被发现存在于一些肿瘤的表面。朱诺治疗公司（Juno Therapeutics）正在探索该技术能否被用于治疗那些影响B细胞的癌症。B细胞也是免疫系统的一部分。

里德尔同时也致力于改善这一技术。他在大会上表示，他试图分离并改造对某种疾病反应最佳的几种T细胞。在对31名急性淋巴细胞白血病患者测试中，这种方法的“完全缓解”率达到了93%，里德尔形容这前所未有的。

另一项改进则针对这类治疗可能引发的毒性反应。有时，被加强的T细胞可能会因护主心切而行动过度。随着其数量以约每12小时增加一倍的速度繁殖，它们可能会触发细胞因子风暴这种失控的免疫反应。这可能会致命——两名患者在上述试验中因此死亡。

不过，最强烈的细胞因子风暴反应似乎来自最晚期的癌症病患。里德尔的解决方法是给最严重的病患最少的剂量。这会让T细胞以较缓慢的速度繁

殖，从而减少发生免疫系统过度反应的几率。

虽然对急性淋巴细胞白血病的测试结果令人惊艳，但要把这种方法扩展到治疗其他癌症却有难度。要引导T细胞做好定向攻击的准备，需要给予它精确的协调指令，否则它可能会锁定并破坏人体的其他组织。然而，除了CD19这种仅在少数几种癌症中发现的分子外，科学家们尚不知晓任何其他唯癌症独有的化学目标。

在1月28日于《细胞》（*Cell*）期刊上发表的报告中，加州大学旧金山分校的科尔·罗伊鲍尔（Kole Roybal）及其同事提出了一个解决方案：改造细胞以令它们在发现两种不同的目标化学物而非一种目标化学物时做出攻击反应。这两种目标在分开出现时可能无一为癌细胞所独有，但当它们同时出现就有可能。这会让免疫系统猛烈攻击肿瘤而放过健康的组织。

从实验室到诊所是一个漫长的旅程，但这项技术正在快速发展，而研究人员希望，某天经基因改造的T细胞可能被用于治疗种类广泛的疾病，包括HIV、免疫缺损和自体免疫失调等。提升人体自身防御力是一个优雅的方法，除此之外该技术相比传统药物还有另一个巨大的优势：一旦完成任务，这些经改造的T细胞会继续存留体内，从而可能防止再度感染或癌症复发。米兰圣拉斐尔科学研究所（San Raffaele Scientific Institute）的基娅拉·博尼尼（Chiara Bonini）在大会上表示，她已经发现某些经改造的细胞非常持久，可能会保护其主人十年甚至更久。■



Touchscreens

The moving finger moves on

Researchers find new ways to make touchscreens more responsive

THE only way to operate an increasing number of modern devices, from smartphones to cash machines and cars, is the deft use of a finger on a touchscreen, with a tap for this and a swipe for that. But sometimes such actions do not work all that well. It is easy to miss the required key on a tiny virtual keyboard and produce spelling errors. Sometimes the screen fails to respond at all. And it can be downright dangerous to take your eyes off the road to flip through myriad air-conditioning options on a vehicle's control panel. Now help, as it were, is at hand. As touchscreens become ubiquitous on devices, new ways to make and use them are emerging.

Robert Bosch, a German producer of car parts, among other things, recently displayed a touchscreen with "haptic feedback". Visual effects, sounds and vibrations are already used with touchscreens to confirm when icons or keys are selected. What the Bosch system does is to add different surface textures to the mix.

The textures on the screen can be rough, smooth or patterned in various ways to represent the location of different buttons with different uses. The idea is that a driver would be able to feel for the right button without having to look at the screen. To avoid accidentally activating buttons as he feels his way across the screen, the driver needs to press a particular surface more firmly to turn the required function on or off, much like pushing on a mechanical switch. By applying variable pressure, a user can scroll faster or slower through, say, different music tracks or radio stations.

Because neoSense, as Bosch calls the system, is still under development the company will not say how it works other than that it uses a conventional

touch sensor coupled with a sensor that measures the amount of pressure from fingers. That gives little away. Bosch is probably doing something similar to other groups working on such systems: placing under the screen a thin device that generates specially tuned vibrations in the area of the virtual buttons. The pattern of these vibrations would create textured effects that could be felt by the user's fingers as if they were physical elements on the screen.

| *All charged up*

Although research into touchscreens dates back to the 1960s, they did not appear on consumer gadgets until the 1980s. Many of these early screens were the "resistive" type, which in its simplest form relies on a finger pushing against a ductile screen to press two underlying conductive sheets together to complete an electric circuit. The point of contact is measured to provide the co-ordinates of the finger.

Resistive screens are cheap to make and tough: lots are still used in restaurants to take orders and in factories to control machines. But many devices, particularly smartphones and tablets, now use a system that relies on capacitance. (Capacitance is a measure of an object's capacity to store an electric charge. The charge builds up if there is no circuit through which the electrons can flow and is dissipated when a circuit is completed—in extreme cases as a jolt when static electricity builds up in the body and is discharged when touching something metallic.)

There are a number of ways in which capacitive touchscreens can be made. The current favourite uses a grid of tiny wires made from a transparent, conducting material, usually indium tin oxide, just below the surface of the screen. When a finger touches the screen, or is very close to it, an electrostatic field created in the grid is disturbed by a small change in capacitance at the point at which the charge transfers to the finger. The software in a chip which controls the screen detects the position of the

change in capacitance and uses it to determine the finger's location. Capacitive touchscreens are smooth to operate and require only a light touch. They also allow the use of more than one finger, making “pinch and zoom” movements possible.

Most research now is going into improving capacitive devices and integrating the conducting layers into the screen to make thinner displays, says Jeff Han, a pioneer of multi-touch systems. His company, Perceptive Pixel, developed giant touchscreens used by some news organisations for election coverage and was sold to Microsoft in 2012. Mr Han says users should expect to see more ways to use fingers and gestures to operate touchscreens, along with additional haptic effects.

More capacitive screens will become pressure-sensitive. Apple's latest iPhone 6s responds to finger pressure with a process the company calls 3D Touch. The phone has another sensor below the screen which can detect a minute deformation in the glass when a finger is pushed against it. This allows additional actions by the user, such as pressing to preview a message or e-mail before opening it. Apple has also added haptic effects with something it calls a “taptic engine”, in effect a refined tiny vibrator which provides subtle taps in response to certain finger movements.

To boost the responsiveness of touchscreens, alternatives to indium tin oxide are starting to be used. Although the material is transparent it is only moderately conductive, which can restrict just how responsive a screen is to touch. Metals, particularly gold and silver, are much better conductors, but not being transparent, they can interfere with the displayed image unless deposited in minute quantities—which reduces conductivity. One way around that problem has been developed by Dimos Poulikakos and his colleagues at ETH Zurich, a Swiss technical university. This involves building gold and silver capacitive grids as “nanowalls”, just 80-500 nanometres (billionths of a metre) wide. As the walls are perpendicular to

the screen and two to four times taller than their width, the grid is highly conductive but almost invisible.

| *Printing walls*

Dr Poulidakos's nanowalls are made with a new form of 3D printing. The process begins with gold or silver nanoparticles suspended in a solvent. This "ink" is drawn out of a tiny glass capillary tube by an electric field to form a drop which remains hanging onto the tip of the tube. By carefully balancing the composition of the ink and the electric field, the researchers have been able to get an even smaller droplet to form at the base of the attached drop. It is these secondary droplets which are used to print the nano walls.

Using nanoparticles means the cost of printing grids with precious metals, such as gold or silver, is not a concern, says Dr Poulidakos. Indeed, he reckons the "nanodrip" process would be a lot cheaper than current methods used to produce capacitive grids for touchscreens as these rely on costly clean rooms and vapour-deposition equipment, similar to that used to make computer chips. Nanodrip is now being scaled up for commercial use by a spin-off company called Scrona.

Other conductive materials that might be used to build touchscreens include graphene, a lattice of carbon atoms which, being only one atom thick, is essentially transparent. Researchers at the University of Manchester in Britain, where graphene was discovered, reckon the material can be used to make touchscreens which are flexible enough to roll up like a newspaper. This is because, unlike indium tin oxide, graphene is not brittle.

It will also become possible to operate touchscreens without actually touching them. Samsung has already employed tiny infra-red sensors just above the screen on some of its phones to detect hand gestures. Google is

developing a miniature radar chip that could be embedded behind the screen itself to do much the same thing. The chip is supposed to be sensitive enough to pick up complex gestures, such as twirling a finger in a clockwise circle to increase the volume on a virtual dial or anticlockwise to reduce it.

Such technology could work on touchscreens in cars, too, without distracting drivers. BMW has developed a touchscreen that uses a camera in the roof of the car to recognise hand gestures. If the phone rings, say, you can simply point towards the screen to take the call; if it's the office, swiping your hand to the side will reject it.

Add in fast-improving speech-recognition systems, such as Apple's Siri and Microsoft's Cortana, and the amount of time people spend jabbing, gesticulating and talking to their devices will only rise. ■



触摸屏

指尖的飞跃

研究人员发现了让触摸屏变得更灵敏的新方法

从手机到取款机再到汽车，越来越多现代设备的唯一操作方式是在触摸屏上熟练地用手指敲敲这个，划划那个。但有时这些动作效果不佳。在一个微型的虚拟键盘上打字很容易按错键、拼错词。有时屏幕完全没反应。开车时不看路而去扫视控制板上的一堆空调选项，则可能非常危险。现在，改善之法似乎触手可及。随着触摸屏变得无处不在，制造和使用它们的新方法正在出现。

生产汽车零部件等产品的德国制造商博世集团（Robert Bosch）最近展示了一块带有“触觉反馈”的触摸屏。现有的触摸屏已经运用了视觉效果、声音和振动来确认用户对图标或按键的选择，而博世的系统又增添了表面触感差异这一反馈方式。

屏幕上不同用途的按键可以用多种表面质感来呈现：粗糙的、平滑的，或者以各种方式打造的模式。这样一来，司机不用看屏幕也能摸到那个正确的按键。当他的手指在屏幕上移动寻找正确的位置时，为避免不小心激活一些按键，他要在那个特定按键的表面上更用力地按压，以打开或关闭某项功能，感觉就像按动一个机械开关。通过施加不同的力道，用户在选择歌曲或电台时可以放慢或加快滚动的速度。

博世这套名为neoSense的系统目前仍处在开发阶段，因此公司不愿透露它具体如何运作，只说使用了传统的触摸传感器，配以一个测量手指压力的传感器。这等于什么也没说。博世正在做的或许跟其他研发此类系统的团队差不多：在屏幕下方放置一个薄形设备，在虚拟按键的位置产生专门设定的振动。这类振动的模式会创造出类似纹理的效果，让用户的手指仿佛在触摸屏幕上的物理按钮。

| 充足电

虽然对触摸屏的研究可以追溯到上世纪60年代，但它们直到80年代才开始在各类消费设备上出现。许多早期的屏幕为“电阻”型，其最简单的形式依靠手指按压一个弹性屏幕，从而同时触动屏幕下方的两个导电层，形成一个电路回路。测量触摸的点就能给出手指在屏幕上的坐标位置。

电阻屏造价低廉又耐用，很多仍被用于饭店点餐和工厂内控制机器。但许多设备尤其是智能手机和平板电脑如今使用一套依赖电容的系统。（电容是对物体存储电荷能力的测量。当不存在可供电子流过的电路时，电荷会开始累积，在电路形成时会消散。在极端情况下，当静电在体内累积而后在触摸某些金属制物时释放，会产生振动。）

电容屏有多种制造方式。目前最常用的一种在紧靠屏幕表面的下方铺设由透明的导电材料（通常是氧化铟锡）制成的微导线网。当手指触摸屏幕或者非常接近屏幕时，在电荷向手指转移的那个点上电容发生了微小变化，对电网形成的静电场产生干扰。屏幕控制芯片中的软件会探测到电容发生变化的位置，据此确定手指的位置。电容屏手感流畅，且只需轻微接触，也可以多手指操作，令“缩放”的动作成为可能。

多点触控技术先驱杰夫·哈恩（Jeff Han）说，目前大部分研究正在改进电容设备，将导电层融合进屏幕中为了让显示屏变得更薄。他的公司 Perceptive Pixel 研发的巨大触屏被一些新闻机构用于大选报道当中，还在 2012 年出售给微软。哈恩说，用户可以预期未来将有更多用手指和手势操作触摸屏的方式以及更多样化的触觉效果。

更多的电容屏幕会兼具有压敏性。苹果最新的 iPhone 6s 就对指压做出反应，该公司称之为 3D 触控（3D Touch）。这款手机的屏幕下方有另一个传感器，当手指触压屏幕时，它可以探测到玻璃屏幕的微小变形。这增加了用户的操作方式，比如点击短信和电子邮件来预览而无需完全将其打开。苹果也已使用它称之为“触觉引擎”的元件添加了触觉效应。该元件实际上是一个精致的小振动器，对某些手指动作以微妙的轻拍回应。

为提升触摸屏的灵敏度，氧化铟锡的替代物已经开始被应用。氧化铟锡这种材料虽然透明，但导电性一般，这限制了屏幕对触摸的反应。金属尤其是金和银则是好得多的导体，但不透明，因此会干扰屏幕的图像显示，除非它们被嵌入的量极少，但这又会减少导电性。瑞士苏黎世联邦理工学院（ETH Zurich）的迪莫斯·波利卡可斯（Dimos Poulikakos）及其同事想出了一个解决方法。他们用金和银打造电容网仅80至500纳米（十亿分之一米）宽的“纳米墙”，这些墙体垂直于屏幕，其高度为宽度的二至四倍，因此这个电网具有高度导电性但几乎看不见。

| 打印纳米墙

波利卡可斯博士的纳米墙由一种新型3D打印技术制成。最初，金或银的纳米粒子悬浮在一种溶剂中。这种“墨水”被电磁场从一个微型玻璃毛细管中吸出，在管口形成一个附着的水滴。研究人员小心地平衡墨水的构成及电磁场，在这个水滴的底部再形成另一个更小的水滴。这第二个水滴被用来打印纳米墙。

波利卡可斯说，使用纳米粒子意味着不必担心金银这类贵金属打印电容网的成本。实际上，他估计“纳米滴”工艺会比目前用来制造触摸屏电容网的方法便宜得多。这是因为后者依赖昂贵的无菌室和气相沉积设备——同用来制造计算机芯片的设备类似。纳米滴目前已被波利卡可斯的实验室派生的公司Scrona规模化应用于商业用途。

其他可能被用来制造触摸屏的传导性材料包括石墨烯，这种由碳原子排列组成的蜂巢状晶格只有单个原子的厚度，因而基本上透明。在首先发现了这种材料的曼彻斯特大学，研究人员认为它可被用来制造出能像报纸那样叠卷的弹性屏幕。这是因为和氧化铟锡不同，石墨烯的质地不脆。

不实际触摸而操控屏幕将成为可能。三星已在其部分手机屏幕的上方使用了微型红外线传感器来探测手势。谷歌正在研发一种微型雷达芯片，可被嵌入屏幕的后方来做同样的事。这块芯片应该会足够的敏感，从而能识别复杂的手势，比如手指以顺时针方向画圈，操作虚拟表盘来增加音量，或是逆时针方向画圈以降低音量。

这类技术也将能运用于汽车内的触摸屏，而让司机不再分心。宝马公司已经研发了一块触摸屏，用装设在汽车车顶的摄像头识别手势。比如，手机响了，你向屏幕一指就能接起电话，如果是办公室打来的，手一挥就能拒绝接听。

再加上快速改进的语音识别系统如苹果的Siri和微软的Cortana，人们在设备上戳点比划、跟它们说话的时间只会增加。 ■



Organ preservation

Wait not in vain

After decades of piecemeal progress, the science of cryogenically storing human organs is warming up

OVER the course of an average winter North American wood frogs, *Rana sylvatica*, may freeze solid several times. They are able to get away with this by replacing most of the water in their bodies with glucose mobilised from stores in their livers. That stops ice forming in their tissues as temperatures drop. When things warm up again, the frogsicles thaw out, with no evident ill effects.

What frogs do without thinking, human researchers are trying, with a great deal of thinking, to replicate. The prize is not the freezing and reanimation of entire people—that idea is somewhere between a fantasy and a fraud—but the long-term preservation of organs for transplant. According to the World Health Organisation, less than 10% of humanity's need for transplantable organs is being met. The supply has fallen as cars have become safer and intensive-care procedures more effective, and part of what supply there is is lost for want of an instantly available recipient. Cooled, but not frozen, a donated kidney might last 12 hours. A donated heart cannot manage even that span. If organs could be frozen and then thawed without damage, all this would change. Proper organ banks could be established. No organs would be wasted. And transplants that matched a patient's requirements precisely could be picked off the shelf as needed.

The problem is that water expands when it freezes. If that water is in living tissue, it does all sorts of damage in the process. But an alliance of experts, ranging from surgeons and biochemists to mechanical engineers and food scientists, is attempting to overcome this inconvenient fact. And, after years of labour, many of them think they are on the threshold of success,

and that cryopreservation will soon become a valuable technology.

| *In from the cold*

Some human tissue is already cryopreserved. The trick was managed with sperm and red blood cells six decades ago and three decades ago with early-stage embryos. But these are special cases. Spermatozoa and blood corpuscles are single cells, and also have little water in them. Frozen embryos have a couple of hundred cells, but are still tiny structures. Freezing full-sized organs has proved more problematic.

Mehmet Toner of Harvard Medical School is following the wood frogs' approach. Surprising as it sounds, these amphibians survive the winter by turning their insides into glass, not ice. Though a layman may not realise it, glasses are technically liquids, not solids. The crucial difference is that when a glass cools it does not form crystals, with the sudden, tissue-damaging change in volume this entails.

Wood-frog "glass" is a concentrated glucose solution. Dr Toner uses a different sugar, trehalose, as the vitrifying "cryoprotectant". The advantage of trehalose over glucose is that it is less reactive, and thus less likely to damage tissue in high concentrations. Its disadvantage is that it is not so readily absorbed into cells. Dr Toner has overcome that, though, by decorating it with molecular titbits called acetyl groups. These act as chemical keys, granting entrance to otherwise inaccessible places. This seems to work. In June 2015 he and his colleagues showed that their acetylated trehalose could allow frozen rat cells to be revived, just as they had hoped.

Revivification brings its own dangers, though. Warming cryopreserved tissue must be done rapidly—otherwise, paradoxically, it can cause ice to form where once there was only glass. This is because the non-aqueous part of the glass melts into a proper liquid before the water does, and thus

separates out. The now-pure water then crystallises, with all the destructive consequences that follow.

This rapid warming must, though, be done uniformly—lest, in the words of John Bischof of the University of Minnesota, “the organ crack like an ice cube dropped into water”. Dr Bischof has hit on a novel solution to the problem. He and his colleagues propose adding tiny particles of magnetite, a form of iron oxide, to the cryoprotectant. Put the organ in a rapidly fluctuating magnetic field and the magnetite will heat up fast. If the particles are scattered uniformly through the tissue, this heating should also be uniform. And recent experiments Dr Bischof has conducted on heart valves and arteries suggest it is.

Ido Braslavsky, of the Hebrew University in Jerusalem, is taking a different tack. Many species of cold-resistant fish, insects and plants employ proteins that actively inhibit the formation of ice crystals, even though they do not lower water’s freezing point. Dr Braslavsky has spent a long time studying such proteins, and he has built a special microscope to do so. By attaching fluorescent tags to individual protein molecules, he can see exactly where they go and how they stymie the growth of ice crystals by attaching themselves to incipient crystals in ways that stop them extending themselves. (He applies this knowledge too, to the way ice formation influences the texture of ice-cream.)

Researchers have also devoted much effort to avoiding the deep freeze altogether, by perfusing organs with a cooled cocktail of preservatives, oxygen, antioxidants and the like. In a sense this is tantamount to keeping an organ on its own dedicated life-support system. Last year Korkut Uygun of Harvard Medical School, in collaboration with Dr Toner, demonstrated that a combination of cooling and perfusion could preserve a rat liver for four days.

All of these approaches, though, are quite intrusive. Kenneth Storey, of Carleton University in Canada, thinks a better tack is to try to understand and emulate the underlying molecular biology of cold-resistant creatures. He has studied in detail the changes to cell proteins and genes that go on in such organisms, including the actions of “micro-RNAs”—small molecules that can interrupt a cell’s gene-expression or protein-making machinery.

In December he published a catalogue of 53 micro-RNA changes that occur in wood frogs as they freeze. Hibernating mammals, insects and even nematode worms all seem to turn off their cells in similar ways to frogs. He therefore thinks there may be an overarching molecular signal which, if it could be found, would prepare organs for the freezer.

| *Leapfrog*

There are, then, many cryopreservationist ideas around—so many that some think a little co-ordination is in order. That is the purpose behind the Organ Preservation Alliance (OPA), an American charity which was set up in 2014. It has enjoyed some success. A year ago it held a hackathon—a kind of DIY-tinkering party to find novel solutions. The winner, Peter Kilbride of University College, London, devised an ingenious vitrification method that uses tiny particles of silicon dioxide—sand, in essence—in lieu of the usual, potentially toxic cryoprotectants. It is a potentially transformative idea that has already been submitted for patent.

The OPA is also good at lobbying. Last year it persuaded America’s defence department, an organisation with an obvious interest in transplants, to seed seven cryopreservation-research teams with money. In January the department expanded the project with three new streams of money. The National Institutes of Health, the American government’s medical-research arm, is also paying for work on cryopreservation.

Venture capitalists, charities and individual philanthropists are queuing up

to add to the rising pile of cash. The XPRIZE Foundation, for example, is considering offering an award to any team that can transplant into five animals organs that have been cryopreserved for a week. The research-funding arm of the Thiel Foundation, started by Peter Thiel, who helped launch PayPal, has given a grant to Arigos Biomedical, a firm working on high-pressure vitrification. New firms abound: Tissue Testing Technologies is working on ways of warming organs uniformly; Sylvatica Biotech is perfecting recipes for cryoprotectants; X-therma is attempting to mimic cryoprotective proteins. The cryopreservation race is on, then. And the winning post is the organ bank. ■



器官保存 不白等

经过几十年零星的进展后，低温存放人体器官的技术开始加速

在一个寻常的冬季里，北美林蛙（*Rana sylvatica*）可能要自我冻结好几回，却安然无恙。这是因为它们能调动自身肝脏内存储的葡萄糖来替代掉体内大部分的水。这样，当气温下降时，它们的身体组织内部便不会形成冰块。当环境转暖时，这些“冻蛙”解冻，不会有明显的不良后遗症。

人类研究人员正费尽心思尝试复制林蛙的这种无意识行为，所获成果并非将整个人冷冻又解冻——这种想法介于幻想和欺诈之间——而是长时间地保存用于移植的器官。根据世卫组织的数据，人类对可移植器官的需求仅有不到10%得到了满足。随着汽车变得越来越安全，而重症看护变得更有成效，器官供给已经减少，其中又有一部分因为找不到即刻匹配的接收者而被浪费掉。一个被冷却而非冷冻的捐赠肾脏可能维持12个小时，一颗捐赠心脏甚至连这点时间也撑不了。如果器官可以被冷冻再解冻，而不会遭到损坏，那一切都将改变。正规的器官银行会被开设起来，没有什么器官会被浪费掉，完全匹配某个病患需求的器官可以按需求从货架上取下来。

难题是水结冰时体积会扩大。如果是活组织中的水，那么在这个过程中会引发各种破坏。不过，一个集结了外科医生、生物化学家、机械工程师、食品科学家等专家的联盟正在试图攻克这一不利因素。经过多年努力后，他们中的许多人认为成功在望，冷冻保存很快将变成一项有价值的技术。

| 走出严寒

一些人体组织已经被冷冻保存。60年前人们已经能用这种方法保存精子和红细胞，到了30年前又开始用它保存早期胚胎。但它们是特例。精子和红细胞是单个细胞，又不含多少水分。冷冻胚胎虽有两三百个细胞，但仍是微型结构。冷冻整只器官则更为困难。

哈佛大学医学院的穆罕默德·托纳（Mehmet Toner）正在研究林蛙所用的方式。听起来不无惊人的是，这些两栖动物安度寒冬的方法是将身体内部变成玻璃而非冰块。外行人可能不知道，玻璃严格说来是液体而非固体，其中的决定性差异是玻璃在冷却时不会形成晶体，所以不会发生体积突变而破坏组织。

“林蛙璃”是一种葡萄糖浓缩液。托纳使用另一种糖——海藻糖——来充当形成玻璃的“冷冻保护剂”。海藻糖相比葡萄糖的优点是它的反应活性更低，因而在高浓度情况下比较不会损伤组织。但其缺点是不太容易被吸收进细胞内。不过托纳博士已经克服了这个问题，他在海藻糖溶液中添加了名为乙酰基的小分子群。这种乙酰基就如同一把化学钥匙，开门让海藻糖进入原本到达不了的地方。这种方法看起来奏效了。2015年6月，托纳及其同事展示了他们研制的添加乙酰基的海藻糖能使冷冻的大鼠细胞复苏——正如他们所希望的那样。

不过，解冻的过程有自身的危险。加热冷冻保存的组织必须迅速完成，否则会出现自相矛盾的现象：在本来只有玻璃的地方会形成冰块。这是因为玻璃中无水的部分会比水更快地融化成正常液体，而后分离出去。留下的纯粹的水会结晶，继而发生所有那些破坏性的后果。

但是，这种快速加热必须完全均匀地开展，以免像明尼苏达大学的约翰·比斯科夫（John Bischof）所说的那样，“器官像掉进水里的冰块那样裂开”。比斯科夫偶然想到了一个全新的解决方案。他和同事提议在冷冻保护剂中添加磁铁矿这种氧化铁的微粒。将器官放进一个快速波动的磁场中，这些磁铁矿会迅速升温。如果这些颗粒被均匀地洒在组织内部各处，那么加热应该也会变均匀了。比斯科夫博士最近对心脏瓣膜和动脉的实验显示结果确实如此。

耶路撒冷希伯来大学的伊多·布拉斯拉夫斯基（Ido Braslavsky）则在探索另一种方法。许多抗寒的鱼、昆虫和植物利用了会积极抑制冰晶形成的蛋白质，尽管它们并不降低水的冰点。布拉斯拉夫斯基博士长期研究这类蛋白质，还为此打造了一台专门的显微镜。他给单个蛋白质分子附上荧光标

签，然后就能清楚看到这些分子如何游走并将自己附着在初步形成的冰晶上，阻碍冰晶扩大。（他还将观察所得应用于理解成冰机制对冰激淋口感的影响。）

研究人员也致力于尝试完全避免深度冷冻，方法是将防腐剂、氧气、抗氧化剂等组成的冷却混合液灌入器官中。从某种意义上说，这等同于用专用的维生系统保存器官。去年，哈佛大学医学院的科尔库特·乌伊贡（Korkut Uygun）和托纳博士合作展示，冷却法和灌注法的结合能让一只大鼠的肝脏保存四天。

不过，所有这些方式都具有很强的干预性。加拿大卡尔顿大学（Carleton University）的肯尼斯·斯托雷（Kenneth Storey）认为，更好的方法是尝试理解和模仿抗寒生物的特性所基于的分子生物学。他细致研究了这类生物体中的细胞蛋白质和基因的变化过程，包括“微RNA”（micro-RNAs）的行为，这种微小分子能干扰细胞的基因表达或蛋白质的制造机制。

他于12月发表了一个目录，罗列了林蛙冻固时体内发生的53种微RNA变化。冬眠的哺乳动物、昆虫甚至线虫看来都使用了和林蛙相似的方式关闭了细胞。他据此认为可能存在同一种分子信号，如果能找到它，就可以准备好把器官放入冷冻库了。

| 蛙跳式跃进

目前已有众多冷冻保存的创意，一些人认为需要一些协同运作了。美国慈善团体器官保存联盟（OPA）正是为此目的而在2014年创立，并已取得了一些成果。一年前它举办了一次黑客马拉松，把大家汇集起来自己动手寻找全新的解决方案。伦敦大学学院的皮特·基尔布赖德（Peter Kilbride）在比赛中获胜，他发明了一种独特的玻璃化方法，用二氧化硅微粒（实质上就是沙子）替代常用且具有潜在毒性的冷冻保存剂。这可能是一个具有变革意义的创意，已经提交了专利申请。

器官保存联盟还擅长游说。去年它说服美国国防部这一显然热衷器官移植的机构重点资助了七个冷冻保存研究团队。1月国防部又三次追加资金来

扩大该项目。美国政府的医疗研究部门国家卫生研究院也在向冷冻保存项目投钱。

风投资本家、慈善机构和个人慈善家也都纷纷加入扩充研究资金的队伍。比如，X大奖基金（XPRIZE Foundation）正考虑向任何能够将冷冻保存一周的器官移植到五只动物体内的团队提供奖励。由贝宝创始人皮特·泰尔（Peter Thiel）创立的泰尔基金会的科研融资部门已向研究高压玻璃化的公司Arigos Biomedical提供了一笔资金。新公司层出不穷：“组织测试技术”（Tissue Testing Technologies）正在研究均匀加热器官的方法；Sylvatica Biotech正在完善冷冻保护剂的构成；X-therma尝试仿造防冻蛋白质。一场冷冻保存大赛已经上演，终点的标志是器官银行。■



Industry in China

The march of the zombies

China's excess industrial capacity harms its economy and riles its trading partners

“OVERSUPPLY is a global problem and a global problem requires collaborative efforts by all countries.” Those defiant words were uttered by Gao Hucheng, China’s minister of commerce, at a press conference held on February 23rd in Beijing. Mr Gao was responding to the worldwide backlash against the rising tide of Chinese industrial exports, by suggesting that everyone is to blame.

Oversupply is indeed a global problem, but not quite in the way Mr Gao implies. China’s huge exports of industrial goods are flooding markets everywhere, contributing to deflationary pressures and threatening producers worldwide. If this oversupply were broadly the result of capacity gluts in many countries, then Mr Gao would be right that China should not be singled out. But this is not the case.

China’s surplus capacity in steelmaking, for example, is bigger than the entire steel production of Japan, America and Germany combined. Rhodium Group, a consulting firm, calculates that global steel production rose by 57% in the decade to 2014, with Chinese mills making up 91% of this increase. In industry after industry, from paper to ships to glass, the picture is the same: China now has far too much supply in the face of shrinking internal demand. Yet still the expansion continues: China’s aluminium-smelting capacity is set to rise by another tenth this year. According to Ying Wang of Fitch, a credit-rating agency, around two billion tonnes of gross new capacity in coal mining will open in China in the next two years.

A detailed report released in February by the European Union Chamber of

Commerce in China reveals that industrial overcapacity has surged since 2008 (see charts). China's central bank recently surveyed 696 industrial firms in Jiangsu, a coastal province full of factories, and found that capacity utilisation had "decreased remarkably". Louis Kuijs of Oxford Economics, a research outfit, calculates that the "output gap"—between production and capacity—for Chinese industry as a whole was zero in 2007; by 2015, it was 13.1% for industry overall, and much higher for heavy industry.

| *Scarier than ghosts*

Much has been made of China's property bubble in recent years, with shrill exposés of "ghost cities". There has been excessive investment in property in places, but many of the supposedly empty cities do eventually fill up. China's grotesque overinvestment in industrial goods is a far bigger problem. Analysis by Janet Hao of the Conference Board, a research group, shows that investment growth in the manufacture of mining equipment and other industrial kit far outpaced that in property from 2000 to 2014. This binge has left many state-owned firms vulnerable to slowdown, turning them into profitless zombies.

Chinese industrial firms last year posted their first annual decline in aggregate profits since 2000. Deutsche Bank estimates that a third of the companies that are taking on more debt to cover existing loan repayments are in industries with overcapacity. Returns on assets of state firms, which dominate heavy industry, are a third those seen at private firms, and half those of foreign-owned firms in China.

The roots of this mess lie in China's response to the financial crisis in 2008. Officials shovelled money indiscriminately at state firms in infrastructure and heavy industry. The resulting overcapacity creates even bigger headaches for China than for the rest of the world. The overhang is helping to push producer prices remorselessly downward: January saw their 47th consecutive month of declines. Falling output prices add to the pressure on

debt-laden state firms.

The good news is that the Chinese have publicly recognised there is a problem. The ruling State Council recently declared dealing with overcapacity to be a national priority. On February 25th the State-Owned Assets Supervision and Administration Commission, which oversees big firms owned by the central government, and several other official bodies said they would soon push ahead with various trial reforms of state enterprises. The bad news is that three of the tacks they are trying only make things worse.

One option is for China's zombies to export their overcapacity. But even if the Chinese keep their promises not to devalue the yuan further, the flood of cheap goods onto foreign markets has already exacerbated trade frictions. The American government has imposed countervailing duties and tariffs on a variety of Chinese imports. India is alarmed at its rising trade gap with China (see next story). Protesters against Chinese imports clogged the streets of Brussels in February. There is also pressure for the European Union to deny China the status of "market economy", which its government says it is entitled to after 15 years as a World Trade Organisation member, and which would make it harder to pursue claims of Chinese dumping.

Another approach is to keep stimulating domestic demand with credit. In January the government's broadest measure of credit grew at its fastest rate in nearly a year: Chinese banks extended \$385 billion of new loans, a record. But borrowing more as profits dive will only worsen the eventual reckoning for zombie firms.

A third policy is to encourage consolidation among state firms. Some mergers have happened—in areas such as shipping and rail equipment. But there is little evidence of capacity being taken out as a result. Chinese

leaders are dancing around the obvious solutions—stopping the flow of cheap credit and subsidised water and energy to state firms; making them pay proper dividends rather than using any spare cash to expand further; and, above all, closing down unviable firms.

That outcome is opposed by provincial officials, who control most of the country's 150,000 or so publicly owned firms. Local governments are funded in part by company taxes, so party officials are reluctant to shut down local firms no matter how inefficient or unprofitable. They are also afraid of the risk of social unrest arising from mass sackings.

China's 33 province-level administrations are at least as fractious as the European Union's 28 member states, jokes Jörg Wuttke, head of the EU Chamber: "On this issue, increasingly Beijing feels like it's Brussels." So Mr Gao's claim that the problem is not entirely his government's fault may be true in a sense. But in the 1990s China's leaders did manage bold state-enterprise reforms involving bankruptcies and capacity cuts, that overcame such vested interests. To meet today's concerns, the central government could provide more generous funding to local governments to offset the loss of tax revenues arising from bankruptcies, and also strengthen unemployment benefits for affected workers.

If China's current leaders have the courage to implement such policies, there may even be a silver lining. Stephen Shih of Bain, another consulting firm, argues that much quiet modernisation "has been masked in many industries by overcapacity". For example, little of the fertiliser industry's capacity used advanced technologies in 2011; most of the new capacity added since then has been the modern sort that is 40% cheaper to operate.

Baosteel Group, a giant state-owned firm, has been forced by Shanghai's local authorities to shut down dirty old mills in the gleaming city. So its bosses have built a gargantuan new complex in Guangdong province with

nearly 9m tonnes of capacity. This highly efficient facility has cutting-edge green technologies that greatly reduce emissions of sulphur dioxide and nitrogen oxides, recycle waste gas from blast furnaces and reuse almost all wastewater. “When the older capacity in China is shut down, we’ll have a much more modern industrial sector,” Mr Shih says. “The question is, how long will this take?” ■



中国工业

僵尸前行

中国工业的产能过剩既伤害自身经济又触怒贸易伙伴

“供过于求是一个全球性问题，这需要所有国家协力解决。”中国商务部部长高虎城2月23日在北京的一场新闻发布会上做出了如上抗辩。面对世界各地对中国工业出口产品不断涌入的抵制，高虎城如此回应，认为每个国家都难辞其咎。

供过于求确实是全球性问题，但又不完全是高虎城所表明的那样。中国出口的大量工业制成品充斥各国市场，助长通缩压力，威胁全球生产商。假如这种供过于求的局面是许多国家普遍产能过剩的结果，那么高虎城所言不差，不该单单指责中国。但情况并非如此。

举例来说，中国过剩的钢铁产能比日、美、德三国钢铁产能的总和还要大。咨询公司荣鼎集团（Rhodium Group）的统计显示，截至2014年的十年间，全球钢产量增加了57%，其中91%的增产来自中国钢厂。从造纸、船舶到玻璃的各行各业，情况都是如此：中国目前国内需求萎缩，供应大量过剩。然而，扩张仍在继续：今年，中国的炼铝产能势将再上升十分之一。信用评级机构惠誉的王颖表示，未来两年，中国煤矿开采新增总产能将达到20亿吨。

中国欧盟商会二月公布的一份详细报告显示，产能过剩的问题早在2008年便开始加剧（见图表）。中国央行近期在工厂密集的沿海省份江苏对696家工业企业进行了调查，发现其产能利用率“显著下降”。据研究机构牛津经济研究所（Oxford Economics）的高路易（Louis Kuijs）计算，中国工业产量与产能之间的“产出缺口”在2007年整体为零，到了2015年，整体为13.1%，重工业部门的数字还要高得多。

| 可怖甚于鬼魅

近年，中国房地产泡沫之说不绝于耳，一座座“鬼城”被尖锐揭露。在某些

地方，房地产一直存在过度投资，但这些原被认为是空城的地方，许多到最后还是能住满人。中国过度投资工业品的怪异之举才是更严重的问题。研究机构世界大型企业联合会（The Conference Board）的郝小慧（Janet Hao，音译）的分析显示，2000年至2014年间，采矿设备及其他工业机械制造的投资增长速度远高于房地产。投资狂潮令许多国有企业在经济放缓之时不堪一击，变成毫无盈利的“僵尸企业”。

去年，中国工业企业总利润录得自2000年以来的首次年度下跌。德意志银行估计，在借更多新债偿还旧债的企业中，有三分之一来自产能过剩的行业。国有企业（在重工业占主导地位）的资产收益是私营企业的三分之一，是在华外资企业的一半。

眼前这堆烂摊子源于中国对2008年金融危机的应对。官员们不加区分地往基建和重工业国有企业身上砸钱。所导致的产能过剩为中国造成了更大的烦恼，尤甚于对世界其他地区形成的压力。过剩的产能促使出厂价格一路下滑：今年一月已是持续下跌的第47个月。产出价格不断下跌加剧了债台高筑的国有企业的压力。

好消息是，中国已公开承认存在问题。国务院最近宣布，处理产能过剩是国家的当务之急。2月25日，负责监督大型央企的国务院国有资产监督管理委员会及其他几个官方机构表示，即将出台多项国企试点改革措施。而坏消息是，这些方法中，有三个只会令事情变得更糟。

一个选择是让中国的僵尸企业出口其过剩产能。但即便中国信守诺言不进一步贬值人民币，大量廉价出口产品涌入外国市场已经加剧了贸易摩擦。美国政府已对各种中国进口货品征收反补贴税及关税。印度对于不断上升的对华贸易赤字感到惊恐。二月，大批示威者聚集在布鲁塞尔街头抗议中国产品涌入。欧盟也受到压力，被要求拒绝承认中国的“市场经济”地位，而中国政府认为在加入世贸组织15年后应该自然享有此地位。如果这一地位得到认可，将更难以指控中国倾销。

另一方式是继续通过信贷刺激内需。今年一月，中国政府最广义信贷指标

的增长速度达到近一年的最高位：中国的银行发放新增贷款创新记录，达3850亿美元。但在利润骤减的情况下加大借贷，这些僵尸企业最终只会面临更坏的局面。

第三个政策是鼓励国有企业的整合。已有部分企业实现合并，如航运及铁路装备等领域。但没有什么证据表明产能会因此而减少。对于一些显然的解决方案，中国领导人正在含糊其辞，比如停止对国企提供低息贷款、供水及能源补贴；要求它们恰当分红，而非用任何闲置资金进一步扩大规模；而最重要的是，关闭无力经营的企业。

这样的方案受到各省官员的反对，全国约15万的国有企业大多由各省级政府管控。地方政府的收入部分来自公司的税收，所以无论当地公司效率多低、亏损多严重，官员们也不愿意关闭这些企业。他们也害怕大规模遣散员工会引发社会骚乱。

中国33个省级政府之间的众口难调程度堪比欧盟28个成员国，欧盟商会的负责人伍德克（Jörg Wuttke）开玩笑说：“在这个问题上，感觉北京越来越像布鲁塞尔了。”所以，高虎城称这不完全是中央政府的问题，某种程度上也是对的。但在上世纪90年代，中国领导人还是能大胆推行涉及破产、削减产能的国企改革，克服上述既得利益的难题。要解决当今的问题，中央政府可向地方政府进一步拨款，以弥补因企业破产造成的税收损失，同时加强受影响工人的失业救济。

如果中国当前领导人有勇气推行这类政策，或许还有惊喜的曙光展现。另一咨询公司贝恩的石教立（Stephen Shih）认为，很大程度上，悄然推进的现代化进程“在许多行业中一直为产能过剩所掩盖”。比如，在2011年，化肥行业的产能很少采用先进技术，而此后新增的产能大多运用到现代科技，运营成本降低40%。

在光鲜亮丽的上海，大型国企宝钢集团老旧肮脏的厂房已被当地政府勒令关闭。其老板们于是在广东省建成了产能近900万吨的庞大新厂房。极高效的新厂房运用尖端环保技术，大大减低了二氧化硫和氮氧化物的排放，

并循环利用高炉废气，几乎所有废水都得到再利用。“中国的旧产能淘汰后，我们将拥有更高度现代化的工业部门，”石教立说。“而问题是，这需要多久？”■



Schumpeter

On the stump

Why tech bosses are playing at being statesmen

HE HAS been on-message for months, sharing his tweet-worthy opinions on stage and playing on media interest. On February 16th, after consulting with his cabinet of close advisers, he made a vigorous statement on privacy rights that attacked the government, every politician's favourite punchbag these days. He vowed to fight government "overreach" and help "people around the country to understand what is at stake".

This is not a populist presidential contender, but Tim Cook, Apple's boss. His views have put him at odds with American law enforcers, who need his company's help to unlock an iPhone used by a terrorist. The government has dismissed Mr Cook's letter as a stunt to bolster Apple's sales. But this charge underestimates the man's ambition. His campaign is aimed at shaping public policy, not just to favour his firm's immediate interests but to nurture its global base of technophile supporters.

Mr Cook is among the latest incarnations of the "CEO-statesman", a type whose origins stretch back at least to the days when Henry Ford campaigned for world peace and Andrew Carnegie for universal education. The CEO-statesman is not content with just accepting a job in the government; nor does he simply lobby behind the scenes. He is an evangelist, out to persuade the world of the righteousness of his chosen causes.

Ford and Carnegie were CEO-statesmen by choice. Today's equivalents often seem to feel it is no longer enough to have admired products and solid financial results. A chief executive needs to have values, and preach them. From Starbucks' Howard Schultz to Unilever's Paul Polman, bosses in

diverse industries have taken positions on controversies including race relations, climate change and gay marriage. But none has higher profiles than the CEO-statesmen of the technology industry.

Microsoft's bruising antitrust case with the Department of Justice, settled in 2001, was the dawning of a realisation by tech bosses that they could not disdain politics, and needed to invest in lobbying. This has evolved into a wider mission to shape public opinion. Mark Zuckerberg, Facebook's boss, is on a drive to bring internet access to the world's poor. He speaks of it as a human right, along with education and nutrition (though it would also, conveniently, add Facebook users). Sheryl Sandberg, one of his lieutenants, who has worked in government, travels the world to talk about equality for women. Google's Sundar Pichai is in Brussels on a "state visit" to meet European Union officials and press his views on data security, privacy and competition.

One reason for the tech industry's statesmanship strategy is necessity. By their nature, tech firms are more likely than others to be operating in areas—such as the on-demand economy—in which regulation is dated or inchoate. Another is that, with their huge constituencies, some have started to look less like businesses and more like countries. Facebook has 1.6 billion users, more than the population of China. Apple has sold more than 1 billion devices. Last year it had revenues of \$234 billion, which is more than those of most governments.

Many people feel a closer relationship with tech firms than with their governments; tweaks to their interfaces and algorithms can have an instant impact on users' lives. People now trust businesses more than their governments, according to surveys by Edelman, a PR agency. Firms like Google and Facebook have taken over the role of disseminators of information that governments once claimed.

In the 1980s and 1990s the “CEO-celebrity” was more prominent: typified by Jack Welch of GE, such figures penned books on their management philosophies and posed for magazine covers. The CEO-statesman is different, because he is after more than publicity. He wants to craft a legacy, as politicians do in their final terms. Leaving behind a healthy business may not be enough to secure a page in the history books. The Reputation Institute, a think-tank, reckons that perhaps a third of a CEO’s legacy is attributed to financial performance, with the rest being influenced by factors such as perceived leadership and corporate citizenship.

Being a statesman means trying to control the message, and thus the media. Like the American president, tech bosses are pursued by a press corps which dissects their every move. They scheme like politicians, feeding titbits to friendly journalists and snubbing ones who write unhelpful truths. Or they appeal to the public directly: Mr Cook and Mr Zuckerberg often publish their views in blog posts rather than give interviews, the digital equivalent of reading off of a teleprompter and taking no questions.

| *Picking the right pedestal*

The statesmanship strategy—taking lofty stances that enhance their standing among their constituents and trying to house-train the press—carries risks. Public campaigns work best when they are core to a firm’s mission. Last year Mr Schultz discovered the dangers of wading into advocacy unrelated to the coffee-shop business. He was ridiculed over his plan to have Starbucks’ baristas strike up conversations about race relations with customers who just want a quick, no-controversy latte. Corporate statesmanship can also backfire if bosses appear too blatantly self-interested. Recently Mr Zuckerberg suffered a defeat in India, where his plan to bring free internet to the poor was dismissed as a colonialist attempt to impose a corporate agenda.

It is easy for bosses to miscalculate the public mood and face a backlash. This has partly been true for Mr Cook. He may have won the loyalty of tech progressives, but many Americans are sympathetic to the government and think he should back down and unlock the iPhone used by the terrorist. “Tim Cook has climbed up on a pedestal, but the pedestal is in the corner,” says Jeffrey Sonnenfeld, a professor at Yale University’s School of Management. As any politician knows, and many CEOs are learning, being a statesman is not easy. ■



熊彼特

巡回演说

科技公司老板为何在扮演政客

连续数个月来他都和既定政策保持一致，在台上分享值得发推特的观点，投媒体所好。2月16日，在和亲密顾问团磋商过后，他做出强力声明，就隐私权问题抨击政府，这也是每个政治家近来最偏爱的出气筒。他誓要与政府“越权”作斗争，帮助“全国人民懂得利害得失所在”。

这不是平民主义的总统竞选人，而是苹果老板库克。他的观点已经让他同美国执法机关之间产生龃龉，执法机关要苹果协助解锁一恐怖分子所用的iPhone。美国政府驳斥库克的公开信，称其为苹果促销的噱头。但这一指控低估了库克的雄心。他的活动旨在影响公共政策，不仅为公司谋取眼前利益，更为了培育其全球的技术支持者。

库克是“CEO-政治家”的最新典型之一，这一类人至少可追溯到亨利·福特（Henry Ford）呼吁世界和平以及安德鲁·卡内基（Andrew Carnegie）呼吁普及教育的年代。CEO-政治家不满足于在政府里获得一个职位，也不满足于只在幕后游说。他是福音传道者，劝说正义世界追随他选定的事业。

福特和卡耐基成为CEO-政治家是出于自我选择。今天的CEO-政治家似乎常常觉得拥有令人赞赏的产品和坚实的财务业绩尚且不够。一位首席执行官要有价值观，并且要为之宣讲布道。从星巴克的霍华德·舒尔茨（Howard Schultz）到联合利华的保罗·波尔曼（Paul Polman），各行各业的老板已经在种种争议话题上选定了立场，包括种族关系、气候变化和同性婚姻。但是没有谁比科技界的CEO-政治家更高调。

微软与美国司法部激烈冲突的反垄断案在2001年达成和解，自此科技老板才真正理解他们不仅不能蔑视政治，而且要投资于游说。这已经演变成一个更广泛的目标，即塑造公众舆论。Facebook老板马克·扎克伯格（Mark Zuckerberg）正努力让全世界的穷人免费接入互联网。他称之为

种人权，与教育和营养一样（尽管这也会很方便地增加Facebook的用户数量）。他的麾下干将之一谢丽尔·桑德伯格（Sheryl Sandberg）曾就职于政府部门，现在环游世界，倡言女性平等。谷歌的桑达·皮采（Sundar Pichai）正在布鲁塞尔进行“国事访问”，与欧盟官员会面，极力陈述他在数据安全、隐私和竞争等方面的观点。

科技产业采取政治家风范策略的原因之一是必要性。因其性质，相较于其他企业而言，科技公司更可能在一些法规过时或尚不完备的领域运营，如按需经济之类。另一个原因是鉴于拥护者众多，有一些科技企业已开始看起来不大像是公司，而更像一个国家。Facebook有16亿用户，比中国的人口还多。苹果已经售出十亿多件产品。去年它的总收入为2340亿美元，比很多政府的还要多。

很多人觉得自己与科技公司的关系比跟政府的关系更亲近；对界面和算法的细微调整都能对用户生活产生立竿见影的影响。公关机构爱德曼（Edelman）的调查显示，比起对政府的信任，现在人们更相信公司。谷歌和Facebook之类的公司已经承担了政府曾经宣称的信息传播者的角色。

20世纪80年代到90年代，“CEO-名人”现象更加突出：以通用电气（GE）的杰克·韦尔奇（Jack Welch）为代表，他们著书立说，写下自己的管理哲学，登上各大杂志封面。CEO-政治家有所不同，因为他所追求的不只是扬名立万。他想要留下一份遗产，正如政治家们在其最后任期内所做的那样。留下一个健康发展的公司可能还不足以保证青史留名。智库声誉研究所（Reputation Institute）估算，一位CEO留下的财富可能有三分之一归功于财务业绩，其他的都受到诸如所感知的领导力、企业公民责任等因素的影响。

做一个政治家意味着努力掌控信息，因此就要掌控媒体。像美国总统一样，科技公司老板被记者团追随，一举一动都被仔细剖析。他们像政客一样谋划，给友善的记者爆点奇闻异事，故意冷落报道无用事实的记者。他们也会直接向公众发出呼吁：库克和扎克伯格常常在博客发布他们的观

点，而不是接受采访，这等于把按提词机照本宣科数字化，并且不用回答问题。

| 选对基座

政治家风范的策略是摆出高姿态，提升自己在选民心中的地位，努力驯养新闻界，这要承担风险。公共活动在符合公司的核心使命时最有成效。去年舒尔茨发现，要涉及与咖啡店生意无关的议题很有风险。他计划让星巴克的服务员通过和顾客聊种族关系来搭讪，而顾客只想快点要一杯无争议的拿铁，这让舒尔茨备受嘲笑。如果老板太过公然表现得自私自利，企业政治家也可能会事与愿违。扎克伯格近来败走印度，他向穷人提供免费互联网接入的计划被认为是想要强加企业议程的殖民主义做法，因而遭到驳斥。

老板们很容易误判公众的情绪，继而面临抵触。对库克而言，这已部分成真。他可能赢得了科技进步派的忠心，但很多美国人同情政府，认为他应当让步，将恐怖分子使用的iPhone解锁。“库克已经爬上了基座，可这个基座在角落里。”耶鲁大学管理学院教授杰弗里·索尼费尔德（Jeffrey Sonnenfeld）说。恰如任何政客都知道的，做一个政治家着实不易，很多CEO也正在意识到这一点。■



Privacy and security

Code to ruin?

The rights and wrongs of Apple's fight with the FBI

CITIZENS have a right to both security and privacy. The difficulties arise when these two rights are in conflict, as they now are in the battle between the world's most valuable company and its most famous law-enforcement agency. Apple has refused to comply with a court order to help the FBI unlock an iPhone used by Syed Farook, one of the terrorists involved in the San Bernardino shootings in December. The company says the government's request fundamentally compromises the privacy of its users; the feds say that Apple's defiance jeopardises the safety of Americans.

Some frame the stand-off in terms of the rule of law: Apple cannot pick and choose which rules it will obey, they say. That is both true and beside the point. The firm has the right to appeal against a court order; if it eventually loses the legal battle, it will have to comply. The real question is whether Apple's substantive arguments are right. That hinges on two issues.

The first is whether the FBI's request sets a precedent. The law-enforcers say not. This is not an attempt to build a generic flaw in Apple's encryption, through which government can walk as needed. It is a request to unlock a specific device, akin to wiretapping a single phone line. The phone belonged to a government department, not Farook. Apple and other tech firms regularly co-operate with the authorities on criminal cases; this is no different. Yet Apple is being asked to do something new: to write a piece of software that does not currently exist in order to sidestep an iPhone feature that erases data after ten unsuccessful password attempts. Later models of the iPhone than the one Farook used are harder to compromise in this way. But if the court's ruling is upheld, it signals that companies can be compelled by the state to write new operating instructions for their devices.

That breaks new ground.

The second issue is whether that precedent is justified. And that entails a judgment on whether security would be enhanced or weakened by Apple's compliance. In the short term, the answer is that security will be enhanced. Farook was a terrorist; his phone is the only one being unlocked; and the device might give up the identity of other malefactors. But in the longer term, things are much fuzzier.

Security does not just mean protecting people from terrorism, but also warding off the threat of rogue espionage agencies, cybercriminals and enemy governments. If Apple writes a new piece of software that could circumvent its password systems on one phone, that software could fall into the hands of hackers and be modified to unlock other devices. If the capability to unlock iPhones exists, so will the temptation for the authorities to use it repeatedly. And if tech firms are forced to comply with this sort of request in America, it is harder for anyone to argue against similar demands from more repressive governments, such as China's. This newspaper has long argued against cryptographic backdoors and skeleton keys on these grounds. It is possible to imagine a scenario that might override such concerns: if information is needed to avert a specific and imminent threat to many lives, for example. But in this instance, Apple's case is the stronger.

| *Core arguments*

This battle presages others. If the courts rule against Apple, it will work to make its devices so secure that they cannot be overridden by any updates. In that event (or, indeed, if the tech firm wins the Farook case), legislators will be tempted to mandate backdoor access via the statute book. If Tim Cook, Apple's boss, is not to hasten the outcome he wishes to avoid, he must lay out the safeguards that would have persuaded the firm to accede to the FBI's request. Tech firms are at the centre of a vital policy debate.

Apple has rejected the authorities' solution. Now it must propose its own. ■



隐私与安全

毁灭代码？

苹果对抗美国联邦调查局的是非曲直

安全和隐私都是公民应享的权利。两者发生冲突时，难题顿生，这从全球市值最高的公司与最知名执法机构当下的酣战可见一斑。苹果公司拒绝服从法院判决，表示不会协助美国联邦调查局为去年12月圣贝纳迪诺（San Bernardino）枪击案的涉案恐怖分子赛义德·法鲁克（Syed Farook）所用的iPhone解锁。该公司表示，政府的要求从根本上损害其用户的隐私；联邦调查局则称苹果的抗令将危及美国人的安全。

有人从法治角度解读目前的僵局，称苹果公司不可以挑选要遵从哪些法规。这是实情，但又不得要领。苹果公司有权对法庭裁决提出上诉；如果最终败诉，公司就必须服从。真正的问题是苹果的实质论点是否正确，而这取决于两个问题。

首先是美国联邦调查局的要求是否会开创先例。其执法人员表示不会。调查局无意为苹果设备的加密机制植入通用漏洞，以便政府在需要时调用。法令要求解锁的是一台特定设备，相当于窃听一条电话线。这部手机属政府部门而非法鲁克所有。苹果和其他科技公司经常就刑事案件与政府当局合作；此案也没什么不同。但苹果还收到一些新指令：编写目前不存在的新软件来避开iPhone的一项功能设定——在连续10次错误输入密码后自动删除数据。比法鲁克那台iPhone型号更新的机型会更难破解。但法庭如果维持原判，这意味着政府可以逼迫企业为设备编写新操作指令。这就开了先河。

第二个问题是，此先例是否合理。这就需要判断，如果苹果从命的话，安全性是增强还是减弱。短期来看，答案是肯定的，安全性将得到提高。法鲁克是恐怖分子，他的手机是唯一被强制解锁的；而且该设备可能暴露其他不法分子的身份。但长远来看，情况则要模糊得多。

安全性不单指保护人们免受恐怖主义之害，还包含抵御流氓间谍机构、网络罪犯及敌对政府的威胁。如果苹果公司编写了可规避手机密码系统的新软件，该软件便可能落入黑客手中而被修改用于解锁其他设备。只要解锁苹果手机的可能性存在，政府当局就会念念不忘，想一再利用。而且如果科技公司在美国被迫遵从这类法令，当像中国这样更为专制的政府提出类似要求时，会更难反驳。基于这些理由，本刊一直反对为加密程序植入后门及万能钥匙。凌驾这些忧虑的情形是可以想像的：比如某一威胁迫在眉睫，关系众多性命，亟需获取信息。但当前这一情况，苹果公司的理据更为有力。

| 核心争论

这只是连串斗法的前哨战。假如法院判苹果败诉，公司将努力提高其设备的安全性，令任何升级也无法逾越。这种情况下（或者反过来，假如苹果公司在法鲁克案件中获胜），立法者会谋求通过修订法律强制要求“打开后门”。假如苹果公司老板蒂姆·库克不想促成他希望避免的结果，就必须制订一套保障措施，说服公司接受联邦调查局的要求。科技公司正处于一场重要政策辩论的核心。苹果公司已经拒绝了当局的解决方案，现在必须要提出自己的方案。 ■



Powering the internet of things

Passive voice

Redesigning Wi-Fi may let devices communicate more easily

MANY prophets of information technology (IT) believe that the next big movement in their field will be the “internet of things”. This, they hope, will connect objects hitherto beyond the reach of IT’s tendrils so that, for example, your sofa can buzz your phone to tell you that you have left your wallet behind, or your refrigerator can order your groceries without you having to make a shopping list. That, though, will mean putting chips in your sofa, your wallet and your fridge to enable them to talk to the rest of the world. And those chips will need power, not least to run their communications.

Sometimes, this power will come from the electricity grid or a battery. But that is not always convenient. However Shyam Gollakota and his colleagues at the University of Washington, in Seattle, think they have at least part of an answer to the problem. They propose to reconfigure a chip’s communications so that they need almost no power to work.

Most conceptions of the internet of things assume the chips in sofas, wallets, fridges and so on will use technologies such as Wi-Fi and Bluetooth to communicate with each other—either directly, over short ranges, or via a base-station connected to the outside world, over longer ones. For a conventional chip to broadcast a Wi-Fi signal requires two things. First, it must generate a narrow-band carrier wave. Then, it must impress upon this wave a digital signal that a receiver can interpret. Following Moore’s law, the components responsible for doing the impressing have become ever more efficient over the past couple of decades. Those generating the carrier wave, however, have not.

Dr Gollakota and his team reasoned that it should be possible to separate the jobs of generation and impression. The system they have designed has a central transmitter (which might be built into a Wi-Fi router) that broadcasts a pure carrier wave. Dr Gollakota's new chips then impress binary data on this carrier wave by either reflecting it (for a one) or absorbing it (for a zero). Whether a chip reflects or absorbs the signal depends on whether or not its aerial is earthed, which is in turn controlled by a simple switch.

Not having to generate its own carrier wave reduces a chip's power consumption ten-thousandfold, for throwing the switch requires only a minuscule amount of current. Moreover, though Dr Gollakota's prototypes do still use batteries, this current could instead be extracted from the part of the carrier wave that is absorbed.

The chips in this system, which Dr Gollakota plans to unveil on March 17th at the USENIX Symposium on Networked Systems Design and Implementation in Santa Clara, California can, he claims, transmit data at a rate of up to 11 megabits a second to smartphones or laptops over 30 metres (100 feet) away, and through walls. Though that rate is worse than standard Wi-Fi it is ten times better than the low-energy form of Bluetooth which is the current favourite for the internet of things.

Dr Gollakota has helped found a company, Jeeva Wireless, to commercialise his research and he predicts that passive Wi-Fi chips, as he calls them, will be in production in less than two years. Eventually, he hopes, the idea behind his system—of generating carrier waves centrally—might be adapted for use in mobile phones. That would mean base stations providing a carrier wave, and phone users making calls, sending text messages and connecting to the internet without constantly having to recharge their handsets. ■



为物联网供电

被动式

重新设计Wi-Fi也许能让设备间的通讯变得更加便捷

信息技术界的许多预言家相信业内下一个大动作将是“物联网”。他们希望迄今未被信息技术触及的物件将通过物联网连接起来，这样一来，你家的沙发可以打电话告诉你落下了钱包，或者你家的冰箱可以自行订购食品，无需你列出购物清单。但这意味着要在你的沙发、钱包和冰箱里安装芯片，使它们能够和其他物件对话。而要进行通信，那些芯片将需要电力。

有时，这电力来自电网或电池，但并非总是很方便。不过，西雅图华盛顿大学的希亚姆·格拉科塔（Shyam Gollakota）及其同事认为已经找到了至少部分解决方案。他们提议重新配置芯片的通信方式，使其几乎无需电力就能工作。

物联网的大多数构想假定沙发、钱包、冰箱等物件中的芯片会使用Wi-Fi及蓝牙等技术来相互通讯——不是短距离直接连接就是通过连接外部世界的基站进行远程通讯。常规芯片传播Wi-Fi信号需要两个要素。首先，芯片必须生成一段窄带载波，然后上面加载接收器能解读的数字信号。根据摩尔定律，过去几十年来，负责加载信号的元件变得越来越高效。但负责生成载波的元件却没有太多改进。

格拉科塔博士和他的研究小组推想，应该能够把生成载波和加载信号这两项工作分离。他们设计的系统具有能传播纯载波的中央发射器（可内置到Wi-Fi路由器中）。格拉科塔博士的新芯片而后会在这一载波上加载二进制数据，方法是反射信号（对1）或吸收信号（对0）。芯片是反射还是吸收信号取决于其天线是否接地，而这可以由一个简单的开关控制。

无须自行生成载波让芯片的功耗减少了万倍，因为控制开关只需要微不足道的电流量。此外，虽然格拉科塔博士的设计原型仍使用电池，但这些电流可以从被吸收的部分载波中析取。

格拉科塔博士打算3月17日在加州圣克拉拉（Santa Clara）举行的USENIX 联网系统设计和实现研讨会上首次展示这一系统。他声称其芯片能以高达每秒11 Mbps的速度向30多米外的智能手机或笔记本电脑发射数据，并可以穿越墙壁阻隔。虽然速度比一般Wi-Fi慢，不过相比目前物联网最热衷的低功耗蓝牙，则要快十倍。

格拉科塔博士已经协助创立了一家名为“Jeeva无线”（Jeeva Wireless）的公司，将其研究成果商业化。他估计这种他称之为“被动式”Wi-Fi芯片的发明将在不到两年内投产。他希望，该系统背后的理念，即中央生成载波，最终可被改良用于手机。这将意味着载波由基站提供，而用户无需时不时地给手机充电就能打电话、发短信以及连接互联网。 ■



Volkswagen

Emission impossible

The German carmaker will escape its emissions scandal largely unscathed. That is bad news for a firm in need of an overhaul

VOLKSWAGEN'S new boss, Matthias Müller, was no doubt hoping that his firm's launches of new models at the Geneva motor show last week would help it move on from the scandal over its cheating in emissions tests. A British prankster had other ideas. As VW's sales chief, Jürgen Stackmann, unveiled a new version of the Up city car, Simon Brodtkin, a comic whose past targets include FIFA's former boss, Sepp Blatter, gatecrashed the presentation in overalls, with a spanner and a "cheat box" which he tried to fit to the car (see picture), before being led off by security men.

Mr Müller can afford to see the funny side of the stunt: he owes his job to the scandal. He was brought in to replace Martin Winterkorn, who was forced out when it emerged last September that 11m of the company's diesel cars had been fitted with software to cheat tests for nitrogen-oxide emissions. Last week VW admitted that Mr Winterkorn had been sent a memo in May 2014 about irregularities in the cars' emissions, but said he may not have read it. Speaking to *The Economist* in Geneva, Mr Müller promised "monumental change". But whatever VW does to make amends, the more far-reaching overhaul that it needs seems unlikely to happen.

The emissions scandal was a symptom of a corporate culture focused on ramping up output to 10m vehicles a year and toppling Toyota as the world's biggest carmaker. In the quest for scale, profitability suffered. Operating profits have hovered around €12 billion (\$13 billion) for years despite a big expansion in output, with the group's huge returns from China disguising poor performance in Europe and losses in America and emerging markets.

Mr Müller says he is determined that VW not be “paralysed” by the emissions affair. Its sales fell in Europe and America in January even as their overall demand for new cars rose. But Mr Müller says 2016 has started well and that he expects little lingering impact from the scandal. He may be right. General Motors’ faulty ignition switches and Toyota’s “unintended accelerations” forced both firms to make huge recalls and generated plenty of bad press. Yet sales recovered within a few months.

Uncertainty about financial penalties will hang over VW for some time. It has delayed its annual report for 2015 until April, when the picture should be clearer. America’s Department of Justice could in theory levy a fine of €60 billion but it is unlikely to go that far. Some analysts reckon that the cost of settling with the authorities and private litigants, worldwide, and fixing the affected cars or compensating their owners, might come to a grand total of as much as €30 billion—roughly the amount by which VW’s stockmarket value has fallen since the scandal broke. Others think it could be far less: both GM and Toyota escaped with fines of around €1 billion.

If paying for its perfidy proves painful but not life-threatening, the impetus to overhaul VW will lose some of its force. Change is needed. VW is a sprawl of brands of varying fortunes. Almost two-thirds of its profits come from its premium-car brand, Audi, and performance-car division, Porsche (see chart 1). The main VW brand is a drag on the group: Sanford C. Bernstein, a research firm, reckons that in 2014 the brand’s profits essentially came from parts sales and royalties (paid by its joint ventures) in China, and that it made no money in its core European market.

Mr Müller is making a start by attempting to revamp the culture of a company in which hitherto a strict hierarchy sent decisions, big and small, to the German engineers that ran VW from its headquarters in Wolfsburg. Mr Müller has replaced seven out of ten senior executives. Some are outsiders, though many of the “new” faces are, like Mr Müller, VW insiders

ingrained in the firm's ways. He is, however, trying to speed up sclerotic decision-making by giving the heads of the group's profusion of brands more responsibility.

A comprehensive restructuring plan is promised for later in the year, but the firm has said it will concentrate harder on profits. As a start, it will make €1 billion of cost cuts at the VW brand next year. But analysts reckon the company, which alone among big carmakers failed to reduce costs during the financial crisis, has plenty more fat to cut. For no good reason, its administrative expenses have trebled since 2007.

The firm will also cut the extravagant number of model variations it offers—more than 300 at last count—and its absurdly long lists of options. The choice of steering wheels on the VW Golf is set to fall from 117 to a mere 43. VW will “reconsider all costs”, says Mr Müller, including even its hallowed research-and-development budget. In 2014 it was €13 billion, €5 billion more than Toyota's. But it is unclear what VW's huge outlays have yielded. It missed the craze for SUVs, it is lagging its main rivals in electric-car technology and it lacks a cheap platform for budget cars in emerging markets. A project to standardise the underpinnings of many VW group models with a platform called the MQB seems not to be producing the expected cost savings.

Mr Müller is resistant, however, to disposing of any part of the firm, even a unit that makes marine diesel engines. A gruff “No” is his response when asked if he would consider selling it, though it is unclear that this division, or another that builds lorries, or Ducati, a maker of exotic motorbikes, is a core part of VW.

The most intractable problem is low productivity, especially at the mass-market VW brand. The group's labour costs have risen from around 13% of sales in 2007 to almost 17%. Outside China (where it makes cars in joint

ventures with local firms), the group's 520,000 workers made 6.7m vehicles in 2014, or about 13 each. That is about the same productivity as at Daimler's Mercedes division, which makes only high-margin premium models (see chart 2).

As other carmakers have shifted production to low-wage countries, VW has remained largely stuck in Germany. Some 45% of its employees are based there, many enjoying a four-day work week. The VW brand's German factories are "among the highest-cost plants in the industry", says Patrick Hummel of UBS, a bank.

But VW's commitment to Germany is absolute. "We are a German company", says Mr Müller, and will "preserve German jobs". Powerful unions would be sure to resist job cuts. Mr Müller says that they agree on the need for reform but admits to disagreement over how it might happen. Unions could also prevent a wider rethink that might shift investment from the VW brand to others that are more profitable. The supervisory board, made up largely of union representatives and nominees of the state of Lower Saxony, which holds a 20% stake in VW, has the power to resist most changes of strategy.

Maybe an outsider with a mandate for change, if backed by the Porsche-Piëch family, which controls the voting shares, could have achieved more. But Mr Müller's hands seem tied. The good bits of the VW group will continue to prop up the underperforming bits. That burden may get heavier: premium and low-cost carmakers are thriving while the mass market, the core of VW's business, becomes more competitive. Odd as it sounds, VW could have done with a bigger crisis. ■



大众汽车

不可能的排放

这家德国汽车制造商将从排放丑闻中脱身，并未伤筋动骨。对于一家需要彻底改革的公司而言，这是个坏消息

大众汽车的新老板马蒂亚斯·穆勒（Matthias Müller）无疑希望上周在日内瓦车展上发布的新车能帮助公司走出排放测试作弊的丑闻。英国一名恶作剧玩家则另有想法。当大众汽车的销售总监于尔根·斯塔克曼（Jürgen Stackmann）展示新款Up城市微型车时，喜剧演员西蒙·布罗德金（Simon Brodtkin，以往恶作剧的对象包括国际足联前主席布拉特）身穿工作服闯入展示现场，手持扳手，并试图把一个“作弊箱”置于车底（见上图），之后他被安保人员带走。

穆勒可以笑看这场闹剧：正是排放丑闻使其获得了大众集团CEO一职。去年9月，1100万台大众柴油车装有可在氮氧化物排放测试中作弊的软件一事曝光，时任大众CEO的马丁·文德恩（Martin Winterkorn）被迫辞职，由穆勒取而代之。上周，大众集团承认早在2014年5月已经有人就汽车排放的违规现象向文德恩发送过一份备忘录，但表示文德恩可能一直没看那份文件。穆勒在日内瓦接受《经济学人》采访时承诺将带来“巨变”。但无论大众如何弥补过失，其所需的更为深远的彻底改革却似乎不太可能发生。

这次排放丑闻显现了其公司企业文化的弊病——一心想推高产量至每年1000万台，力争超越丰田成为世界最大的汽车制造商。在追求规模的过程中，却使盈利能力受损。尽管产量大幅上升，大众的营业利润多年来徘徊于120亿欧元左右（130亿美元），来自的中国巨额回报掩饰了集团在欧洲的疲弱表现以及在美国和新兴市场的亏损。

穆勒表示他确定大众集团不会因排放事件而“瘫痪”。今年一月，尽管新车需求整体上升，集团在欧美的销售却仍旧下跌了。但穆勒说2016年开局不错，并估计丑闻的持续影响不大。他可能是对的。通用汽车的点火开关故

障及丰田汽车的“意外加速”问题曾迫使两家公司大量召回汽车，惹来许多负面报道。但几个月内销售便得以恢复。

经济处罚上的未知数将困扰大众一段时间。集团已推迟到今年四月才公布2015年的年报，届时情况应该会变得明朗。美国司法部理论上可对其罚款600亿欧元，但不太可能如此重罚。一些分析师认为，与各国政府及私人诉讼者和解的费用，加上修复涉事车辆或赔偿车主的成本，总费用可能高达300亿欧元——约等于大众集团自丑闻爆发以来所蒸发的市值。其他分析师则认为费用会低得多：通用和丰田都只以罚款约10亿欧元了结。

假如为造假付出的代价仅仅是皮肉之伤，而未至于危及公司存亡，大众的改革动力将受到削弱。改变确有必要。大众旗下包括业绩各异的众多品牌。其利润几乎有三分之二来自豪华品牌奥迪和高性能跑车保时捷（见图表1）。大众这一主品牌则在集团里拖了后腿：研究公司盛博（Sanford C. Bernstein）认为该品牌在2014年的利润基本上是来自在中国的零件销售和特许权使用费（由其合资公司支付），而在其核心欧洲市场并无盈利。

穆勒正迈出第一步，尝试一改公司文化——迄今为止，公司里等级森严，大小决策层层下达给在沃尔夫斯堡总部的德国工程师，而这些工程师负责运营大众汽车。如今，十名高管中已有七人被穆勒撤换。新上任的有些是局外人，但许多“新”面孔跟穆勒一样，其实是深知大众集团套路的局内人。然而，穆勒正向集团诸多品牌的负责人下放更大权力，试图为僵化的决策过程加速。

公司承诺今年早些时候推出全面重组计划，但还表示将更专注盈利。第一步是明年在大众品牌上削减成本10亿欧元。不过分析师认为，作为金融危机中唯一未能降低成本的大型汽车厂商，大众大有赘肉可减。自2007年以来，其管理费用增加了两倍，这没有什么好的理由解释。

公司还将缩减现在多得离谱的车型款式（最新统计有超过300种）和长得不可思议的选配清单。大众高尔夫的可选方向盘将从117款减少到仅43款。穆勒表示，大众将“重新考虑一切成本”，甚至包括神圣不可侵犯的研发预

算。2014年大众的研发费用为130亿欧元，比丰田多50亿欧元。然而目前尚不清楚这项巨额支出成果何在。公司错失了SUV热潮，在电动车技术上落后于主要对手，在新兴市场上又缺乏廉价平台生产低价车。大众之前推出名为MQB的平台，以标准化集团内众多车型的生产，但在成本节约上似乎并没有产生预想的效果。

不过穆勒不愿意割舍公司的任何一部分，连制造船用柴油发动机的部门也不愿舍弃。被问及会否考虑出售该业务时，他粗声回答“不会”。然而，这个部门，或者制造货车的另一部门，又或制造高端摩托车的杜卡迪公司（Ducati）是否是大众集团的核心部分？并不清楚。

最棘手的问题是生产效率低下，尤其是面对主流市场的大众品牌。集团的劳动力成本已从2007年约占销售额的13%上升至近17%。2014年，集团在中国（与当地企业合资制造汽车）以外的52万工人制造了670万台汽车，每人平均制造13台。这与戴姆勒旗下梅赛德斯公司的生产率相当，而后者仅生产高利润的豪华车（见图表2）。

其他汽车厂商已把生产线转向低工资国家，大众却仍有很大部分保留在德国。约有45%的员工在德国，许多人每周上班四天。大众品牌在德国的工厂是“行内成本最高的工厂之一”，瑞银（UBS）的帕特里克·胡梅尔（Patrick Hummel）说道。

但大众对德国的承诺是绝对的。“我们是一家德国公司”，穆勒说，将“保住德国的就业岗位”。强大的工会肯定会抵制裁员。穆勒说他们一致认为需要改革，但承认在如何改革的问题上存在分歧。工会也会阻止公司更全面地反思，把投资从大众品牌转向其他盈利更好的品牌。大众集团的监事会主要由工会代表及下萨克森州政府推举的代表组成，州政府持有大众20%的股权，能抵制大部分战略改革。

或许在控制着有表决权股份的保时捷和皮耶希家族支持下，一个受命变革的局外人能带来更大转变。不过穆勒似乎被绑住了手脚。大众集团业绩较好的部门将继续撑起表现不佳的部门。负担可能变得更重：豪华和廉价汽

车厂商正蓬勃发展，而大众集团核心业务所在的大众市场竞争日趋激烈。听起来奇怪，如果有更大一场危机，对大众而言或许是件好事。■



Mobile telecoms

Wireless: the next generation

A new wave of mobile technology is on its way, and will bring drastic change

THE future is already arriving, it is just a question of knowing where to look. On Changshou Road in Shanghai, eagle eyes may spot an odd rectangular object on top of an office block: it is a collection of 128 miniature antennae. Pedestrians in Manhattan can catch a glimpse of apparatus that looks like a video camera on a stand, but jerks around and has a strange, hornlike protrusion where the lens should be. It blasts a narrow beam of radio waves at buildings so they can bounce their way to the receiver. The campus of the University of Surrey in Guildford, England, is dotted with 44 antennae, which form virtual wireless cells that follow a device around.

These antennae are vanguards of a new generation of wireless technologies. Although the previous batch, collectively called “fourth generation”, or 4G, is still being rolled out in many countries, the telecoms industry has already started working on the next, 5G. On February 12th AT&T, America’s second-largest mobile operator, said it would begin testing whether prototype 5G circuitry works indoors, following similar news in September from Verizon, the number one. South Korea wants to have a 5G network up and running when it hosts the Winter Olympics in 2018; Japan wants the same for the summer games in 2020. When the industry held its annual jamboree, Mobile World Congress, in Barcelona in February, 5G topped the agenda.

Mobile telecoms have come a long way since Martin Cooper of Motorola (pictured), inventor of the DynaTAC, the first commercially available handset, demonstrated it in 1973. In the early 2000s, when 3G technology made web-browsing feasible on mobiles, operators splashed out more than

\$100 billion on radio-spectrum licences, only to find that the technology most had agreed to use was harder to implement than expected.

The advent of 5G is likely to bring another splurge of investment, just as orders for 4G equipment are peaking. The goal is to be able to offer users no less than the “perception of infinite capacity”, says Rahim Tafazolli, director of the 5G Innovation Centre at the University of Surrey. Rare will be the device that is not wirelessly connected, from self-driving cars and drones to the sensors, industrial machines and household appliances that together constitute the “internet of things” (IoT).

It is easy to dismiss all this as “a lot of hype”, in the words of Kester Mann of CCS Insight, a research firm. When it comes to 5G, much is still up in the air: not only which band of radio spectrum and which wireless technologies will be used, but what standards makers of network gear and handsets will have to comply with. Telecoms firms have reached consensus only on a set of rough “requirements”. The most important are connection speeds of up to 10 gigabits per second and response times (“latency”) of below 1 millisecond (see chart).

Yet the momentum is real. South Korea and Japan are front-runners in wired broadband, and Olympic games are an opportunity to show the world that they intend also to stay ahead in wireless, even if that may mean having to upgrade their 5G networks to comply with a global standard once it is agreed. AT&T and Verizon both invested early in 4G, and would like to lead again with 5G. The market for network equipment has peaked, as recent results from Ericsson and Nokia show, so the makers also need a new generation of products and new groups of customers.

On the demand side, too, pressure is mounting for better wireless infrastructure. The rapid growth in data traffic will continue for the foreseeable future, says Sundeep Rangan of NYU Wireless, a department of

New York University. According to one estimate, networks need to be ready for a 1,000-fold increase in data volumes in the first half of the 2020s. And the radio spectrum used by 4G, which mostly sits below 3 gigahertz, is running out, and thus getting more expensive. An auction in America last year raked in \$45 billion.

But the path to a 5G wireless paradise will not be smooth. It is not only the usual telecoms suspects who will want a say in this mother of all networks. Media companies will want priority to be given to generous bandwidth, so they can stream films with ever higher resolution. Most IoT firms will not need much bandwidth, but will want their sensors to run on one set of batteries for years—so they will want the 5G standard to put a premium on low power consumption. Online-gaming firms will worry about latency: players will complain if it is too high.

The most important set of new actors, however, are information-technology firms. The likes of Apple, IBM and Samsung have a big interest not only in selling more smartphones and other mobile devices, but also in IoT, which is tipped to generate the next big wave of revenues for them and other companies. Google, which already operates high-speed fibre-optic networks in several American cities and may be tempted to build a wireless one, has shown an interest in 5G. In 2014 it bought Alpentel Technologies, a startup which was developing a cheap, high-speed communications service using extremely high radio frequencies, known as “millimetre wave” (mmWave), the spectrum bands above 3 gigahertz where most of 5G is expected to live.

To satisfy all these actors will not be easy, predicts Ulf Ewaldsson, Ericsson’s chief technology officer. Questions over spectrum may be the easiest to solve, in part because the World Radiocommunication Conference, established by international treaty, will settle them. Its last gathering, in November, failed to agree on the frequencies for 5G, but it is

expected to do so when it next meets in 2019. It is likely to carve out space in the mmWave bands. Tests such as the one in Manhattan mentioned above, which are conducted by researchers from NYU Wireless, have shown that such bands can be used for 5G: although they are blocked even by thin obstacles, they can be made to bounce around them.

For the first time there will not be competing sets of technical rules, as was the case with 4G, when LTE, now the standard, was initially threatened by WiMax, which was bankrolled by Intel, a chipmaker. Nobody seems willing to play Intel's role this time around. That said, 5G will be facing a strong competitor, especially indoors: smartphone users are increasingly using Wi-Fi connections for calls and texts as well as data. That means they have ever less need for a mobile connection, no matter how blazingly fast it may be.

| *Evolution or revolution?*

Technology divides the industry in another way, says Stéphane Téral of IHS, a market-research firm. One camp, he says, wants 5G “to take an evolutionary path, use everything they have and make it better.” It includes many existing makers of wireless-network gear and some operators, which want to protect their existing investments and take one step at a time. On February 11th, for instance, Qualcomm, a chip-design firm, introduced the world's first 4G chip set that allows for data-transmission speeds of up to 1 gigabit per second. It does the trick by using a technique called “carrier aggregation”, which means it can combine up to ten wireless data streams of 100 megabits per second.

The other camp, explains Mr Téral, favours a revolutionary approach: to jump straight to cutting-edge technology. This could mean, for instance, leaving behind the conventional cellular structure of mobile networks, in which a single antenna communicates with all the devices within its cell. Instead, one set of small antennae would send out concentrated radio

beams to scan for devices, then a second set would take over as each device comes within reach. It could also mean analysing usage data to predict what kind of connectivity a wireless subscriber will need next and adapt the network accordingly—a technique that the 5G Innovation Centre at the University of Surrey wants to develop.

One of the most outspoken representatives of the revolutionary camp is China Mobile. For Chih-Lin I, its chief scientist, wireless networks, as currently designed, are no longer sustainable. Antennae are using ever more energy to push each extra megabit through the air. Her firm's position, she says, is based on necessity: as the world's biggest carrier, with 1.1m 4G base stations and 825m subscribers (more than all the European operators put together), problems with the current network architecture are exacerbated by the firm's scale. Sceptics suspect there may be an "industrial agenda" at work, that favours Chinese equipment-makers and lowers the patent royalties these have to pay. The more different 5G is from 4G, the higher the chances that China can make its own intellectual property part of the standard.

Whatever the motivation, Ms I's vision of how 5G networks will ultimately be designed is widely shared. They will not only be "super fast", she says, but "green and soft", meaning much less energy-hungry and entirely controlled by software. As with computer systems before them, much of a network's specialised hardware, such as the processor units that sit alongside each cell tower, will become "virtualised"—that is, it will be replaced with software, making it far easier to reconfigure. Wireless networks will become a bit like computing in the online "cloud", and in some senses will merge with it, using the same off-the-shelf hardware.

Discussions have already begun about how 5G would change the industry's structure. One question is whether wireless access will become even more of a commodity, says Chetan Sharma, a telecoms consultant. According to

his estimates, operators' share of total industry revenues has already fallen below 50% in America, with the rest going to mobile services such as Facebook's smartphone apps, which make money through ads.

The switch to 5G could help the operators reverse that decline by allowing them to do such things as market their own video content. But it is easier to imagine their decline accelerating, turning them into low-margin "dumb pipes". If so, a further consolidation of an already highly concentrated industry may be inevitable: some countries may be left with just one provider of wireless infrastructure, just as they often have only one provider of water.

If the recent history of IT after the rise of cloud computing is any guide—with the likes of Dell, HP and IBM struggling to keep up—network-equipment makers will also get squeezed. Ericsson and Nokia already make nearly half of their sales by managing networks on behalf of operators. But 5G may finally bring about what has been long talked of, says Bengt Nordstrom of Northstream, another consulting firm: the convergence of the makers of computers and telecoms equipment, as standardisation and low margins force them together. Last year Ericsson formed partnerships first with HP and then with Cisco. Full mergers could follow at some point.

Big, ugly mobile-phone masts will also become harder to spot. Antennae will be more numerous, for sure, but will shrink. Besides the rectangular array that China Mobile is testing in Shanghai, it is also experimenting with smaller, subtler "tiles" that can be combined and, say, embedded into the lettering on the side of a building. In this sense, but few others, the future of mobile telecoms will be invisible. ■



移动通信

无线：下一世代

酝酿中的新一代移动技术将带来巨变

未来已然在目，只在于我们放眼何方。上海的长寿路上，目光敏锐的人会发现一座办公楼的楼顶架着奇怪的矩形物体：由128条微型天线组成的设备。在曼哈顿，行人会瞥见摄像头般的装置立在支架上，不但会猛然转动，而且在本应是镜头的位置有奇怪的角状突出。该装置向建筑物发射窄束无线电波，经过反射的电波可以传给接收器。萨里大学（University of Surrey）在英格兰吉尔福德（Guildford）的校园内分布着44台天线，形成一套虚拟的无线基站，供手机使用。

这些天线是新一代无线技术的前沿成果。虽然许多国家仍在推广被统称为“第四代”（即4G）的前一代无线技术，但电信业已经迈向下一代技术即5G的研发。2月12日，美国第二大移动运营商AT&T表示将试验5G原型电路能否在室内接通。而早在去年9月，美国第一大移动运营商Verizon也做过类似的实验。韩国希望在2018年主办冬季奥运会时能建成并启用5G网络；日本希望在2020年主办夏季奥运会时实现同样的愿景。2月在无线业界于巴塞罗那召开的年度峰会世界移动通信大会（Mobile World Congress）上，5G技术成为首要议题。

自摩托罗拉的马丁·库帕（Martin Cooper，如图）在1973年展示其发明的首款商用手机DynaTAC以来，移动通讯已有长足的发展。21世纪初，3G技术使手机上网成为可能，运营商于是砸出超过千亿美元购入无线电频谱牌照，却发现这项大多数人已同意使用的技术推广起来难于预期。

正当4G设备迎来订单高峰之际，5G的出现很可能激发另一轮投资热潮。目标是至少给用户以“功能无限的印象”，萨里大学5G创新中心主任拉希姆·塔法佐利（Rahim Tafazolli）说。将来，从无人驾驶汽车、无人机到构成“物联网”的一切传感器、工业机械及家用电器，几乎所有设备都能无线联网。

视这一切为“炒作”并嗤之以鼻很容易，研究公司CCS Insight的凯斯特·曼（Kester Mann）说道。提到5G，大都未有定论：不只是利用哪一频段的无线电频谱及哪些无线技术未定，还有网络设备及手机制造商须遵照哪些标准也未确定。电信公司已就一套宽泛的“要求”达成共识。最重要的是连接速度最高要达到10Gbps，而且响应时间（“网络延迟”）须低于一毫秒（见图表）。

然而，势头已然成真。韩国和日本是有线宽带建设的领跑国家，举办奥运会是一个机会，向世界展现它们也想要领跑无线领域，即便这意味着在全球标准议定出台后它们可能必须升级其5G网络以符合标准要求。AT&T及Verizon均在早期率先投资4G，如今同样希望在5G上再度领先。正如爱立信和诺基亚最近业绩所显示的那样，网络设备市场已经饱和，因此制造商也需要新一代产品及新的客户群。

需求方面也一样，改善无线基础设施的呼声日益迫切。纽约大学无线研究中心（NYU Wireless）的森迪普·兰根（Sundeep Rangan）表示，在可预见的未来，数据流量将继续快速增长。据估计，在本世纪20年代的前五年，网络需要准备好迎接上千倍的数据量增长。而4G所用的无线电频段（大多低于3GHz）已逐渐稀缺，且愈加昂贵，去年美国一次竞拍便卖得450亿美元。

但通往5G无线天堂的道路不会一帆风顺。对这一“万网之源”，争取话事权的不单是惯常那些电信企业。媒体公司希望优先获得更高的带宽，以便其以更高分辨率在线播放影片。大部分物联网企业不需要太大的带宽，而是想自己的传感器能靠一组电池续航数年，所以它们会希望5G标准重视低功耗。网游公司会担心网络延迟的问题：假如延迟过久，玩家会抱怨。

然而，最重要的新登场者是信息技术公司。苹果、IBM、三星这类企业不但关心卖出更多的智能手机及其他移动设备，对于物联网这据称将为其带来下一波收入巨浪的领域，他们也饶有兴致。谷歌已在美国多个城市运营高速光纤网络业务，而且可能有意打造无线网络，目前该公司已对5G表示兴趣。2014年，谷歌收购了创业公司Alpental Technologies，该公司当时

正在研发通过极高频无线电提供廉价而高速的通讯服务，即所谓的“毫米波”（mmWave，频段高于3GHz，也是5G预期主要使用的频段）。

要满足所有各方所求并非易事，爱立信首席技术官乌尔夫·艾华信（Ulf Ewaldsson）预言道。频段问题也许是最容易解决的，一方面是因为按国际条约成立的世界无线电通信大会将解决这些问题。大会上一次召开是在去年11月，虽然当时无法就5G所用频率达成一致，但预计大会下一次在2019年召开时便可达成共识，并很可能在毫米波频段中开辟空间。诸如上文提及由NYU无线研究中心研究人员在曼哈顿所做的测试已显示，这些频段可以用于5G：虽然薄障碍物也会造成阻隔，但可以让它们通过反射绕过障碍物。

没有多套技术准则相互竞争，这实属首次，不像4G推出时的情形，如今普遍采用的LTE标准最初还受到芯片制造商英特尔投资开发的WiMax标准威胁。这次，似乎没有谁愿意扮演英特尔的角色。尽管如此，5G将面对一个强大对手，尤其是在室内：智能手机用户除了用Wi-Fi传输数据之外，也越来越多地用其打电话及发短信。那意味着他们对接入移动网络的需求越来越少，不管数据的传输有多么极速。

| 渐进还是革命？

技术还以另一种方式分割电信行业，市场研究公司IHS的斯特凡·泰拉尔（Stéphane Téral）认为。他说，一个阵营希望5G“走上渐进的道路，利用现有一切，逐步改善”。这里面包括了许多现在的无线网络设备厂商及部分运营商，它们希望保护已有的投资，逐步改进。比如，2月11日，芯片设计公司高通（Qualcomm）推出全球首款数据传输速度高达1Gbps的4G芯片组。所运用的技术名为“载波聚合”，意味着每秒可以聚合多达十个100Mbps的数据流。

泰拉尔解释说，另一阵营主张采取革命性的方式：直接跃升至尖端技术。这可能意味着，举例说，靠单一天线与基站覆盖范围内的所有设备作通信的传统蜂窝结构移动网络将被舍弃。取而代之的是，一组小型天线将发射集合无线电波束扫描设备，在搜索到设备后，第二组天线将逐一接管。这

也意味着可能需要分析使用数据来预测无线用户下一步需要何种连接性能，然后对网络做相应调整——这正是萨里大学的5G创新中心希望开发的技术。

这一革命阵营中最直言不讳的代表是中国移动。其首席科学家易芝玲认为，按目前的设计，无线网络难以持续。要传输更多数据，天线能耗会越来越来大。易芝玲表示，其公司的立场是基于必要性：中国移动是全球最大的通信运营商，拥有110万4G基站及8.25亿用户（超过欧洲所有运营商的总和），公司的规模进一步加剧了现有网络结构面临的问题。持怀疑态度者猜测其中也许存在一套“产业化安排”，偏袒中国设备制造商并降低这些公司须支付的专利使用费。5G与4G的差异越大，中国就越可趁机让自己的知识产权成为全球标准的一部分。

不论动机如何，大家普遍认同易芝玲对5G网络最终设计的展望。她说，这些网络不止“超快”，还是“绿色和软性”的，即耗能低得多，且完全由软件控制。跟此前的电脑系统一样，5G网络的专用硬件（例如每一基站上的处理器单元）大部分会“虚拟化”，即会由软件取代，重新配置起来容易得多。无线网络将变得有点像在线“云”计算，而且在某种意义上将与之融合，使用相同的现成硬件。

有关5G将如何改变通信行业结构的讨论已经展开。一个问题是，“无线接入”服务会否变得更像是一种日用商品，电信咨询师切坦·沙尔玛（Chetan Sharma）认为。据其估计，在美国电信业的总收入中，运营商所占的份额已跌至50%以下，其余份额为移动服务商所占据，比如像Facebook的智能手机应用，它们通过广告盈利。

向5G转型，运营商或许可以通过销售自有视频内容等方式逆转目前的颓势。但更可能的是其业务加速下滑，沦为低利润的“哑管道”。倘若如此，这个本来已经高度集中的行业可能难免进一步整合：部分国家也许会只剩一个无线基础网络供应商，正如它们往往只有一家供水公司那样。

纵观云计算崛起之后IT行业近来的发展（戴尔、惠普、IBM这类公司难以

跟上步伐），如果有所启示，那就是网络设备制造商也将受到挤压。爱立信和诺基亚已有近半销售额是通过为运营商代管网络而取得。另一咨询公司Northstream的本特·诺思通（Bengt Nordstrom）表示，5G可能最终会令人们一直谈论的一件事成为现实：在标准化生产及低利润的压力下，计算机制造商和电信设备商将合二为一。去年，爱立信先后与惠普及思科缔结合作伙伴关系。日后可能出现全面并购整合。

巨大而丑陋的移动通信天线杆也将变得踪影难寻。天线会变多，但体积肯定会缩小。除了中国移动在上海测试中的矩形天线阵列，公司还在试验采用更小型隐蔽的“瓷片”（tile）天线，可以组合并嵌入建筑物墙面的文字中。在这个意义上，遑论其他，移动通信的前景将变得难以觉察。■



Emerging-market debt

The well runs dry

Why borrowing in dollars is central to the business cycle in developing countries

OIL PRICES have perked up a bit, but producers are still reeling from the slump in crude prices last year. The boss of Pemex, Mexico's state-owned oil firm, said last week that the company faced a "liquidity crunch". Malaysia's state oil firm is laying off workers. Petrobras, Brazil's troubled oil giant, recently secured a \$10 billion loan from the China Development Bank to help it to pay off maturing bonds. The trouble at these firms underlines broader concerns about the burden of corporate debt in emerging markets. A particular worry for resources firms is the rising cost of servicing dollar debts taken out when the greenback was much weaker than it is now. Short-term dollar loans to be repaid with earnings in falling currencies featured prominently in past emerging-market crises. But the concern about the role of dollar lending in the current cycle is different.

The numbers are startling. Corporate debt in 12 biggish emerging markets rose from around 60% of GDP in 2008 to more than 100% in 2015, according to the Bank for International Settlements (BIS). Places that experience a rapid run-up in debt often subsequently endure a sharp slowdown in GDP. An extra twist is that big emerging-market firms were for a while able to borrow freely in dollars. By the middle of last year, the stock of dollar loans to non-bank borrowers in emerging markets, including companies and government, had reached \$3.3 trillion. Indeed until recently, dollar credit to borrowers outside America was growing much more quickly than to borrowers within it. The fastest increase of all was in corporate bonds issued by emerging-market firms.

Jaime Caruana, the head of the BIS, argues that a global liquidity cycle—the waxing and waning of dollar borrowing outside America—helps to explain

the slowdown in emerging-market economies, the rise in the dollar's value, and the sudden oil glut. When the dollar was weak and global liquidity was ample thanks to the purchase of Treasuries by the Federal Reserve (so-called "quantitative easing", or QE), companies outside America were happy to borrow in dollars, because that was cheaper than borrowing in local currency. Capital inflows pushed up local asset prices, including currencies, making dollar debt seem even more affordable.

As long as the dollar remained weak, the feedback loop of cheap credit, rising asset prices and strong GDP growth could continue. But when the dollar started to strengthen, the loop reversed. The dollar's ascent is tied to a change in America's monetary policy which began in May 2013, when the Fed first hinted that it would phase out QE. When the Fed's bond-buying ended in October 2014, it paved the way for an interest-rate increase 14 months later. The tightening of monetary policy in America has reduced the appetite for financial risk-taking beyond its shores.

The impact of this minor shift on the value of the dollar has been remarkable, particularly against emerging-market currencies (see chart 1). Wherever there has been lots of borrowing in foreign currency, the exchange rate becomes a financial amplifier, notes Mr Caruana. As companies scramble to pay down their dollar debts, asset prices in emerging markets fall. Firms cut back on investment and shed employees. GDP falters. This drives emerging-market currencies down even further in a vicious cycle that mirrors the virtuous cycle during the boom. Since much of the credit went to oil firms, the result has been a supply glut, as producers pump crude at full tilt to earn dollars to pay down their debts.

Mr Caruana's reading of events has dollar borrowing at its centre. Yet the sell-off in emerging-market currencies has more to it. Rich countries that export raw materials, including Australia, Canada and Norway, have also seen their currencies plummet against the dollar. Falling export income as

a consequence of much lower oil and commodity prices is likely to have played a similar role in the slump in other currencies.

Some analysts think the problem of dollar debt is blown out of proportion. There are countries, such as Chile and Turkey, where dollar debts loom large (see chart 2). But the average dollar share of corporate debt in emerging markets is just 10%. Chinese firms account for more than a quarter of the \$3.3 trillion of dollar loans to emerging markets—and since August, when fears surged that the yuan would be devalued, they have been swapping dollar loans into yuan, notes Jan Dehn of Ashmore Group, a fund manager.

Much of the foreign-currency debt taken out by companies elsewhere was long-term: the average maturity of bonds issued last year was more than ten years, for instance. That pushes refinancing, and the associated risk of default, far into the future. In many cases, dollar debt is matched by dollar income—even if, as in the case of oil exporters, it is much diminished by low prices. And there are pots of dollars in emerging-market banks to which indebted companies may have recourse.

In any event, the dollar's ascent has stalled because of concerns about America's faltering economy and doubts that the Fed can raise interest rates again. Yet the cycle of dollar lending nevertheless has implications that may not be fully appreciated. A recent study of firm-level finances by Valentino Bruno and Hyun Song Shin of the BIS found that emerging-market firms with strong cash balances are more likely to issue dollar bonds. That goes against a tenet of corporate finance, that firms only borrow to invest once they have exhausted internal sources of funds. It suggests that financial risk-taking was the motivation for borrowing. On average, 17-22 cents of every dollar borrowed by an emerging-market company ends up as cash on the firm's balance-sheet. Such liquid funds could go into bank deposits, or be used to buy other firms' commercial

paper or even to lend to them directly. In other words, the authors say, companies seem to be acting as surrogate financial firms. As a result, dollar borrowing spills over into easier credit conditions in domestic markets.

This is one of the ways the dollar-credit cycle exerts a strong influence over overall lending in emerging markets. The credit cycle took an apparently decisive turn last year. The stock of dollar credit to emerging markets stopped rising in the third quarter, says the BIS, the first stalling since 2009. Dollar credit is much harder to come by than it was. So are local-currency loans. Bank-lending conditions in emerging markets tightened further in the fourth quarter, according to the Institute for International Finance. The dollar may have peaked but, for emerging markets, tight financial conditions are likely to endure. ■



新兴市场债务

井水逐渐枯竭

为何美元计价债务对发展中国家的商业周期至关重要

虽然油价已轻微上涨，但生产商仍在为去年原油价格暴跌而心烦意乱。国有的墨西哥国家石油公司（Pemex）的老板上周表示，公司面临“流动性风险”。马来西亚的国有石油公司正在裁员。陷入困境的石油巨头巴西国家石油公司（Petrobras）最近从中国国家开发银行争取到100亿美元的贷款来帮助它偿还到期债券。这些公司的困难凸显了人们对新兴市场的企业债务负担更广泛的担忧。对资源型企业尤其如此，在美元远比现在疲软时，它们借入美元债务，如今偿债成本不断上升。在新兴市场过往的危机中，用贬值货币计价的收入去偿还短期美元贷款是一个突出特点。但是，对美元贷款在当前周期中所起作用的担忧却有所不同。

数字很惊人。根据国际清算银行（BIS）的数据，在12个较大的新兴市场中，企业债务占GDP的比例从2008年的60%左右上升至2015年的超过100%。经历过债务快速增长的地区，其GDP的增速往往随后会大幅放缓。新兴市场的大公司一度能够自由地以美元举债，这让问题更加复杂。到去年中期，新兴市场的企业和政府等非银行借款人的美元贷款总额已经达到3.3万亿美元。的确，直到最近，对美国以外借款人的美元贷款增速远高于美国国内。其中增长最快的是新兴市场公司发行的公司债券。

国际清算银行行长杰米·卡如纳（Jaime Caruana）认为，全球的流动性周期，即美国以外美元贷款的消长变化，有助于解释新兴市场经济的放缓、美元的升值以及突如其来的石油过剩。当美联储买入美国国债（所谓的“量化宽松”），导致美元疲软、全球流动性充裕时，美国以外的公司很乐意借入美元，因为这比本币借贷更便宜。资本的流入推高了包括货币在内的当地资产的价格，使美元债务显得更加便宜。

只要美元保持疲软，廉价信贷、资产价格上升以及GDP强劲增长组成的回馈循环就有可能持续。但是，当美元开始走强，这一循环有所逆转。美元

的升值与美国货币政策从2013年5月开始的变化密切相关，当时美联储首次暗示将逐步退出量化宽松。2014年10月，美联储停止买入债券，为14个月之后的加息铺平了道路。美国收紧货币政策，这降低了人们在美国之外进行金融冒险的意愿。

美元汇率这一轻微变化的影响非同寻常，尤其是在比对新兴市场货币的时候（见图表1）。卡如纳表示，哪里有大量的外币贷款，哪里的汇率就会成为金融放大器。随着公司竞相偿还各自的美元债务，新兴市场的资产价格走低。公司削减投资并裁汰员工，GDP止步不前。这迫使新兴市场的货币进一步下跌，形成恶性循环，正如经济繁荣时形成良性循环一样。由于大部分贷款流向了石油公司，这些公司为了赚取美元来偿还债务而全速开采原油，结果造成供应过剩。

卡如纳对这些事件解读的核心是美元贷款。然而，抛售新兴市场货币的原因不止于此。澳大利亚、加拿大和挪威等富裕国家出口原材料，其货币兑美元的汇率也大幅下跌。石油和大宗商品价格大幅走低导致了出口收入下滑，而这种下滑在其他货币的下挫中可能起了类似的作用。

一些分析师认为美元债务的问题被过分夸大了。的确有些国家，如智利和土耳其，它们的美元债务显得很突出（见图表2）。但在新兴市场的企业债务中，美元债务的平均比例仅为10%。基金管理公司安石集团

（Ashmore Group）的简·德恩（Jan Dehn）指出，在新兴市场的3.3万亿美元贷款中，中国企业占了超过四分之一，而且从去年8月以来，对人民币贬值的恐慌四起，这些企业就一直在把美元贷款置换成人民币贷款。

其他地方公司借入的大量外币债务是长期的：例如，去年发行的债券，其平均期限超过十年。这就把再融资和相关的违约风险推后到遥远的将来。在许多情况下，美元债务与美元收入相匹配——即使对于石油出口国而言，美元收入因为低油价而大幅降低，情况也是如此。而且，新兴市场的银行拥有大量美元，负债企业可以向银行求助。

无论如何，由于人们担心美国经济疲软并怀疑美联储会再次加息，美元的

上涨已经停滞。然而，美元借款周期可能引发的后果或许没有被充分认识到。国际清算银行的瓦伦蒂诺·布鲁诺（Valentino Bruno）和申铉松（Hyun Song Shin）最近一项关于公司层面财务状况的研究发现，现金很多的新兴市场公司更有可能发行美元债券。这违背了企业财务管理的一个宗旨，即企业只有在耗尽内部资金后才借钱投资。这表明，借贷的动机是主动承担金融风险。平均而言，新兴市场的公司每借一美元，就会有17至22美分最终进入公司资产负债表的现金项。这种流动资金可以存入银行，也可以用来买入其他公司的商业票据，甚至直接借款给它们。作者认为，换言之，企业似乎充当了金融公司的角色。其结果是，美元借贷流入国内市场，使得信贷环境更为宽松。

这就是美元信贷周期强有力地影响新兴市场整体借贷的方式之一。去年，信贷周期发生了明显的决定性转变。国际清算银行表示，新兴市场的美元信贷总额在第三季度停止了上升，这是2009年以来的第一次。美元贷款比以往更难以获得。本币贷款亦是如此。国际金融协会（Institute for International Finance）表示，新兴市场的银行贷款条件在第四季度进一步收紧。美元也许已攀升至最高点，但是对于新兴市场而言，金融市场紧缩的状况可能会持续下去。 ■



The India-China trade gap

Arrive full, leave empty

India seeks to boost its manufacturing industry and cut the trade deficit

SHIPS leaving Nhava Sheva port, across the harbour from Mumbai, tend to ride higher on the water than when they arrive. India's trading statistics explain why: steel and other industrial goods from China weigh down the ships as they come in, to be replaced on the way out by fluffy cotton bales, pills and—given India's perennial trade deficit in goods—empty containers.

India's economy grew by 7.5% last year, cruising past China's 6.9% growth. Yet the deficit in goods trade with China continues to widen (see chart), to over 2% of GDP last year. For Indian policymakers this is an irksome reminder of the weakness of the country's manufacturers. Halving the trade shortfall with China would be enough to eliminate India's overall current-account deficit, and thus the need for external financing.

The government's ideas for shrinking the shortfall have been sadly predictable. The minimum import prices it imposed earlier this month on various grades of Chinese steel, which it claims are being "dumped" below cost, come on top of other anti-dumping levies and taxes on steel and myriad other products, from raw silk to melamine dinner sets. No country has used such measures as energetically as India over the past 20 years, according to the World Trade Organisation.

The commerce minister, Nirmala Sitharaman, has called for a devaluation of the rupee to curb imports and boost exports. Yet the rupee has been falling against the yuan for years, with little effect on trade. And a weakening currency could revive inflation, which falling oil prices and sound monetary policy have helped tame.

The government looks longingly at manufacturing's 32% share of China's GDP, roughly double the Indian figure. It sees factories as the ideal way to soak up the million-odd young workers who join the labour force every month. So it is showering sops on various industries. It is handing out subsidised loans to small-scale and labour-intensive industries such as ceramics and bicycle parts. Lightly-taxed "special economic zones", many of which are set up to benefit a single company, are in line for further handouts.

A "Make in India" jamboree in Mumbai earlier this month sought to present an image of openness to foreign investment, eliciting promises of multi-billion-dollar plants from firms keen to cosy up to policymakers. But India is trying to emulate China's export-led manufacturing growth in a global economy that is now drowning in China's industrial surpluses. It hopes to fill the vacuum left by its larger neighbour as Chinese wages rise, to double those of Indians, and its economy rebalances from exports to consumption. Yet so far it has struggled to seize that opportunity.

Indian firms grumble, with some justification, about their products being shut out of the Chinese market. Agricultural products, of which India is a net exporter, are largely excluded from China through various phytosanitary rules. Indian pharmaceutical firms complain that China's growing aid to other developing countries often includes the provision of medicines—Chinese-made ones, of course—which means that the recipient countries buy fewer Indian-made drugs than they used to.

India runs a global surplus in services, mainly by selling them to rich countries. But they are a small component of Indo-Chinese trade. China gets the best of tourist exchanges between the two countries: 181,000 Chinese tourists came to India in 2014, against 730,000 Indians who visited China. All this tortures Indians, for whom China is the biggest source of imports and third-biggest export market, but barely troubles China, for

whom India is a second-tier trade partner. Indian policymakers are reflexively sceptical, for example, of China's plan to build a road linking the countries, worrying it will only widen the trade imbalance.

If China's consumers won't buy Indian goods, perhaps its businesses could build factories in India instead? Some big projects have recently been announced, notably a \$10 billion industrial park to be developed by Dalian Wanda, a Chinese property group; and a \$5 billion plant proposed by Foxconn, a Taiwanese electronics outfit which mainly manufactures in China. Foxconn said last July that it might employ up to 1m Indians in 10-12 plants by 2020, despite suffering labour strife when it closed an existing factory last year. However, foreign investors' projects often fall quietly by the wayside when bureaucratic obstacles prove insurmountable. Foxconn is already said to be rolling back its ambitions.

After years in the doldrums, India is enjoying its moment as the world's fastest-growing large economy. That in itself will be enough to pique the interest of multinationals: Apple, for example, thinks a sales push in India can help make up for sluggish Chinese demand. Even so, it will be a while before its devices (whose assembly it outsources to Foxconn) are made in India. Instead, they will further weigh down the ships entering its ports. ■



印度对华贸易赤字

满载而来，空舱而去

印度力图提振本国制造业并削减贸易赤字

从那瓦舍瓦港（Nhava Sheva，即孟买新港）离开的货船往往比其到达时吃水浅。从印度的贸易统计数字可见缘由：货船来时装载从中国进口的钢材和其他工业品，因而吃水深，而从印度离港出口时装的是蓬松的棉包、药丸以及空集装箱（鉴于印度长期的商品贸易赤字）。

印度经济去年增长7.5%，超越了中国6.9%的增长率。但其对华商品贸易赤字持续扩大（见图表），去年占GDP比例超过2%。在印度政策制定者看来，这是个恼人的标签，显示出该国制造业的弱势。对华贸易赤字只要减少一半，印度就足以消除整体经常账户赤字，也就无须向外部融资。

可悲的是，政府缩小逆差的点子全无新意可言。印度称中国低于成本向其“倾销”钢材，于是在二月初对各级别中国钢材设定最低进口价，外加对钢材、生丝以至密胺餐具等众多其他产品征收反倾销税和其他税收。世贸组织表示，过去20年间，没哪个国家像印度如此积极地采用这类措施。

印度商工部长尼尔玛拉·希塔拉曼（Nirmala Sitharaman）呼吁贬值卢比以遏制进口，提振出口。但卢比兑人民币已多年持续下跌，对贸易却帮助不大。而且，油价下跌和稳健的货币政策已有助压抑通胀，而货币走弱则可能令通胀再度抬头。

印度政府艳羡中国制造业的GDP占比达32%，约为印度的两倍。印度每月有逾百万年轻人加入劳动力大军，政府视工厂为吸收这些劳动者的理想方式，因此对各行业加以扶助，向陶瓷和自行车零件等劳动密集的小型产业发放贴息贷款。而低税率的“经济特区”（许多是为某一家公司的利益而设）还会有进一步的优惠待遇。

二月初在孟买举行的“印度制造”大型宣传活动希望营造开放的形象，欢迎

外国投资，吸引热衷向政策制定者示好的公司做出承诺，投资兴建价值数十亿美元的工厂。尽管全球经济正受中国工业品过剩之害，印度仍然想仿效中国，实现出口导向型的制造业增长。随着中国的工资上升（是印度工人的两倍）以及经济从出口向消费转型，印度希望填补这一更大邻居留下的空白。但目前为止，它仍难以抓住这一机会。

印度企业抱怨产品被挡在中国市场之外，这有一定道理。印度是农产品净出口国，而中国通过各种植物检疫规则把大量印度农产品拒之门外。印度制药公司埋怨，中国对其他发展中国家不断增加的援助通常包括供应药品（当然是中国制造的药品），这意味着受援国购买的印度药品会比以前少。

印度服务贸易在全球实现顺差，主要是向富裕国家提供服务。但印度对华贸易中，服务业只占一小部分。在两国旅游交流方面，中国也占上风：2014年访印中国游客为18.1万，而访华印度游客则为73万。这一切令印度人心焦，作为印度的最大进口国及第三大出口市场，中国则不太担忧，毕竟印度只是其二线贸易伙伴。印度政策制定者会本能地猜疑中国的举动，比如，担心中国建造公路连接两国的计划只会扩大贸易失衡的问题。

如果中国消费者不买印度商品，也许中国企业还可以反过来到印度设厂吧？近期已经公布了一些大型项目，尤其是中国地产集团大连万达开发建设价值100亿美元的工业园。另外，富士康（台湾电子厂商，工厂主要在中国）也计划投资50亿美元在印度建造工厂。去年七月，富士康表示，尽管去年因劳资纠纷而关闭一家现有工厂，但到2020年公司的10到12家工厂或许将雇用多达100万印度人。然而，官僚屏障如被证明难以逾越，外国投资计划往往会随之湮没无闻。据称，富士康的雄心已有退缩。

经过多年的低迷，如今印度成为全球增长最快的大型经济体。这本身就足以激起跨国公司的兴趣：比如，苹果公司认为在印度推动销售可以弥补中国需求的低迷。但即便如此，苹果电子设备（富士康为其装配厂商）在印度投产还须假以时日。在这之前，它们仍会登上货船，朝着印度港口，重载而来。■



Central banks and digital currencies

Redistributed ledger

Even central bankers are excited about the blockchain

RUSSIA'S central bank has set up a working group. The People's Bank of China (PBOC) is keen. Inspired by bitcoin and its blockchain technology, the world's central bankers are contemplating digital currencies of their own. Like bitcoin, these would be built around a database listing who owns what. Unlike bitcoin's, though, these "distributed ledgers" would not be maintained collectively by some of their users. Instead, they would be tightly controlled by the issuers of the currency.

The plans involve letting individuals and firms open accounts at the central bank, a privilege usually enjoyed only by retail banks. Unlike a regular bank account, these would be guaranteed in full by the state, regardless of any limit in the national deposit-insurance scheme. That would make parking cash at the central bank particularly attractive during times of uncertainty.

Central banks would benefit too. They could save on printing costs if people held more bits and fewer banknotes. Digital currency would be tougher to forge, though a successful cyber-attack would be catastrophic. Digital central-bank money could even, in theory, replace cash. If it did, central bankers could then use deeply negative interest rates to give the economy a jolt. And boosting growth by handing out "helicopter money" would become as easy as adding a zero to electronic balances.

Better yet, whereas bundles of banknotes can be moved without trace, electronic payments cannot. Replacing cash with digital currency, under the control of the central bank, would make it tougher to launder money, dodge taxes or sell drugs. It would also make prying into people's finances much easier. That may be one reason why the PBOC wants to introduce a

digital currency “as soon as possible”. The technology first developed to free money from the grip of central bankers may soon be used to tighten their control. ■



中央银行和数字货币

分类账再分配

连央行也在为区块链而兴奋

俄罗斯央行已经成立了一个工作小组。中国人民银行正在积极准备。受到比特币及其背后的区块链技术启发，世界各地的央行正在酝酿自己的数字货币。和比特币一样，这些数字货币将围绕一个列明谁拥有什么的数据库而建。但和比特币不同的是，这些“分布式分类账”不会由部分用户来共同维护，而会由货币发行方严格控制。

这类计划包括让个人和企业中央银行开设账户，这是通常只有零售银行才享有的特权。与常规银行账户不同的是，无论国家存款保险制度有何种限制，这些账户都会从国家那里获得完全的保障。这会使得在央行存钱变得特别有吸引力，尤其在经济不稳定的时期。

央行也会从中受益。如果人们拥有更多数字比特而非纸币，就将能节省更多的印钞成本。数字货币更难伪造，尽管一次成功的网络攻击可能会带来灾难性的后果。从理论上讲，央行的数字货币甚至可以替代现金。果真如此的话，央行随后可以利用较大的负利率刺激经济。而用“直升机撒钱”促进经济增长会变得像在电子账目上加一个零那么简单。

更好的是，虽然一捆纸币可以被神不知鬼不觉地转移，但在电子支付中却做不到。在央行的控制下以数字货币取代现金将会使得洗钱、逃税或贩毒都变得更加困难。政府要窥探人们的财务状况也会变得容易得多。这可能是中国人民银行想要“尽快”推出一种数字货币的原因。区块链这项技术的初衷是让金钱逃脱央行之手，而它却可能很快被用于加强央行的掌控。■



High-denomination banknotes

Cash talk

Getting rid of big banknotes is not as easy as it sounds

A SIGN on the door of a Wild Bean café in Zurich shows the nine different cards accepted for payment inside. Below the logos is a picture of a purple bank note, crossed out in red. From behind the counter, Aymen Kandil explains that for everyday transactions, “thousand-franc notes are not so good”.

Although many merchants will not accept them, the SFr1,000 (\$1,000) note makes up over 60% of all Swiss cash in circulation. It is the most valuable banknote issued by a Western country and is worth twenty times its weight in gold. Rather than being a way of paying for things, it is meant to act as a convenient store of value. In 2008, as banks were failing and the value of most assets collapsed, demand for the SFr1,000 note jumped by 16%, having grown by only 1-4% in previous years.

Yet lawmen suspect that most high-denomination notes are in the hands not of jittery savers, but of criminals. Good data on the use of such notes are scarce—their anonymity is one of their attractions. But a report in 2010 from a British police unit that focuses on organised crime claimed that only 10% of €500 (\$542) notes were used for legitimate purposes. A report from Europol recounts how criminals will sometimes pay more than face value for high-value notes because of how convenient they are to transport. And it seems telling that the €500 note accounts for around 30% of euros in circulation, yet 56% of Europeans surveyed by the European Central Bank say they have never seen one.

David Lewis of the Financial Action Task Force, an international body that co-ordinates efforts to prevent criminals using the financial system, says

big notes are used mainly in drug- and people-trafficking, money-laundering and racketeering. Finance for terrorism is another concern. A courier for jihadists caught travelling to Turkey in 2014 with 40 €500 bills (€20,000) in her underwear would have needed knickers of epic proportions to transport the same sum using €100 notes.

To make life difficult for criminals, Britain has barred banks and money-changing firms from providing €500 notes; the biggest British note is a mere £50 (\$70). Canada started withdrawing its C\$1,000 note (then worth \$670) from circulation in 2000 for the same reason. Singapore is phasing out the S\$10,000 note, the world's most valuable (worth \$7,100). The ECB seems to be moving in a similar direction. In early February it announced an investigation into the use of the €500 note.

The ECB will report to euro-zone finance ministers by May 1st, but resistance to scrapping the €500 note is already strong. Some (particularly in Germany) fear that the withdrawal of big notes is a precursor to the eventual abolition of cash, and thus a vast increase in the state's power to pry and meddle. There are other benefits to the state from getting rid of high-value notes than hitting big-time criminals. Withdrawing them could help fill government coffers, by making tax-avoiding cash payments more awkward. It might even grease the wheels of monetary policy, by making it easier to impose negative interest rates. Yet the "slippery slope" argument need not hold: Canada still has smaller notes, long after it binned the C\$1,000 bill.

A weightier concern is that the process of eliminating big notes has less impact on criminals the more slowly it proceeds. But central banks are reluctant to cancel or even put an expiry date on notes, for fear that this would undermine trust in those left in circulation. Instead, they tend to ask commercial banks to filter out the offending notes whenever they receive any. That is what Canada did in 2000 and, 16 years on, some 20% of

C\$1,000 notes remain in circulation.

Moreover, getting rid of one kind of big note will have only limited impact as long as there are others in circulation, points out Peter Sands of Harvard University. He would like to see the ECB scrap the €200 and €100 notes as well, and the Federal Reserve withdraw the \$100 bill, which would be a huge inconvenience to drug-traffickers moving money across the Mexican border.

The Swiss National Bank has stated categorically that it has no plans to get rid of high-value notes, so criminals will have at least one option for the foreseeable future. As Mr Lewis says, “Whatever you do, the problem is going to get pushed somewhere else.” Nonetheless, he continues, “What you’re doing is making it harder for criminals to smuggle cash and easier for authorities to detect them.” That is nothing to sneer at. ■



大面额钞票 现金之辩

取消大面额钞票并不像听起来那么容易

位于苏黎世的一家Wild Bean咖啡馆门上贴着一个标示，显示该店接受九种银行卡付款。在这些银行卡标志的下方是一张紫色钞票的图案，上面打了一个红色的大叉。站在柜台后面的艾曼·坎迪尔（Aymen Kandil）解释说，对于日常交易来说，“一千瑞郎面额的纸币不太方便”。

尽管众多商家都不接受1000瑞郎（约合1000美元）面额的纸币付款，它占到所有流通中瑞士现金的逾60%。它是西方国家发行的价值最高的钞票，比同等重量的金子贵20倍。其主要用途并非购物，而是充当一种便捷的储值工具。2008年当银行纷纷倒闭而多数资产的价值崩塌时，对1000瑞郎面额纸币的需求上升了16%，而在此之前的年份中增幅仅为1%到4%。

不过，执法部门怀疑大部分最高面额的纸币并不在忧虑不安的储户手中，而是在罪犯那里。对于这类纸币的使用情况欠缺很好的数据记录——其匿名性正是它吸引人的地方之一。但英国一间警署在2010年发表了一份聚焦有组织犯罪的报告，声称500欧元（542美元）面额的纸币仅10%被用于合法途径。来自欧洲刑警组织（Europol）的另一份报告记述了犯罪分子有时会为高额钞票支付超过其面额的钱，因为这类钞票太便于运送了。有一个数据很能说明问题：流通中的欧元约30%为500欧元面额，但欧洲央行调查的欧洲人中有56%说自己从未见过这种纸币。

反洗钱金融行动特别工作组（Financial Action Task Force）是一个协调行动以阻止罪犯利用金融系统作案的国际组织。该组织的戴维·路易斯（David Lewis）说，大面额钞票主要被用于贩卖毒品和人口、洗钱以及诈骗。为恐怖主义提供融资则是另一个令人担忧的问题。2014年一名伊斯兰圣战分子在前往土耳其的途中被抓获，在她的内裤中藏有40张500欧元面值（共计2万欧元）的纸币。如果她携带的是100欧元面值的纸币，就不是

正常尺寸的内衣能搞得定的了。

为了让罪犯的日子更不好过，英国已经禁止银行和货币兑换公司提供500欧元面额的纸币。面额最大的英国纸币仅为50英镑（合70美元）。加拿大从2000年起因为相同的原因从流通中撤回1000加元（当时约合670美元）的纸币。新加坡正在逐渐淘汰1万新加坡元的纸币，这是全世界最高价值的纸币（约合7100美元）。欧洲央行似乎也正朝着类似的方向行动。2月初该行宣布启动一项对500欧元面额纸币使用情况的调查。

欧洲央行将在5月1日前向欧元区的财政部长们汇报调查成果，但对于取消500欧元面额纸币的抵抗已很强烈。一些人（尤其德国人）担心，取消大额钞票只是一个序曲，最终将导致取消现金，从而极大地增加国家探查和干预的能力。除打击大规模犯罪外，取消大额纸币还将为国家带来其他的益处：帮助填充政府金库，因为人们将更难通过现金支付来逃税；甚至实施负利率也可能变得更加容易，从而更便于推行货币政策。但是，这种“滑坡”理论不一定站得住脚：加拿大取消1000加元纸币已有多多年，至今还在使用较小面额的现金。

另一种担忧更值得关注：取消大额纸币的进程越慢，对犯罪分子的冲击就越小。但中央银行不太愿意取消纸币，甚至不愿定下一个截止日期，担心这会损害对仍在流通中的货币的信心。相反，它们往往会要求商业银行在收到大额纸币后予以回收，这就是加拿大在2000年所做的事。16年后，仍有约20%的1000加元纸币处于流通当中。

此外，哈佛大学的彼得·桑兹（Peter Sands）指出，只要尚有其他纸币在发行，那么废除某一种大额纸币只会产生有限的影响。他希望欧洲央行也取消200欧元和100欧元面额的纸币，而美联储会取消100美元的纸币。后者会给穿越美墨边境转移现金的毒贩带来巨大的麻烦。

瑞士央行已经明确表示并无废除大额纸币的计划，所以在可预见的未来犯罪分子至少还留有一个选择。正如路易斯所说：“无论你做什么，问题会被推到另一处。”不过，他接着说，“如今的行动会使罪犯更难运送现金，

也让当局更容易发现它们。”这并不可笑。 ■



The blockchain in finance

Hype springs eternal

Distributed ledgers are the future, but their advent will be slow

NORMALLY, it is Simon Taylor's job to persuade sceptical colleagues at Barclays that rapid technological change will disrupt the bank's business. So it comes as something of a surprise to have to dampen the excitement about the blockchain. "It's quite silly. I get ten invitations to speak at a conference every day," he says. "The technology will have real impact, but it will take time."

The blockchain is the technology underpinning bitcoin, a digital currency with a chequered history. It is an example of a "distributed ledger": in essence, a database that is maintained not by a single actor, such as a bank, but collaboratively by a number of participants. Their respective computers regularly agree on how to update the database using a "consensus mechanism", after which the modifications they have settled on are rendered unchangeable with the help of complex cryptography. Once information has been immortalised in this way, it can be used as proof of ownership. The blockchain can also serve as the underpinning for "smart contracts"—programs that automatically execute the promises embedded in a bond, for instance.

It is easy to see why bankers get excited about distributed ledgers. Instead of having to keep track of their assets in separate databases, as financial firms do now, they can share just one. Trades can be settled almost instantly, without the need for lots of intermediaries. As a result, less capital is tied up during a transaction, reducing risk. Such ledgers also make it easier to comply with anti-money-laundering and other regulations, since they provide a record of all past transactions (which is why regulators are so keen on them).

Besides, embracing the technology allows big banks to appear innovative. For the most breathless evangelists, it holds out the prospect of liberation from all the dross that has accumulated in the financial system, from incompatible IT systems to expensive intermediaries. “For many, the blockchain is the Messiah,” says Gideon Greenspan, the founder of Coin Sciences, a blockchain startup based in Israel.

Yet the path to the promised land won’t be an easy one. One stumbling block is what geeks call “scalability”: today’s distributed ledgers cannot handle huge numbers of transactions. Another is confidentiality: encryption techniques that allow distributed ledgers to work while keeping trading patterns, say, private are only now being developed.

Such technical hurdles can be overcome only with a high degree of cooperation between all involved. But this is not a given in the highly competitive world of finance. Some efforts are already under way. More than 40 banks now have a stake in R3 CEV, a startup meant to come up with shared standards. Similarly, firms including IBM and Digital Asset Holdings have started the Open Ledger Project to develop open-source blockchain software.

The Open Ledger Project may have trouble combining the bits of code its members contribute. Such problems will slow adoption, notes Tolga Oguz of McKinsey, a consultancy. Moreover, most projects are still “proofs of concept”. Only a few services have gone live. A dozen banks are using a firm called Ripple to process international payments cheaply. In August Overstock.com, an online retailer, announced a “smart-contract” platform, as did Symbiont, another startup. In January NASDAQ, a stock-exchange operator, launched Linq, a service that allows companies to issue debt and securities. It also plans to initiate a blockchain-based e-voting service for shareholders in firms listed on its exchange in Estonia.

Then there are more specialised services. Everledger uses a blockchain to protect diamonds by sticking data about a stone's attributes on it, providing proof of its identity should it be stolen. Wave, another blockchain startup, encodes documents used in global supply chains, reducing the risk of disputes and forgeries.

More applications will pop up this year and next. Prime targets will be self-contained markets with complex products, many participants and convoluted procedures. One example is syndicated loans, which can involve dozens of lenders and which can take as long as a month to negotiate. Symbiont recently teamed up with Ipreo, another fintech firm, to automate such loans using smart contracts. Another tempting target is trade finance, which still requires lots of paperwork to travel around the globe along with the goods being sold.

Widespread use of the blockchain is still five to ten years off, predicts Angus Scott of Euroclear, which settles securities transactions. What is more, he says, disruptive fintech startups are unlikely to lead the charge. In markets where the success of a technology depends on its adoption by many counterparties, as is often the case in finance, incumbents have an advantage. The Australian Securities Exchange in January set an example when it enlisted Digital Asset Holdings to develop a blockchain-based system for settling trades.

Given the attenuated timetable and daunting obstacles, there is a risk that banks will lose interest and pursue less glamorous technologies instead. BNY Mellon, an American bank, recently decided not to go ahead with a project that would have used the blockchain to simplify international payments, because it could not persuade enough banks to participate. It would have taken "a significant effort" to make it work, according to Tony Brady of BNY Mellon.

Yet it would be wrong to conclude that the blockchain is no more than a fad. It is merely moving through the same hype cycle as other next-big-things have done before it: inflated expectations are followed by disillusionment before a technology eventually finds its place. Although it will take a while for distributed ledgers to rule the world, they are an idea, to paraphrase Victor Hugo, that will be hard to resist. ■



金融业区块链技术

热捧不息

分布式分类账未来可期，但来日方长

通常，在巴克莱银行内，说服持怀疑态度的同事相信迅猛的技术变革将颠覆该银行业务的正是西蒙·泰勒（Simon Taylor）的职责。所以，令人意外的是，在区块链受到热捧之际他却泼了一盆冷水。“真的很傻。我每天会收到十份演讲邀请。”他说。“这项技术是会带来实在的冲击，但得要些时间才会发生。”

区块链是发展历程曲折的数字货币“比特币”的底层技术。它是“分布式分类账”（distributed ledger）的一种应用：实质上是一个数据库，不只由银行这样的单一操作者维护，而是由多个参与者协作完成。他们各自的计算机定期议定如何使用“共识机制”更新数据库，之后，通过复杂的加密技术执行各方同意的变更，从此不可逆转。信息以此方式一经固化，便可用于证明所有权。区块链也是“智能合同”（例如自动执行债券中所嵌入承诺的程序）的底层技术。

不难理解银行家对分布式总账的欣喜之情。金融机构目前在不同的数据库中记录资产，而采用分布式分类账技术后，各机构可共享一个数据库。交易几乎可瞬间结算，无须由诸多中间机构经手。结果是，更少资金在交易过程中被占用，降低了风险。这样的分类账也令遵守反洗钱等规定变得更容易，因为它能提供过去所有交易的记录（监管机构对其如此热衷原因就在于此）。

此外，采用该技术有利于大银行展现创新形象。在那些迫不及待要传播“福音”的先行者眼中，该技术有望清除金融系统累积的一切糟粕，摆脱互不兼容的IT系统以至收费高昂的中间商。“对许多人来说，区块链是救世主弥赛亚，”以色列一家区块链技术创业企业“钱币科学”（Coin Sciences）的创始人吉丁·格林斯潘（Gideon Greenspan）说道。

然而，通往应许之地的路途不会一帆风顺。一个障碍是极客们所谓的“可扩展性”：当今的分布式分类账无法处理大量交易。另一个障碍是保密性：支持分布式分类账运作的同时保证交易模式不变（如交易的私密性）的加密技术在目前只处于研发阶段。

这类技术障碍只有通过所有参与方高度合作才能克服。但在竞争极为激烈的金融界，这并非理所当然之事。已有机构作出努力。超过40家银行入股创业企业R3 CEV，开发共享的标准。同样地，IBM和“数字资产控股”（Digital Asset Holdings）等公司已启动“开放总分类账项目”（Open Ledger Project），研发开源区块链软件。

“开放分类账项目”在总合各成员提供的代码时可能会遇到困难。这类问题会延缓其推广，咨询公司麦肯锡的托尔加·奥古兹（Tolga Oguz）指出。此外，大多数项目仍只在“概念验证”阶段。仅有少数已启动服务。十几家银行目前使用一家名为Ripple的公司以低廉费用处理跨国支付交易。去年八月，网络零售商Overstock.com发布其“智能合同”平台，另一家创业公司Symbiont也推出了同类平台。今年一月，股票交易所运营商纳斯达克推出Linq平台，方便企业发行债券及证券。纳斯达克还计划在爱沙尼亚推出基于区块链技术的电子投票系统，为在纳斯达克上市的当地公司的股东服务。

也有更专业化的服务。Everledger运用区块链技术为钻石附上品质数据，万一钻石被盗，可以提供鉴定证明加以保护。另一家区块链创业公司Wave则对全球供应链中使用的文档进行加密，减少纠纷及伪造风险。

更多的应用将会在今年和明年出现。主要目标将是产品复杂、参与者众多、程序繁复的自封闭市场。银团贷款便是其中一例，这一般涉及几十个借款人且谈判需时长达数月。Symbiont近期与另一家金融科技公司Ipreo联手使用智能合同自动化处理贷款等业务。另一诱人目标是贸易融资，目前货物在全球运送过程中仍涉及大量文书工作。

证券交易结算平台“欧洲结算系统”（Euroclear）的安格斯·斯科特

(Angus Scott) 预计，区块链要得到广泛使用，还需要五到十年的时间。而且，他表示，颠覆性的金融科技创业公司不太可能是冲锋主力。在金融市场，一种技术往往要得到众多交易对手采用才能获得成功，所以，既有企业占有优势。澳洲证券交易所就是一例。今年一月，它联合数字资产控股公司开发基于区块链的交易结算系统。

由于区块链技术的广泛应用还需时日，而且障碍重重，银行有可能会对其丧失兴趣，转投较普通的技术。最近，美国纽约梅隆银行 (BNY Mellon) 因无法说服足够的银行参与，而决定不推进一个以区块链简化国际支付业务的项目。该银行的托尼·布雷迪 (Tony Brady) 表示，需要“巨大努力”才能推进这一项目。

然而，不能就此判定区块链仅仅是一时狂热。跟以往其他“明日之星”一样，区块链只是经历着同样的炒作周期：期望过高，继而失望，最终某一技术成熟立足。虽然分布式分类账统治世界还需要一些时间，但这一理念，套用大文豪雨果的话，将是难以抗拒的。■



Measuring inflation

How much is that doggy?

Big data provide new ways to gauge price rises

INFLATION is a simple concept, but price rises are surprisingly hard to measure. First, statisticians must work out what stuff people buy, and in what proportions (the “basket” of goods). Then they must track the prices of those goods over time. Finally they must decide how to account for new products, changing tastes and the fact that if the price of, say, apples rises, some people will buy another fruit instead rather than pay more.

Big data could make all of this easier. At the moment, calculating America’s consumer-price index (CPI) involves sending people into shops to note down prices. The basket is based on a survey of consumers which is updated only every three years or so. This looks increasingly cumbersome in a world where every online purchase is logged, somewhere, in a database. In theory online baskets and prices, at least, could be tracked digitally.

Adobe, a technology firm, is trying to do just that. The firm collects anonymised sales data from websites that use its software. The amount of data available is vast: according to the firm, it includes three-quarters of online spending at America’s top 500 retailers. It is using this ocean of information to compile a “digital price index” (DPI) to rival official measures of inflation. Two economists, Pete Klenow of Stanford University and Austan Goolsbee of the University of Chicago, are helping the firm to crunch the numbers.

The DPI has several advantages over the conventional approach. It tracks 1.4m goods, compared with the CPI’s 80,000. It is based on actual purchases rather than advertised prices, increasing its accuracy. And the

volume of data allows Messrs Klenow and Goolsbee to use fancier statistical methods to account for people changing what they buy as prices move.

The new index completely misses changes in offline prices and spending on things like petrol and rent. It will not replace the CPI any time soon. It does suggest, however, that official statistics may themselves be missing big price movements, especially for consumer technology. The researchers found that the price of computers fell by 13.1% in the year to January, almost double the 7.1% fall recorded in the CPI. Televisions fell more in price than the CPI reports, too. The speed of innovation in technology might account for the difference. The researchers found that fully 80% of technology spending is on new products, which the more nimble DPI can incorporate quickly.

If this is a widespread phenomenon, and inflation is lower than officially recorded, that has implications for central bankers, borrowers, savers and anyone who strikes long-term contracts. It also means that GDP might be understated, says Mr Klenow. If overall spending is recorded accurately but inflation is exaggerated, output must be higher than thought.

Official statisticians are improving their methods. The CPI includes some prices that are collected automatically by “scraping” websites (something Britain’s statisticians are also experimenting with). But if their take-up of big data is sluggish, official statistics could eventually face disruptive private-sector competition. ■



衡量通胀

小狗多少钱？

大数据为衡量物价涨幅提供新方法

通货膨胀是个简单的概念，但要衡量物价升幅却艰难得让人咋舌。首先，统计人员必须了解人们购买的是什么，分别在“篮子”商品中占多少比例，然后必须追踪这些商品在一段时间内的价格变化。最后，他们要解释一系列现象，包括新产品的出现、人们喜好的变化以及假如某商品价格上升，比如说苹果，为什么一些人会改买其他水果而不愿意付更高的价钱。

大数据可以令这一切变得更轻松。目前，美国消费者价格指数（CPI）的计算需要派人到店铺内记录价格。篮子内商品根据约三年一次的消费者调查而选定。这种方式显得越来越繁琐不便，毕竟现在每次在线购物都在某个数据库里有记录。理论上，至少在线交易的商品及其价格是可以数字化追踪的。

科技公司Adobe正在尝试做这项工作。该公司从使用其软件的网站上收集经过匿名处理的销售数据。可供收集的数据数量庞大：Adobe表示其中包括美国500强零售商四分之三的网上销售。公司正利用这些海量信息编制一份“数字物价指数”（DPI），与官方的通胀衡量指标分庭抗礼。两位经济学家，斯坦福大学的皮特·克列诺（Pete Klenow）和芝加哥大学的奥斯坦·古尔斯比（Austan Goolsbee），正帮助Adobe处理这些数据。

DPI相比传统方法有几个优点。相较CPI只包含八万种商品，DPI追踪140万种商品的价格。DPI基于实际购买价格而非广告标价，因而提高了指数的精确性。而庞大的数据量使克列诺和古尔斯比可以运用更先进的统计方法来解释人们因价格变动而改变购买选择的行为。

新指数完全忽略线下商品价格及汽油、租金等支出的变化，短期内不可能取代CPI的地位。但DPI确实显示官方统计数据本身可能忽略了大的价格变动，尤其是在消费科技产品方面。研究人员发现，截至今年一月，电脑价

格的年跌幅为13.1%，几乎是CPI所显示7.1%的两倍。电视机价格跌幅也比CPI所显示的要大。科技创新的速度也许可以解释这种差异。研究人员发现，科技产品开支中足足有80%是用于购置新产品，更灵活的DPI能够迅速整合此类数据。

假如这是普遍现象，而且通胀低于官方数据所示，这对央行行长、借款人、储户及签订长期合同的人士都意味深长。这也表明GDP可能被低估，克列诺说。如果总支出记录无误，但通胀被夸大，那么实际产出肯定比认为的要高。

官方统计人员正在改善其方法。CPI已包含通过在网站自动“刮取”收集到的部分价格，英国统计人员也正试验此法。但如果他们融合大数据的行动步履迟缓，官方数据可能最终面临私营部门颠覆性的竞争。■



Voice-powered medical devices

Good vibrations

A generator that runs off the vocal cords may improve the efficacy of implants

IMPLANTED devices, such as heart pacemakers, are a valuable part of modern medicine's armamentarium. Their use, however, is limited by the need to renew their batteries—and this is a particular problem for those, such as cochlear implants (which improve hearing), that are inside the wearer's head.

For obvious reasons, surgeons do not like opening heads up unless it is strictly necessary. Sometimes, therefore, the battery packs that power head implants are put in the wearer's chest. But this means running a wire up through the patient's neck, from the one to the other, which is scarcely satisfactory either. A way to power such implants without replacing their batteries at all would thus be welcome. And Hyuck Choo of the California Institute of Technology and his colleagues think they have one. They plan to scavenge the necessary energy from the vibrations of the vocal cords that occur when someone is talking.

Dr Choo's power plants are small sheets of lead zirconate titanate, a substance that is piezoelectric—meaning it generates electricity when it vibrates. He knew from past work that sheets of the size he chose (just under 1cm²) resonate at around 690Hz. This is close to the F in the octave above middle C, and thus well above the normal range of the human voice. Using larger sheets would lower the resonant frequency, just as long organ pipes produce lower notes than short ones. Larger sheets, though, would be less deployable inside the body. So, instead, he sought to lower a sheet's resonant frequency without increasing its area by carving a sinusoidal shape out of it (see picture). Such a shape must inevitably be longer than its parent rectangle's longest sides, albeit that its length is now zigzagged. A

sinusoidal sheet should thus have a lower resonant frequency than its rectangular parent.

It worked. When Dr Choo and his colleagues tested the carved sheets by exposing them to a range of frequencies and monitoring the amount of electricity generated, they found that the voltage spiked at between 100Hz and 120Hz (approximately the dominant frequencies of adult male voices), and also between 200Hz and 250Hz (the female voice's dominant frequencies). And, although the amount of power produced is not huge, it seems adequate for the task proposed.

As Dr Choo reported on January 26th, to the International Conference on Micro Electro Mechanical Systems in Shanghai, he and his team were able to harvest a tenth of a milliwatt per square centimetre of lead zirconate titanate from the voice of a man talking at 70 decibels, which is normal speaking volume, and three-tenths from someone shouting at 100 decibels. Implants usually require a tenth of a milliwatt or less to function, so this prototype's performance suggests a practical device might be within reach—especially as the vibrations produced by the voice travel efficiently up through the skull, meaning the generator could be integrated into an implant, rather than having to be separate from it.

Since most people are not chatterboxes, talking all the time, a practical system will still need batteries to build up charge so that the surplus can be used when needed. Intriguingly, this might even be possible when someone is asleep. Part of the sound of snoring is in the experimental device's sweet spot. That may not be much consolation for the partners of snorers. But at least their bedmates will no longer be able to turn a deaf ear to their complaints. ■



声音驱动的医疗设备

合奏一曲

一台有赖于声带的发电机或将改善植入装置的效用

像心脏起搏器这类植入装置是现代医学设备的宝贵组成，但它们的使用却因为需要更换电池而受限。对于那些被植入患者脑颅内的装置比如人工耳蜗（用以改善听力），这尤其是个难题。

除非逼不得已，否则外科医生不会想要打开患者的头颅，原因显而易见。因此，为脑内装置供电的电池组有时被放进患者的胸腔内，但这意味着要让一根电线从胸腔向上穿过颈部到达脑颅，这同样难以令人满意。所以，如果能找到方法，完全不需要更换电池就能驱动这些装置，将会大受欢迎。加州理工学院的秋赫（Hyuck Choo，音译）及其同事认为他们已经找到了一个办法。他们想从人们说话时声带的振动中寻获所需的能量。

秋博士的发电厂是小块的锆钛酸铅薄片。锆钛酸铅具有压电性，即它在震动时会发电。秋博士从过去的研究中已经获知，他选择的薄片尺寸（略小于1平方厘米）会在690赫兹的声波频率下发生共振。这个频率在八度音阶中高于中央C而接近F，因而远高于人声的正常区间。使用更大面积的薄片会降低共振频率，正如风琴中的长管发出的声音要比短管更低，但面积更大的薄片更难以在人体内部署。因此，他想要降低薄片的共振频率却不增加面积，方法是将其雕刻成蛇形（见图）。这个形状的长度自然大于原本的长方形最长的边，尽管如今薄片的边长变得曲曲折折。这一蛇形薄片理应比其长方形母体具有更低的共振频率。

事实果真如此。秋博士和同事们把雕刻薄片放到各种不同的音频中监测其发电量，结果发现当音频在100到120赫兹之间（大概就是成年男性声音的主要频率）以及200到250赫兹之间（女性声音的主要频率）时，电压达到峰值。虽然发电量算不上大，但看来已足以应付它要完成的任务。

根据秋博士于1月26日在上海微电子机械系统国际会议上发表的报告，他

和他的团队能从70分贝（正常的声音强度）的男声中获得每平方厘米锆钛酸铅0.1毫瓦的电力，从100分贝的叫喊声中获得0.3毫瓦。植入装置通常需要0.1毫瓦或更少的电量来驱动，因而从这个原型设备的表现来看，一个可被实际应用的设备或许已近在咫尺，尤其是声音产生的震动能有效穿越头颅，也就是说，现在发电器可以被整合到植入装置之中而无需分开放置。

大部分人都不是一直絮絮叨叨的话匣子，因而一个实用的系统仍将需要用电池蓄电，这样就可以在有需要使用盈余的电。有趣的是，发电甚至有可能在人们熟睡时进行。人的鼾声中有一部分音频正巧落在这套实验设备的有效频率区间内。对于打鼾者的伴侣而言，这可能不是什么多大的安慰，不过，至少他们的身边人无法再对他们的抱怨充耳不闻了。 ■



Tesla's mass-market ambitions

On a charge

As Tesla becomes more like a regular carmaker, it faces a bumpier ride

THE eye-catching falcon-wing doors that adorn Tesla's Model X (see picture) set it apart from other big and expensive SUVs. But like the firm's Model S, a stylish and speedy saloon, the biggest difference lies under the bodywork: it is powered by a battery. Tesla has accelerated into the automotive fast-lane by making electric cars that appeal to rich folk keen to burnish their credentials as environmentally aware techies. But at the end of March it is launching the Model 3, a cheaper motor aimed at the upper end of the mass market. It will be a far harder sell.

Tesla has hitherto thrived in a niche. Other carmakers crammed bulky and expensive batteries into petite "city" cars. Tesla put a bigger power-pack into large and expensive ones (prices start at \$70,000), more readily absorbing the cost of the battery. This also gives the cars a decent range of more than 250 miles (400km) between charges, and lightning acceleration. In 2015, after just over ten years in business, Tesla's sales surpassed 50,000 cars. By 2020 it hopes to sell 500,000 a year, mostly Model 3s. These will cost as little as \$35,000 (before the generous subsidies many governments dish out). But it is entering a part of the market where competition is intense and profit margins slimmer.

Its achievement so far is, nonetheless, remarkable. The roadside is littered with the wrecks of new entrants unable to take on the established carmakers, from Tucker in the 1940s to DeLorean in the 1970s and latterly Fisker's failed bid to sell upmarket petrol-electric hybrids. Tesla's classy design and nifty technology—a touchscreen instead of an instrument panel, and autonomous-driving capabilities—have ensured that only the Mercedes S-Class, which Daimler-Benz has spent decades refining, outsells

it among large luxury saloons.

Tesla has shown that the barriers to entry in the car industry are far lower than widely assumed. The company bought a factory in Fremont, California, from GM and Toyota for just \$42m, after the American firm pulled out of their joint venture and filed for bankruptcy in the wake of the financial crisis. Tesla also bought equipment to kit it out cheaply, from other carmakers struggling to cut their capacity.

It is run frugally. Sanford C. Bernstein, a research firm, reckons Tesla's total capital spending and outlay on research and development so far is under \$4 billion—one-seventh of what Volkswagen spends in a year. And in Elon Musk, its ebullient boss, it has a figurehead whose relentless promotion has quickly established Tesla as a luxury brand in an industry where convention suggests this should take 25 years.

Tesla has also rewritten the economics of making electric cars. It tackled high costs by stringing together hundreds of small, mass-produced laptop batteries. Tesla claims that its power-packs cost half what big carmakers pay their suppliers for custom-designed large-format batteries, and that its Gigafactory, a huge battery plant close to completion in the Nevada desert, will cut costs by another 30%.

It will need all its superior performance to stay ahead. Tesla currently has no direct competitors. Yet Apple looks set to launch a luxury electric car. Battery costs for other carmakers are also falling fast. In a couple of years Audi, Jaguar and other premium-car makers plan electric vehicles on a par with Tesla's two priciest cars.

Launching the Model 3 will put Tesla's business model under far more strain. Other carmakers look on its extreme vertical integration with bemusement. If Mr Musk fancies himself as the next Henry Ford, his

factory certainly resembles the Model T's production line, where iron ore and rubber went in one end and a car chugged out the other. Other carmakers are now largely brand managers, assemblers and systems integrators, ensuring that all the parts they buy from suppliers work in harmony when bolted and welded together. This serves to spread risk and push costs to suppliers. Tesla makes most of its parts in-house. Mr Musk regards this as a competitive advantage. Firms "build value by doing hard things," he reckons. But tooling, forging and design suck up capital.

The firm is far more integrated even than carmakers of yesteryear. It has sought to attract buyers and tackle "range anxiety" by building its own worldwide network of more than 3,500 roadside "superchargers". These can put an 80% charge on the battery in 40 minutes, and Tesla drivers can charge up without charge. It is a bit like Ford opening its own filling stations and giving away the petrol.

Whereas other carmakers sell their vehicles through networks of independent dealers, Tesla sells directly to the public, through its website and in showrooms located in shopping centres. This means it keeps the retail markup, but it is unclear how much, if at all, this offsets the cost of maintaining the showrooms. And dealer networks are useful in other ways: they assume a lot of risk by paying for cars when they take delivery of them, rather than when they sell them.

In all, Tesla's way of working requires lots of cash. Barclays, a bank, thinks the firm will burn through \$11 billion over the next five years, and will not generate significant profits until then. Investors have willingly stumped up so far but many analysts question whether Tesla is worth its current market capitalisation of \$29 billion, more than half the value of GM, which makes nearly 10m cars a year. The worry is that entering the mass market will change the way Tesla makes cars, the sort of customers it chases and the competitors it faces.

Tesla thinks of itself as a technology company but the Model 3 will make it more of a large-scale manufacturer. It is unclear how well suited it will be to the task of designing and churning out cars at far higher rates than now. Mr Musk admitted that the design of the Model X was overly ambitious, especially the fancy doors, delaying its launch by many months.

Tesla will henceforth have to attract customers who want to buy a car not an engine, as Berenberg, another bank, puts it. The wealthy customers it has now often own more than one car, and can afford the luxury of charging facilities at home. They use the Tesla to salve their consciences with a “trip to church on Sunday”, as the boss of a rival carmaker jokes. Buyers of its cheaper model may rely on it as their sole vehicle, and lack space for home charging, making its range and the availability of public chargers more important.

They may also care less about image and the environment, and more about cost and performance, putting the Model 3 in competition with fossil-fuel cars such as the BMW 3 Series and Mercedes C-Class, not just other electric cars. Even in the market for electrics, Tesla will no longer have the road to itself. Other makers are constantly boosting their battery cars’ range. A new version of the BMW i3 will go for 120 miles before plugging in. GM’s Chevrolet Bolt, which hits forecourts later this year, may cost a bit more than a Model 3 but boast a similar, 200-mile range.

Analysts reckon Tesla will at best have ramped up its production to 320,000 cars, rather than its target of 500,000, in 2020. But perhaps that doesn’t matter. Mr Musk insists he is more interested in disrupting the car industry, and advancing the switch to electric cars, than in playing by his rivals’ numbers game. Among the Silicon Valley neighbours Tesla likes to compare itself to, “full stack” vertical integration is all the rage, and the biggest tech firms are less interested in making things than they are in creating software “platforms” on top of which a variety of services can be

built.

So, Tesla's ultimate aim may be more to create a platform for slick electric, autonomous cars that can also be built by others, in the way that various smartphone brands run on Google's Android operating system. In that case, how well the Model 3 sells may not be the main determinant of the firm's value. ■



特斯拉的大众市场雄心

充电向前

特斯拉越来越像传统汽车厂商，其前路渐现坎坷

特斯拉Model X那炫目的鹰翼式车门（见图片）使其从众多大型豪华SUV中脱颖而出。然而与该公司的时尚轿跑Model S一样，特斯拉汽车最与众不同之处在于车身之下：由电池驱动。通过瞄准追求“环保科技达人”之名的富裕阶层，生产吸引他们的电动汽车，特斯拉已经加速驶入汽车制造业的快车道。但三月底，特斯拉将推出针对大众市场中上层消费者的廉价车型Model 3。这一车型的销售将艰难得多。

目前为止，特斯拉在小众市场上蓬勃发展。其他汽车制造商把笨重昂贵的电池塞进身型娇小的城市小型车里，而特斯拉则把更大的电池包安装在昂贵的大型汽车中（七万美元起价）。这样更能消化电池的成本，同时可为电动车提供不俗的续航能力，一次充电能跑400公里，而且加速迅猛。成立十多年的特斯拉在2015年销售了超过五万辆汽车。公司希望到2020年销量能达到50万台，以Model 3车型为主。其价格最低只需35000美元（未计算各国政府给予的慷慨补贴）。但特斯拉迈入的是竞争激烈且利润更薄的市场领域。

尽管如此，特斯拉发展至今成绩斐然。纵观过往挑战主流汽车厂商的新进企业，从上世纪40年代的塔克（Tucker）到70年代的德罗宁（DeLorean）以及后来销售高端油电混合动力汽车却无果而终的菲斯克（Fisker），失败者众多，哀鸿遍地。特斯拉的优雅设计及炫目技术（运用触摸屏而非仪表盘，并配备自动驾驶功能）确保了在大型豪华轿车中，其销量仅次于奔驰S级轿车，而后者是戴勒姆-奔驰公司历经数十年努力打造的精品。

特斯拉的例子表明，汽车行业的准入门槛远低于一般所想。该公司以仅仅4200万美元从通用汽车和丰田手上购入位于加州费利蒙市（Fremont）的一家工厂（当时通用汽车受金融危机影响，从该合资工厂撤资并申请破产）。特斯拉还从其他挣扎减产的汽车制造商手上低价购入设备来装备厂

房。

公司经营节俭。盛博研究公司（Sanford C. Bernstein）估计，迄今为止，特斯拉的总资本支出及研发经费不到40亿美元，是大众汽车每年同类开支的七分之一。而且公司由热情洋溢的伊隆·马斯克（Elon Musk）领导，其不懈推广迅速确立了特斯拉作为豪华品牌的地位，而这在汽车行业通常需要25年。

特斯拉也重写了电动车制造业的经济模式。通过把数百个小体积的量产笔记本电池捆绑组成电池包，特斯拉解决了高成本问题。公司称其电池包的成本仅为大型汽车制造商找供应商订制的大型电池的一半，而且特斯拉在内华达沙漠上兴建的大型电池厂“超级电池工厂”（Gigafactory）即将完工，投产后将把电池成本再减少30%。

未来，特斯拉需要一切杰出表现来维持领先地位。目前该公司仍无直接的竞争对手。但苹果公司似乎将推出一款豪华电动汽车。其他制造商的电池成本也正迅速下降。几年内，奥迪、捷豹等高端汽车制造商纷纷计划推出媲美特斯拉两大最贵车型的电动车。

推出Model 3车型将令特斯拉的业务模式经受更大的考验。其他厂商对其极度垂直的整合感到困惑。假如马斯克自视为下一个福特，其工厂肯定会类似T型车的生产线，一端投入铁矿石和橡胶，另一端产出一辆汽车。其他汽车厂商目前主要在做品牌管理、装配、系统集成，确保从供应商购入的零部件在组装焊接成型后能协调运作。这利于向供应商分散风险及成本。特斯拉则是自己制造大部分零件。马斯克视之为自己的竞争优势。他认为，企业“通过做艰难的事情来创造价值”。但模具、锻造、设计都很耗费资本。

特斯拉的整合程度甚至比昔日的汽车制造商更高。该公司已尝试在各地打造3500个路边“超级充电站”，形成自己的全球网络，以此吸引买家并解决“里程焦虑”问题。这些充电站可在40分钟内给电池充至80%的电量，而且特斯拉车主可以免费使用这些充电站。有点像福特自设加油站提供免费加

油服务。

其他汽车厂商通过独立经销商网络销售汽车，特斯拉则通过其网站及购物中心内的展厅向公众直销。这意味着公司得以留存零售利润，但尚不清楚销售是否确有盈利以及可以抵消多少展厅的维护成本。而且经销商网络还有其他用处：经销商从厂商提车时便支付车款，并不是等到卖出车辆后，从而承担了许多风险。

总之，特斯拉的经营模式需要大量资金。巴克莱银行认为在未来五年该公司将烧掉110亿美元，而且在那之前不会获得很多利润。至今为止，投资者都心甘情愿向其中砸钱，不过许多分析师质疑特斯拉现在290亿美元的市值是否名副其实，毕竟那是年产汽车近千万辆的通用汽车市值的一半还多。令人忧虑的是，步入大众市场将改变特斯拉的生产模式、目标客户群以及面对的竞争对手。

特斯拉自认为是科技公司，但Model 3会让它变得更像一家大规模制造商。特斯拉在多大程度上能以远高于目前的速度设计并大量生产汽车，还是个未知数。马斯克承认，Model X的设计野心过大，尤其是那炫目的车门，致使其耽误数月才得以推出市场。

正如贝伦贝格银行（Berenberg）指出的，特斯拉今后要吸引的是那些为了汽车本身而非引擎而购车的顾客。它目前拥有的富裕顾客往往有不止一台汽车，而且能豪气地在家安装充电设备。一位对手汽车厂商的老板开玩笑说，他们驾驶特斯拉“在周日到教堂去”，以减轻负疚感。但较廉价的特斯拉车型买家也许就只有这一台汽车，家里也没有空间安置充电设备，这使续航里程及公用充电站显得更为重要。

他们也可能更关注成本及性能而非形象和环保，因此特斯拉Model 3的竞争对手还有宝马3系和奔驰C级等化石燃料汽车，而不仅是其他的电动车。即使在电动车领域，特斯拉也不再独享市场。其他制造商正在不断提升自己电动车的续航里程。新版的宝马i3一次充电能行驶120英里。通用的雪佛兰Bolt将在今年晚些时候推出，虽然价格可能比Model 3稍高，但宣称同样

拥有200英里的续航里程。

分析师认为，到2020年，特斯拉最多只能把年产量提升至32万台，而非其确定的50万台目标。但也许那并不重要。马斯克坚称，自己更在意要打破汽车产业的旧秩序，推动人们改用电动车，而非只顾与对手你追我赶玩数字游戏。特斯拉喜欢自比其硅谷邻居，而这些硅谷企业之间正大兴“全方位”垂直整合的风潮，大型科技企业不太热衷制造东西，而更投入于创造软件“平台”，并在此之上建立各类服务。

所以，特斯拉的终极目标也许更专注在创建平台，为时尚的电动自动驾驶汽车提供服务，包括其他厂商生产的汽车，就像谷歌提供安卓系统供各品牌智能手机运行一样。如此一来，Model 3的销量也许并非特斯拉公司价值的主要决定因素。■



Toshiba and Sharp

Coming clean?

A reckoning looms for two troubled corporate giants

FEW tasks are more urgent for Japan than the clean-up of the stricken Fukushima Dai-ichi nuclear plant. Extracting spent fuel-rods from its toxic reactor buildings calls for a new generation of remote-controlled robots. One gadget broke down last spring after just a few hours' operating amid intense radiation. In January Toshiba, a conglomerate ranging from semiconductors to nuclear engineering, unveiled a scorpion-shaped robot equipped with multiple live-feed cameras that will go into action at the plant next year.

That is a reminder of how important the company remains at home, where it is a pillar of the engineering establishment. But its financial plight has deepened following an accounting scandal that began early last year and that obliged Toshiba to restate its profits to the tune of ¥152 billion (\$1.3 billion). An investigation ordered by the firm concluded that, under the guidance of Atsutoshi Nishida, its boss from 2005 to 2009, employees began doctoring losses into paper profits and continued doing so under two subsequent bosses.

Its crisis deepened in December, when Toshiba forecast a ¥500 billion loss for the year to March, due to ill-performing businesses and restructuring costs. Its shares promptly fell by one-fifth and Moody's, a credit-rating agency, downgraded its debt to junk. Its cash flow has collapsed. Analysts worry that its equity could be wiped out if it is obliged to write down goodwill resulting from its acquisition in 2006 of Westinghouse Electric Company, an American nuclear-industry supplier.

Investors are watching to see if the authorities' handling of Toshiba's fall

from grace is consistent with Japan's of-late more shareholder-friendly climate. Last year Shinzo Abe, the prime minister, brought in a corporate-governance code which mandates firms to listen to outside board directors and requires hitherto supine institutional investors to keep a close eye on firms they invest in. In January the overseer of Mr Abe's reforms, Akira Amari, the economy minister, resigned over bribery allegations, denying any wrongdoing.

The government's professed zeal for corporate reform ought to mean that, in dealing with Toshiba, it departs from old-style industrial policies, says Hidemi Moue of Japan Industrial Partners, a private-equity firm which hopes to snap up some of the stricken firm's businesses. But it will be hard for the Ministry of Economy, Trade and Industry to resist pressure to lend a helping hand to the group and its 200,000 or so employees. Toshiba was allowed to miss several financial-reporting deadlines and remain listed last year as its accounts were being investigated (though its shares remain "on alert", which could lead to delisting). Lesser firms would surely have faced tougher sanctions.

In parallel, Mr Abe's bid to make Japan more open to foreign investment is being tested by an offer from Foxconn, the Taiwanese assembler of Apple's iPhones, for Sharp, a once-great but now near-bankrupt electronics firm. It emerged that Foxconn had bid more than \$5 billion for Sharp (though some details, including whether the offer includes the firm's vast debts, have yet to be revealed).

Shareholder advocates fear that, under official pressure, Sharp's two Japanese creditor banks will spurn Foxconn and sell the firm to a government-backed fund, the Innovation Network Corporation of Japan (INCJ), for a lower price. One reason for this would be bureaucrats' fears that Sharp's liquid-crystal display (LCD) know-how could benefit foreign rivals.

After its scandal, Toshiba urgently needs to shore up its balance-sheet ahead of bank loans coming due. It must sell some businesses, from perennially loss-making ones, like the manufacture of televisions, to jewels such as its medical-equipment division. Some of those businesses may attract foreign bids. But Toshiba may also turn to the INCJ, which may buy its electrical-appliances operations, then perhaps seek to meld them with Sharp's white-goods businesses and those of Hitachi, another conglomerate that has revived itself through disposals.

The INCJ's goal is to consolidate industries that have too many competitors and little profit to go round (five Japanese companies, for example, make fridges). Three years ago the fund cobbled together Japan Display out of the small and mid-size LCD-panel divisions of Sony, Toshiba and Hitachi. It is now thriving as a supplier to Apple. This suggests that the INCJ could succeed in overhauling other industries, says Atul Goyal of Jefferies, a stockbroker.

Even if the INCJ does a good job in rationalising the troubled businesses of Toshiba and Sharp, shareholders may lose out if this means turning down higher offers for them. And some serious worries about Toshiba's scandal would linger. The firm already obeyed, on paper, the new governance code's requirements on outside board directors, which suggests that those at other firms may prove just as toothless.

Toshiba's auditor, Ernst & Young ShinNihon, has been fined and suspended from taking new audits for three months, but many Japanese businesspeople agree with Toshiba's description of its profit-padding as merely "inappropriate" accounting, since executives were not out for personal gain. It was fraud, insists Jamie Allen of the Asian Corporate Governance Association in Hong Kong; and those involved should face prosecution, as they would in any other developed market. It is unclear whether they will. ■



东芝和夏普

渐渐清晰？

对两大麻烦缠身的企业巨头而言，最终审判隐约可见

对日本来说，极少有比清理严重损毁的福岛第一核电站更紧迫的任务了。要从有毒的反应堆建筑中取出废燃料棒需要新一代遥控机器人。去年春天，一台机器人在强辐射环境中仅工作了几个小时就发生了故障。今年1月，业务覆盖从半导体到核能工程的企业集团东芝发布了一款配有多个实时摄像头的蝎形机器人，明年将在核电站投入使用。

这提醒众人东芝在日本国内仍然举足轻重，是工程机械的业界支柱。但是发端于去年年初的会计丑闻进一步加剧了东芝的财务困境，迫使东芝重新公布利润，下调金额达1520亿日元（13亿美元）。公司下令开展的调查得出结论称，2005年至2009年间，在老板西田厚聪的授意下，员工们开始将亏损伪造成账面利润，这种做法一直延续到之后两位老板的任期内。

去年12月，当东芝预计截至2016年3月的财年内，因经营不善以及重组成本，亏损将达5000亿日元时，危机进一步恶化。公司股价暴跌五分之一，信用评级机构穆迪将其债务评级降至垃圾级。东芝的现金流已经崩溃。分析师担心，如果东芝不得不减记自2006年收购美国核工业供应商西屋电气公司（Westinghouse Electric Company）而获得的商誉价值，其股权将变得一文不值。

投资者正拭目以待，看有关部门对东芝跌落神坛的处理是否和日本近来对股东更为有利的氛围一致。去年日本首相安倍晋三引入一项公司治理的准则，要求公司听取外部董事的意见，并要求素来懒散的机构投资者密切关注他们投资的公司。1月，安倍改革的监督人、日本财政大臣甘利明（Akira Amari）因受贿指控而辞职，他否认有任何不当行为。

私募股权公司日本产业投资基金（Japan Industrial Partners）的马上英实认为，政府宣称的对企业改革的热情理当意味着在处理东芝的问题上，日

本正在脱离旧式的产业政策。日本产业投资基金希望趁机从身受重创的东芝手中抢购部分业务。但日本经济贸易产业省很难抵抗压力，而不得不向东芝集团及其约20万名员工伸出援手。去年因接受账目调查，东芝数次获准逾越财务报告的最后期限，并维持上市（尽管其股票仍处于“特别注意”一栏，可能导致退市）。换做小公司，必定已受到更加严厉的制裁。

与此同时，安倍要让日本对国外投资更加开放的努力正经受来自富士康收购夏普的考验。据称，为苹果组装iPhone的台湾公司富士康出价50多亿美元收购夏普这一曾经辉煌、如今却濒临破产的电子公司（尽管有些细节尚未披露，包括此报价是否包括公司庞大的债务）。

拥护股东利益的人担心，迫于政府压力，夏普的两家日本债权银行会拒绝富士康，转而以较低的价格将公司卖给政府支持的基金日本产业革新机构（INCJ）。原因之一可能是日本官员担心夏普的液晶显示屏（LCD）技术会让国外竞争对手获益。

丑闻之后，东芝迫切需要赶在银行贷款到期之前提振公司的资产负债表。东芝必须出售部分业务，既有像电视机制造这类常年亏损的业务，也有公司的掌上明珠如医疗设备部门。其中某些业务可能吸引外资出价。不过，东芝公司也可能转投INCJ，后者可能购买东芝的家电业务，之后或将寻求与夏普的白色家电业务以及日立的家电业务融合。日立是另一企业集团，已通过抛售资产恢复元气。

INCJ的目标是整合竞争者过多、利润微薄难以为继的产业（例如，五家生产冰箱的日本公司）。三年前，该基金把索尼、东芝和日立的中小尺寸液晶面板部门拼凑起来，成立了日本显示器公司（Japan Display）。目前该公司作为苹果的供应商正在蓬勃发展。股票经纪公司Jefferies的阿图尔·戈亚尔（Atul Goyal）认为，这表明INCJ能够成功地全面修复其他产业。

即便INCJ很好地理顺了东芝和夏普麻烦缠身的业务，但如果这意味着要拒绝更高的报价，股东可能会遭受损失。同时关于东芝财务丑闻的严重担忧也会挥之不去。东芝在名义上已经遵照执行了新治理准则关于外部董事的

规定，这表明此类规定在其他公司可能最终同样毫无效力。

东芝公司的审计部门新日本有限责任检查法人（Ernst & Young ShinNihon，安永分公司）已经被处以罚款，并且三个月内禁止接受新的审计业务，但鉴于高管们并未从中牟取私利，许多日本商界人士赞同东芝对于其虚报利润做法的描述，即仅仅是“不恰当”的会计行为。而香港的亚洲公司治理协会（Asian Corporate Governance Association）的杰米·艾伦（Jamie Allen）坚持认为这是一种欺诈行为，而涉事人员应当被起诉，正如他们在其他任何成熟市场本会面临的那样。然而尚不清楚他们是否真会如此。 ■



Vietnamese companies

Gold stars

Foreign firms and investors are cheerful once more about Vietnam's prospects

WHEN he left a job in banking to join a “company that sells fish sauce” in Vietnam, Michael Nguyen’s parents wondered if he was throwing away a lucrative career. Now a big cheese at Masan Group, one of the country’s largest listed companies, the Vietnamese-American seems happy with his gamble. Masan’s brands meet a big chunk of the local demand for pungent sauces, noodles and freeze-dried coffee—and in December the firm accepted a \$1.1 billion investment from Singha, a Thai brewer, to help finance an assault on Vietnam’s frothy beer market.

Singha’s purchase of a 25% stake in Masan’s consumer-goods arm and 33% of its brewery capped a busy 12 months for mergers and acquisitions in the country. Their combined value in 2015 is reckoned to have been around \$10 billion (see chart). Overall foreign direct investment into Vietnam began to pick up, after a slump following the financial crisis. More big deals are “percolating”, reckons Fred Burke of Baker & McKenzie, a law firm. This month All Nippon Airways of Japan said it would pay \$108m for an 8.8% stake in Vietnam Airlines. The government may soon sell a \$1 billion chunk of Sabeco, the country’s biggest brewer, and a stake of around \$2.5 billion in Vinamilk, a dairy firm.

All this reflects renewed optimism for Vietnam, a country of 93m people with a median age of around 30 and an economy expanding by nearly 7% a year. Its consumer sector is particularly appealing. Vinamilk’s revenues have been growing more than 20% annually; per-capita beer consumption is the highest in Asia after China and Japan, and rising. Masan’s latest wheeze is animal feed, as it hopes to gain from the rising consumption of fresh meat.

In part the country has benefited from its neighbours' weaknesses. Despite lower productivity and limited local supply chains, Vietnam's manufacturers are gradually taking business from China, where wages are higher. Elsewhere in the region, Indonesia is shrinking back into protectionism; political scandals are unsettling Malaysia. And Thailand's companies are keen on tie-ups in Vietnam, to flee low growth and irascible military rule at home.

But foreign enthusiasm has also been greatly boosted by a barrage of trade agreements which the government negotiated in 2015—not just the American-led Trans-Pacific Partnership but also a hodgepodge of treaties with places including Europe, South Korea and Japan. Meanwhile a new law on investment and enterprise, passed in 2014 but only implemented last summer, has cut red tape. Vietnam ranks mid-table in the World Bank's ease-of-doing-business index, but is inching upwards. Foreigners often find it easier to operate in Vietnam than in China, and its recent reforms compare favourably with those elsewhere in South-East Asia, says Alberto Vettoretti of Dezan Shira, a consulting firm.

There are plenty of frustrations, nonetheless. The unusual esteem which has accrued to Vinamilk—praised at home and abroad as a paragon of corporate governance—says as much about the grimmer standards among other Vietnamese firms. Even many well-run ones have a disconcerting taste for adventurism: Mr Nguyen promises that Masan will be picky with its investments, after its bet on a tungsten mine turned sour.

There is also more for the government to do. Despite a few recent exceptions, reform of the flabby state sector has been a let-down, with many state firms selling only tiny slivers of equity. A promise to lift caps on foreign ownership of listed firms—for the moment limited to 49% in most industries—is bogged down in bureaucratic twaddle. Kevin Snowball of PXP Vietnam Asset Management says the representatives of foreign

institutional investors who turned up “in droves” late last year were disappointed at the limited liquidity of, and restricted access to, Vietnam’s stockmarkets that they encountered.

All this makes more important the decisions to be reached at the five-yearly congress of the Vietnamese Communist Party, which began in Hanoi on January 21st. By the time it concludes, on the 28th, some or all of the country’s top officials could be replaced. Most of Vietnam’s local and foreign businesspeople would like to see Nguyen Tan Dung, its prime minister for the past ten years, retain high office. He holds some blame for leading Vietnam into a deep banking crisis from which it is only now emerging, but he is also credited for a competent clean-up and for the many pro-business policies which have followed. Yet the latest rumour is that Mr Dung, and perhaps some of his younger allies, will be sidelined by a conservative faction loyal to Nguyen Phu Trong, the present party leader.

That would somewhat dampen spirits among businesspeople and investors. But it need be no disaster. Analysts worry that the pace of liberalisation could soften, but few expect the direction of reform to reverse. For one thing, Mr Dung’s trade deals mean that once-vague party promises have now been written into international treaties, notes a Vietnamese economist and government adviser. “The only way is forward,” he insists. ■



越南企业

金星闪耀

外国公司及投资者再度看涨越南前景

当年，迈克尔·阮（Michael Nguyen）辞去银行工作，加入越南一家销售鱼露的企业时，他的父母还担心儿子是否白白放弃了薪水丰厚的大好事业。如今，他已是越南首屈一指的上市公司马山集团（Masan Group）的高管，这位美籍越南人似乎对自己赌博的结果感到满意。马山集团的各种品牌产品占据了本地辛辣味调料、面条及冻干咖啡市场很大的份额。去年12月，公司接受了泰国胜狮啤酒公司（Singha）11亿美元的投资，进军越南火热的啤酒市场。

胜狮公司购入马山集团消费品事业部25%及其啤酒厂33%的股份，为越南这一整年纷繁的并购活动划上了句号。据估计，这些并购交易在2015年总值约达100亿美元（见图表）。在越南，外国直接投资开始走出金融危机后的低迷局面，整体回暖。贝克·麦坚时国际律师事务所（Baker & McKenzie）的弗雷德·伯克（Fred Burke）认为，更多大型交易正在“酝酿”之中。今年1月，日本的全日空航空公司表示将以1.08亿美元收购越南航空8.8%的股份。越南政府可能很快将出售国内最大酿酒厂西贡啤酒酒精饮料公司（Sabeco）10亿美元的股权以及越南乳制品公司（Vinamilk）约25亿美元的股权。

这一切反映了市场对越南重拾信心。这个9300万人口的国家年龄中位数约为30岁，经济年增长率近7%。其消费品行业尤其具有吸引力。越南乳制品公司的营收年增长超过20%；越南人均啤酒消费量在亚洲仅次于中国和日本，并持续上升。马山集团的最新计划是打入饲料市场，希望从日益增长的新鲜肉类消费中获利。

某种程度上，越南是在趁邻国虚弱而得利。尽管生产力低下、本地供应链有限，越南的制造商正逐渐从工资较高的中国抢得订单。同地区的国家中，印尼正退向保护主义，马来西亚则受政治丑闻困扰。泰国企业热衷与

越南企业结盟，以逃避本国低增长及军方暴政的影响。

然而，大大刺激外资投入热情的还有越南政府在2015年谈妥的一系列贸易协定——不止有美国主导的跨太平洋伙伴关系协议，还有与欧洲、韩国及日本等地签署的各类贸易协议。同时，越南政府在2014年通过的一道法律减少了投资和开办企业繁琐的审批程序，并于去年夏天开始实施。世界银行的宜商指数中，越南位居中游，但正缓步攀升。协力管理咨询有限公司（Dezan Shira）的阿尔贝托·韦托雷蒂（Alberto Vettoretti）说，外国投资者往往觉得在越南做生意比在中国容易，而且越南近期实施的改革比东南亚其他地区更胜一筹。

然而，也有很多令人沮丧之处。越南乳制品公司在国内外都被誉为公司治理的典范，这种不同寻常的尊敬同样表明了其他越南公司的情况没那么好。即使很多经营良好的公司对冒险的执着也令人不安：在投资一座钨矿失败后，迈克尔·阮承诺马山集团将对投资更为挑剔。

政府也还有更多方面需要努力。除了近期一些例外情况，越南对疲弱国营部门的改革令人失望，许多国有企业只出售少量股权。政府本来承诺提高对上市公司外资持股的上限（目前大多数行业的上限为49%），但陷于官僚空谈而没有行动。PXP越南资产管理公司（PXP Vietnam Asset Management）的凯文·斯诺博尔（Kevin Snowball）表示，去年底外国机构投资者的代表“一窝蜂地”涌入，但在越南股市遭遇流动性及准入限制，深感失望。

这一切令越南共产党将在五年一次的全国代表大会上达成的决议更显重要。本次会议于1月21日在河内召开，到28日会议闭幕时，越南的部分或全部高官可能会被替换掉。越南本地及外国的商人大多希望已在位十年的总理阮晋勇继续留任高层领导。越南陷入严重的银行业危机，直至现在方才好转，这部分要归咎于阮晋勇，但也是他有力地整顿了银行业继而推行了许多亲商政策。而最新的传闻是，阮晋勇（也许还有其部分年轻一些的盟友）会受到以现任党主席阮富仲为首的保守派排挤。

某种程度上，这将是浇在商人和投资者头上的一盆冷水。不过这未必是一场灾难。分析师担心自由化的步伐或许将因此放缓，但很少人认为改革的大方向会逆转。很重要的一点是，阮晋勇签下的贸易协议意味着曾经含糊其辞的党派承诺如今已被写入国际条约中，越南一位经济学家及政府顾问这样指出。他坚称：“唯一的路是向前走。”■



Schumpeter

The measure of a man

Reports of the death of performance reviews are exaggerated

IN RECENT months the business press has reverberated with cheers for the end of performance reviews. “Performance reviews are getting sacked,” crows the BBC. They “will soon be over for all of us”, rejoices the *Financial Times*. Such celebration is hardly surprising. Kevin Murphy, a performance-review guru at Colorado State University, sums up the general feeling about them: an “expensive and complex way of making people unhappy”. The problem is, they are not in fact being scrapped.

A survey in 2013 by Mercer, a consulting firm, of 1,000 employers in more than 50 countries reported that 94% of them undertook formal reviews of workers’ performance each year and 95% set individual goals for employees; 89% calculated an overall score for each worker and linked pay to these ratings. It is true that a number of big companies have announced that they are abandoning annual performance reviews; in February IBM did so, joining Accenture, Adobe, Deloitte, GE, Microsoft and Netflix. In reality, though, they are no more getting rid of performance reviews than a person who shifts from drinking whisky to wine is becoming teetotal. Employee reviews are being modified, not abolished, and not necessarily for the better.

Four changes are proving particularly popular. First, companies are getting rid of “ranking and yanking”, in which those with the lowest scores each year are sacked. GE, which practised this system with particular enthusiasm under its previous boss, Jack Welch, has now dropped it. Second, annual reviews are being replaced with more frequent ones—quarterly, or even weekly. Third, pay reviews and performance reviews are being separated. And fourth, some performance reviews are

turning into performance “previews”, focusing more on discovering and developing employees’ potential than on rating their past work.

Is this new system of employee reviews any better than the old? There are good arguments for getting rid of ranking and yanking: the ritualistic decimation of the workforce on the basis of a single number routinely paralysed businesses in the run-up to each year’s reviews, killing creativity and setting workers against each other. Thereafter the picture is murkier.

Some of the arguments being advanced for the new-style reviews are hoopla. Deloitte says its new system is about “speed, agility, one-size-fits-one and constant learning”. The consulting firm’s employees sit down once a week with their “team leaders”. But good managers should give their charges constant feedback anyway. Adding another regular meeting to everyone’s calendar sounds like a formula for time-wasting. “One-size-fits-one” assessment is meaningless: a vital part of assessing people is measuring them against their peers—particularly when you have to think about who to promote or how to divvy out bonuses. It sounds nice to focus on people’s potential rather than their past performance. But how do you assess the former without considering the latter? And if decisions about pay are not based on performance, what will they be based on?

Some of the arguments are not just hoopla, but dangerous hoopla. Social scientists have repeatedly demonstrated that performance reviews are distorted by two things: office politics and grade inflation. Managers are susceptible to lobbying. They also have an incentive to put a positive spin on things, often against their own better judgment, because in assessing their subordinates’ performance they are, to a large extent, evaluating their own ability to manage. Deliver a series of damning verdicts on your team and you inevitably raise a red flag about your own leadership. But the more subjective the reviewing process becomes, the more powerful these distortions are likely to be: “instant” feedback sessions can easily become

orgies of mutual praise that do not teach anybody anything.

For purists, such as Samuel Culbert of UCLA's Anderson School of Management, this is proof that performance reviews are unsalvageable: better to get rid of them entirely than to replace one imperfect system with another. In fact there are good reasons why almost all organisations this side of Utopia use employee reviews of one type or another.

| *Insurance against lawsuits*

Companies are always having to make difficult decisions, whether allocating limited resources (such as promotions and bonuses) or sacking people if they hold the organisation back or if the market turns down. It is preferable to make such decisions on the back of robust criteria rather than on the basis of managerial whim. Increasingly, firms also have to defend those decisions in the courts against people who feel hard done by. Firms that embrace more touchy-feely assessment systems, let alone get rid of them entirely, may be setting themselves up for legal nightmares.

Annual performance reviews can certainly be improved. Companies need to put more effort into guarding the guards—training them in how to conduct reviews and holding them accountable if they are overgenerous or otherwise sloppy. Google wisely encourages its managers to review each other's assessments. Bosses also need to be more rigorous about acting on what they discover: there is no point in amassing information about weak performers if you only act on it in a crisis.

However, provided they are carried out consistently, rationally and fairly, and supplemented with more frequent feedback, annual performance reviews have many virtues. They provide a way of measuring an employee's development over time (it is odd that some of those who criticise annual feedback for being too slow also criticise companies for being too short-term). They also provide a way of measuring all a company's employees

against each other rather than just their immediate colleagues. Bill Clinton once said that the best approach to affirmative action was “mend it, don’t end it”. The same is true of annual performance reviews. ■



熊彼特

衡量人的方法

有关绩效考核已经消亡的论调言过其实

最近几个月，商业媒体回荡着对绩效考核终结的喝彩。英国广播公司（BBC）欢呼道：“绩效考核要下课了”。《金融时报》（Financial Times）欣喜地表示：它“对于我们所有人而言将很快成为过去”。这种庆祝并不奇怪。科罗拉多州立大学（Colorado State University）的绩效考核专家凯文·墨菲（Kevin Murphy）总结了人们对此的普遍感受：一种“昂贵复杂又令人不快的方式”。问题是，绩效考核实际上并没有被摒弃。

咨询公司美世（Mercer）2013年对50多个国家1000位雇主的一次调查显示，他们中有94%每年对员工的业绩进行正式考核，95%设立员工的个人目标，89%计算每位员工的总体得分并把工资和这些评分挂钩。诚然，一些大公司已经宣布它们正在取消年度绩效考核；IBM今年二月也这样做了，加入到埃森哲（Accenture）、Adobe、德勤（Deloitte）、通用电气（GE）、微软和Netflix的行列。不过在现实中，它们并没有完全摆脱绩效考核，这就像一个人从喝威士忌转为喝红酒来逐渐戒酒一样。员工考核正在被改变，而非废除，还未必能越改越好。

现今四种改变特别流行。首先，公司正在取消末位淘汰制度，即每年解雇那些得分最低的人。在前任老板杰克·韦尔奇（Jack Welch）任内，GE曾尤其热衷于实行这种体系，而现在已经放弃。其次，年度考核正在被更为频繁的考核所取代——季度考核，甚至是每周考核。第三，工资考核与绩效考核相分离。第四，有些绩效考核正转变为绩效“预评”，更注重发现与开发员工的潜能，而不是评价他们过去的工作。

这种新的员工考核体系会比旧的更好吗？取消末位淘汰有充分理由：基于单个数字就例行公事地定期裁减一定比例的员工，这让企业在每年考核之前陷入瘫痪、扼杀创造力，并使员工互相对立。那之后，情形将更为不妙。

有些关于新式考核的理由则夸大其词了。德勤称其新体系代表了“速度、敏捷、因材施教和持续学习”。这家咨询公司的员工和“团队领导”每周开一次会。但是无论如何，优秀的管理者应该给自己的下属持续不断的反馈。在每个人的日程表上再添加一个例会听起来像是浪费时间。“因材施教”的评估毫无意义：人员评估一个至关重要的部分就是把他们与同僚做比较，尤其是在你要考虑晋升哪个人，以及该如何分配奖金的时候。关注人们的潜能而不是他们的过往业绩，这听起来不错。但是，你怎么能不考虑业绩就评估潜能？如果工资不依据业绩来决定，它们要以什么为基础？

一些理由不仅夸大其词，而且危险地夸大其词。社会科学家已经反复证明，绩效考核被两个因素所扭曲：办公室政治和等级膨胀。管理者容易被游说。他们也有动机去美化事情——往往与自己更准确的判断相反，因为评估自己下属表现时，他们很大程度上也在评价自己的管理能力。给自己团队打出一系列差评，你必然也是对自己的领导能力举出了示警红旗。不过，评估过程越主观，这种扭曲就可能越强烈：“即时”反馈会议可能很容易成为相互吹捧的聚会，而对所有人都毫无裨益。

对于加州大学洛杉矶分校（UCLA）安德森商学院（Anderson School of Management）的塞缪尔·卡伯特（Samuel Culbert）这样的纯粹主义者而言，这证明了绩效考核已经不可救药：与其用一种不完善的体系去替换另一种，不如完全摆脱它们。而事实上，与这种理想主义相反，之所以几乎所有组织都使用某种形式的员工考核，背后有合理的原因。

| 谨防诉讼

公司总是不得不做出艰难的决定，无论是分配有限的资源（如晋升和奖金），还是解雇阻碍组织发展的员工或者在市场低迷时裁员。在这些时候，根据稳健标准做出的决定比管理者一时兴起的决定更为可取。企业还要越来越多地与觉得受到不公平待遇的人对簿公堂，为这些决定辩护。采用更感性评估体系的企业都可能会陷入法律噩梦，更遑论完全废除它们。

年度绩效考核一定能得到改善。公司需要投入更大努力看管守护者，培训他们如何评估，并在他们过分宽松或敷衍了事时向他们问责。谷歌明智地鼓励管理者互相审核评估的结果。老板也要更加自律，发现问题就采取行动：如果你只在危机时才行动，收集表现不佳者的信息就没有意义。

然而，只要年度绩效考核能够持续、合理、公平地进行，并辅以更频繁的反馈，还是有很多优点的。年度考核提供了一种衡量员工长期发展的方法（奇怪的是，一些批评年度反馈太慢的人，同时又批评公司过于急功近利）。它还提供了一种与公司所有员工而不只是身边同事相比较的考核方法。克林顿曾经说过，对待平权法案最好的途径是“改进它，而不是终止它”。这同样也适用于年度绩效考核。 ■



African firms and private equity

Climbing aboard the Africa train

Local firms gain more than investors when private equity arrives

A LONG line of smoke-belching lorries clogs the highway for miles outside Mombasa, Kenya's main port. They are waiting to collect shipping containers that they will haul across 1,200 grinding kilometres to Kampala, Uganda's capital. Doing so is slow and costly. Yet for a quarter of a century this was the only viable way of shipping goods into east Africa's interior. The moribund railway was even slower, and thoroughly unreliable: at best it would take 12 days to move a container by train.

Today a procession of brightly painted locomotives (pictured) belonging to Rift Valley Railways are taking an increasing share of the load. The time to send a container by rail has fallen by more than half and, for the first time in decades, the trains are running on time. Now, as much as 10% of the traffic out of Mombasa is carried by rail—double the share of a few years ago—and new wagons and locomotives may double that share again.

The improvement is almost entirely due to the influence of private equity on a railway that, when built in British colonial times, seemed such an outlandish venture that it was dubbed the “lunatic line”. Qalaa Holdings, an Egyptian investment firm, has invested almost \$200m in improving the railway since it first took a stake in 2010.

More than money, Qalaa has brought skills and technology. When it arrived it found a “dead fleet” of locomotives rusting in the sidings for lack of spare parts. Almost half have been repaired. New machines now carry out maintenance on the tracks at a rate of 1km an hour, where previously it was done by hand at a pace of 40m an hour. Modern electronic control systems have helped trim spending on fuel by about a tenth.

“Without proper processes and maintenance, capital spending is just money down the drain,” says Karim Sadek, Qalaa’s managing director. Other private-equity firms are drawing similar lessons. “You have to be really hands-on with every one of your companies,” says Suleiman Kiggundu of CDC, a development arm of the British government that uses private-equity techniques. With luck, this will mean that the large amounts of private-equity money now going into Africa—seen as the last great frontier market—are not wasted. Last year such investments reached \$8.1 billion, close to the pre-crisis peak and well up on the low of \$1.5 billion in 2009.

This great migration of capital comes as African economies are slowing after a decade of good growth. Lower commodity prices are dampening expansion in places such as Nigeria and Angola. Poor financial management is hurting others, such as Ghana, Kenya and South Africa. But the slowdown may affect African businesses less than ones that private-equity firms have invested in elsewhere in the world.

In many countries, a typical deal would involve a buy-out fund loading its newly acquired business with debt, to multiply its returns. In Africa, most buy-outs are done with little or no debt because domestic-currency borrowing rates are so high—perhaps 15-24% in the region’s larger economies. (Foreign-currency rates are much lower, but are a risky bet for businesses that do not earn revenues in dollars or euros to pay back their loans).

So, instead of boosting African businesses’ returns through debt, private-equity firms have to increase revenue and improve efficiency. Consider the example of Umeme, which runs Uganda’s power-distribution grid. When Actis, a British investment firm, bought a stake, power losses consumed 40% of the electricity generated. By making some simple changes, such as replacing old insulators on its cables and reducing the theft of electricity by dismantling illegal connections, it has cut those losses in half.

Companies can also get help from private-equity investors in expanding into new markets, or replicating existing businesses in other countries. Agri-Vie, a South African firm, owns stakes in several agricultural and food-processing businesses, ranging from a flower grower in Kenya to an Ethiopian fruit-grower and juice-maker. “We find solid companies. The key challenge comes at the point of scaling up and moving beyond a single market or country,” says Herman Marais, its managing partner.

In other cases private-equity firms find themselves acting more like venture capitalists, or even startup founders. One of Nigeria’s most successful home-grown firms is Verod Capital Management, which earned about 15 times its investment on a new factory making drinks cans. It is now involved in several other startups, including a fish farm. It has bought Spinlet, a Finnish music-streaming company, and transplanted it to Nigeria.

Yet even if they adapt to local conditions, buy-out firms still find that Africa is no path to easy riches. In the ten years to September 2014, South African private-equity firms, for instance, delivered returns that, although seemingly juicy at 18.5% a year (in local currency), were less than their investors would have earned simply by betting on stockmarkets.

Data on other firms and other countries are sparse, but industry insiders reckon that African deals had annual returns of only about 11% for the decade to 2012. Fewer than half of buy-out funds did better than the median fund investing in listed stocks. The worst-performing investments were those struck during the previous peak, a warning to those firms now itching to spend unused capital. In the rich world private equity is often accused of enriching investors at the expense of the firms they buy. In Africa, the reverse seems to hold. ■



非洲公司与私募股权

登上非洲列车

当私募股权到来时，本地企业比投资者获利更多

一长排喷着浓烟的卡车堵在肯尼亚主要港口蒙巴萨之外数英里的公路上。它们正在等待装运集装箱，然后跨越1200公里艰辛的路途运往乌干达首都坎帕拉。这样做既缓慢又昂贵，但在过去25年里，这是向东非内地运送货物唯一可行的方法。死气沉沉的铁路更慢，而且完全不可靠：用火车运送集装箱最快也要12天。

如今，裂谷铁路公司（Rift Valley Railways）一队色彩鲜艳的机车（如图）正在承担越来越多的运输份额。铁路运输集装箱的耗时减少了一半以上，并且十年来列车首次准点运行。现在，蒙巴萨高达10%的对外运输经由铁路完成，份额比几年前翻了一番，而新的机车和车皮可能使这一份额再度翻番。

这种改善几乎完全来自私募股权对铁路的影响。这条建于英国殖民时期的铁路在当时就因看似不切实际而被称为“疯狂铁路线”。埃及的投资公司Qalaa控股（Qalaa Holdings）自2010年首次入股后，已经为改善该铁路投资了近2亿美元。

除了钱，Qalaa还带来了技能和技术。刚接手时，它发现有一批废弃机车因缺少零部件闲置在岔道上生锈。今天其中将近一半的机车已被修好。新机器正以每小时1公里的速度维护铁轨，而以前依靠手工维护每小时只能完成40米。现代电子控制系统帮助削减了约十分之一的燃料支出。

Qalaa的总经理卡里姆·萨迪克（Karim Sadek）说：“没有适当的流程和维护，资本支出就是打水漂。”其他私募股权公司正在吸取类似的教训。英国政府的开发机构中央数据控制有限公司（Central Data Control Ltd，简称CDC）也运用私募股权手段，该公司的苏雷曼·吉根度（Suleiman Kiggundu）表示：“必须真正手把手地指导你投资的每一个公司。”幸运的

话，这意味着现今正在进入非洲这个被视为最后一个庞大前沿市场的大量私募股权资金将不会被浪费掉。此类投资去年达到81亿美元，接近危机前的峰值，远高于2009年15亿美元的低点。

这轮资本投资恰逢非洲各经济体经历十年良好增长之后的放缓。大宗商品价格下跌，正在抑制尼日利亚和安哥拉等国的经济增长。财政管理不善正伤害加纳、肯尼亚和南非等其他国家。但经济放缓对非洲企业的影响也许少于对私募股权公司在世界其他地方所投资企业的影响。

在许多国家，典型的交易通常由并购基金让新收购的企业承担大量债务，以获得多倍收益。在非洲，大多数并购基金只少量举债或不举债，原因是其本国货币的借贷利率非常高，该地区较大经济体的利率可能高达15%至24%。（外币借贷利率要低得多，但对于不赚取美元或欧元收入的企业而言，偿还外币贷款就是冒险下注）。

因此，私募股权公司必须增加收入和提高效率，而不是通过债务来增加非洲企业的收益。运营乌干达配电网的乌干达供电公司（Umeme）就是一个例子。英国的投资公司英联（Actis）入股时，电力损耗占了发电量的40%。通过一些简单改变，比如更换电缆上的旧绝缘子，拆除非法接线以减少窃电行为等，该公司已削减了一半损耗。

公司还能从私募股权投资者那里获得帮助，开拓新市场，或复制其他国家已有的业务。南非的Agri-Vie公司入股了多家农业和食品加工企业，从肯尼亚的花卉栽培公司到埃塞俄比亚的水果种植企业和果汁制造厂，均有涉猎。该公司的执行合伙人赫尔曼·马雷（Herman Marais）说：“我们找到了可靠的公司。能否扩大规模，超越单一市场或者国家继续发展是最主要的挑战。”

在其他情况下，私募股权公司发现自己的行为更像风险投资家，甚至像创业公司的创始人。尼日利亚最成功的本土企业是Verod资本管理公司，它投资的一家制造饮料罐的新工厂赢得了约15倍的收益。现在它参与了包括一家养鱼场在内的其他一些创业公司，还收购了芬兰的音乐流媒体公司

Spinlet，并将它引进到尼日利亚。

然而，即便并购企业能够适应当地的情况，它们仍会发现非洲并不是一条轻松致富的捷径。比如说，2004年9月至2014年9月，南非的私募股权公司实现了每年18.5%（按当地货币计）的收益率，看似利润丰厚，但小于投资者直接押宝股市所能获得的回报。

其他的公司与国家数据稀缺，但据业内人士估计，2002年至2012年，非洲交易的年收益率大约只有11%。少于一半并购基金的表现超过了投资上市股票的基金的中位水平。表现最糟糕的投资在前一个高峰时期倍受打击，对于那些现在迫切想要花掉未使用资本的公司来说，这是一个警告。在富裕世界，私募股权通常受到指责，说它以收购的公司为代价让投资者获利。而在非洲，情况似乎恰恰相反。■



Schumpeter

Team spirit

Businesses are embracing the idea of working in teams. Managing them is hard

TEAMS have become the basic building-blocks of organisations.

Recruitment ads routinely call for “team players”. Business schools grade their students in part on their performance in group projects. Office managers knock down walls to encourage team-building. Teams are as old as civilisation, of course: even Jesus had 12 co-workers. But a new report by Deloitte, “Global Human Capital Trends”, based on a survey of more than 7,000 executives in over 130 countries, suggests that the fashion for teamwork has reached a new high. Almost half of those surveyed said their companies were either in the middle of restructuring or about to embark on it; and for the most part, restructuring meant putting more emphasis on teams.

Companies are abandoning functional silos and organising employees into cross-disciplinary teams that focus on particular products, problems or customers. These teams are gaining more power to run their own affairs. They are also spending more time working with each other rather than reporting upwards. Deloitte argues that a new organisational form is on the rise: a network of teams is replacing the conventional hierarchy.

The fashion for teams is driven by a sense that the old way of organising people is too rigid for both the modern marketplace and the expectations of employees. Technological innovation puts a premium on agility. John Chambers, chairman of Cisco, an electronics firm, says that “we compete against market transitions, not competitors. Product transitions used to take five or seven years; now they take one or two.” Digital technology also makes it easier for people to co-ordinate their activities without resorting to hierarchy. The “millennials” who will soon make up half the workforce

in rich countries were reared from nursery school onwards to work in groups.

The fashion for teams is also spreading from the usual corporate suspects (such as GE and IBM) to some more unusual ones. The Cleveland Clinic, a hospital operator, has reorganised its medical staff into teams to focus on particular treatment areas; consultants, nurses and others collaborate closely instead of being separated by speciality and rank. The US Army has gone the same way. In his book, “Team of Teams”, General Stanley McChrystal describes how the army’s hierarchical structure hindered its operations during the early stages of the Iraq war. His solution was to learn something from the insurgents it was fighting: decentralise authority to self-organising teams.

A good rule of thumb is that as soon as generals and hospital administrators jump on a management bandwagon, it is time to ask questions. Leigh Thompson of Kellogg School of Management in Illinois warns that, “Teams are not always the answer—teams may provide insight, creativity and knowledge in a way that a person working independently cannot; but teamwork may also lead to confusion, delay and poor decision-making.” The late Richard Hackman of Harvard University once argued, “I have no question that when you have a team, the possibility exists that it will generate magic, producing something extraordinary...But don’t count on it.”

Hackman (who died in 2013) noted that teams are hampered by problems of co-ordination and motivation that chip away at the benefits of collaboration. High-flyers forced to work in teams may be undervalued and free-riders empowered. Groupthink may be unavoidable. In a study of 120 teams of senior executives, he discovered that less than 10% of their supposed members agreed on who exactly was on the team. If it is hard enough to define a team’s membership, agreeing on its purpose is harder

still.

Profound changes in the workforce are making teams trickier to manage. Teams work best if their members have a strong common culture. This is hard to achieve when, as is now the case in many big firms, a large proportion of staff are temporary contractors. Teamwork improves with time: America's National Transportation Safety Board found that 73% of the incidents in its civil-aviation database occurred on a crew's first day of flying together. However, as Amy Edmondson of Harvard points out, organisations increasingly use "team" as a verb rather than a noun: they form teams for specific purposes and then quickly disband them.

| *Teaming with doubts*

The least that can be concluded from this research is that companies need to think harder about managing teams. They need to rid their minds of sentimental egalitarianism: the most successful teams have leaders who set an overall direction and clamp down on dithering and waffle. They need to keep teams small and focused: giving in to pressure to be more "inclusive" is a guarantee of dysfunction. Jeff Bezos, Amazon's boss, says that "If I see more than two pizzas for lunch, the team is too big." They need to immunise teams against groupthink: Hackman argued that the best ones contain "deviants" who are willing to ruffle feathers. A new study of 12,000 workers in 17 countries by Steelcase, a furniture-maker which also does consulting, finds that the best way to ensure employees are "engaged" is to give them more control over where and how they do their work—which may mean liberating them from having to do everything in collaboration with others.

However, organisations need to learn something bigger than how to manage teams better: they need to be in the habit of asking themselves whether teams are the best tools for the job. Team-building skills are in short supply: Deloitte reports that only 12% of the executives they

contacted feel they understand the way people work together in networks and only 21% feel confident in their ability to build cross-functional teams. Slackly managed teams can become hotbeds of distraction—employees routinely complain that they can't get their work done because they are forced to spend too much time in meetings or compelled to work in noisy offices. Even in the age of open-plan offices and social networks some work is best left to the individual. ■



熊彼特

团队精神

各公司都信奉以团队形式工作的理念。管理团队实属不易

团队是建立组织的基石。招聘广告通常都招募“具有团队精神的人”。商学院给学生的评分部分取决于他们在团队项目中的表现。办公室经理拆除隔墙，鼓励团队合作。当然，团队的历史同文明一样悠久：就连耶稣也有十二门徒。然而德勤一份名为《全球人力资本趋势》的新报告调查了130多个国家中的七千多名管理者，结果表明团队合作的风潮已经到达了一个新高度。几乎一半被访者称他们的公司不是正在重组就是打算重组；而大多数情况下，重组意味着更注重团队。

各公司正在摒弃功能性“竖井”，转而组织员工构建专注于特定产品、问题或客户的跨职能团队。这些团队正获得越来越大的权力处理自身事务。它们也在花费更多时间彼此合作而不是向上级汇报。德勤认为一种新的组织形式正在兴起：团队网络正在取代传统的等级制度。

旧的组织形式给人的感觉是无论对于现代市场还是员工的期待来说都太过死板，正是这种感觉推动了团队工作的风潮。科技创新重视敏捷性。电子公司思科的主席约翰·钱伯斯（John Chambers）说，“我们是在和市场转型竞争，而不是与对手竞争。产品转型以往需要五到七年；现在只需要一两年。”数字技术也让人们更容易协调活动，无需求助于等级制度。很快将占到富裕国家一半劳动力的“千禧一代”从托儿所起就以分组工作被培养长大。

团队的风潮也从一般的典型企业（如GE和IBM）蔓延至一些更特殊的公司。医院运营商克利夫兰诊所（Cleveland Clinic）已经按照具体的治疗领域，重新将其医疗员工编制成团队；顾问、护士和其他人紧密协作，而不是按专长和职位高低分开。美国陆军也采用了同样的方式。在《团队中的团队》一书中，作者斯坦利·麦克里斯特尔（Stanley McChrystal）将军描述了军队的等级制度在伊拉克战争初期如何阻碍了美军的行动。他的解

决方法是向与之对抗的叛乱分子学习：将权力下放到自组织的团队。

一条好的经验法则是，一旦将军们和医院管理者加入管理的风潮，就该是发问的时候了。伊利诺伊州凯洛格商学院（Kellogg School of Management）的利·汤普森（Leigh Thompson）警告说，“团队不能解决所有问题——团队或许可以提供一个人独立工作时无法提供的洞见、创造力和知识，但是团队工作也可能导致混乱、延误、决策不佳。”哈佛已故的理查德·哈克曼（Richard Hackman）曾经表示，“我完全相信，如果你有个团队，它或许能创造奇迹，做出非同寻常的成就……但是别指望这个团队。”

哈克曼（2013年去世）指出团队受到协调和推动力等问题的牵制，损害了协同合作的优势。被迫在团队里工作的成功人士可能被低估，而搭顺风车的人却被赋予权力。趋同思维或许无法避免。在对120个高级管理人员团队的研究中，他发现理应属于同一团队的队员中，只有不到10%的人对于谁真正属于这个团队没有异议。如果确定一个团队的成员如此困难，达成团队目标则只会更难。

劳动力的深刻变化让团队更难管理。当成员有强大的共同文化时，团队表现得最好。不过这一点很难达到，因为现在很多大公司里，很大一部分员工是临时合同工。假以时日，团队合作会有所改善：美国国家运输安全委员会（National Transportation Safety Board）发现，它的民航数据库中有73%的事故发生在机组一起飞行的首日。不过，正如哈佛的艾米·埃德蒙森（Amy Edmondson）指出的，各组织越来越多地将“团队”用作动词而非名词：它们为了特殊的目的组建团队，然后又很快解散团队。

| 怀疑满满

从这一研究中，我们至少可以得出这样的结论：公司要好好考虑一下团队管理。它们要摆脱脑子里感性的平等主义：最成功的团队有领袖，由其设定总体方向，坚决取缔犹豫不决和含糊其辞。它们要让团队保持小而专：屈从压力、变得更具“包容性”一定意味着会功能失调。亚马逊老板杰夫·贝佐斯（Jeff Bezos）说，“要是我看到午餐点了超过两个披萨，那这个团

队就太大了。”它们要给团队打预防针，避免趋同思维：哈克曼认为最好的团队一定有“离经叛道者”，这些人愿意挑起事端。家具生产商Steelcase同时也做咨询，它的一项新研究调查了17个国家的12000名员工，发现确保员工“投入”的最好方式是赋予他们更多权力，控制自己在哪里以何种方式工作，这可能意味着把他们从无时无刻与他人的合作中解放出来。

但是，各组织需要学习的不止是如何更好地管理团队：它们还要习惯问问自己团队是不是从事这一工作最好的工具。团队建设的技能供不应求：德勤的报告显示其联系的管理人员中仅有12%觉得他们懂得人们在网络中共同协作的方式，只有21%对建立跨功能团队方面的能力有自信。管理松散的团队会成为注意力分散的温床，员工们例行公事地抱怨他们做不完工作，因为他们被迫花太多时间开会，或者被逼着在吵吵嚷嚷的办公室里工作。即便是在开放式办公室与社交网络的时代，有些工作最好还是留给个人完成。■



Schumpeter

The collaboration curse

The fashion for making employees collaborate has gone too far

IN MODERN business, collaboration is next to godliness. Firms shove their staff into open-plan offices to encourage serendipitous encounters. Managers oblige their underlings to add new collaborative tools such as Slack and Chatter to existing ones such as e-mail and telephones. Management thinkers urge workers to be good corporate citizens and help each other out all the time.

The fashion for collaboration makes some sense. The point of organisations is that people can achieve things collectively that they cannot achieve individually. Talking to your colleagues can spark valuable insights. Mixing with people from different departments can be useful. But this hardly justifies forcing people to share large noisy spaces or bombarding them with electronic messages. Oddly, the cult of collaboration has reached its apogee in the very arena where the value of uninterrupted concentration is at its height: knowledge work. Open-plan offices have become near-ubiquitous in knowledge-intensive companies. Facebook has built what is said to be the world's biggest such open space, of 430,000 square feet (40,000 square metres), for its workers.

Hitherto, knowledge workers have largely suffered in silence or grumbled in private because their chances of promotion have come to be influenced by their willingness to collaborate. But a backlash is setting in: the current *Harvard Business Review* (HBR) has a cover story on “collaborative overload”; and Cal Newport of Georgetown University has just brought out a book called “Deep Work: Rules for Focused Success in a Distracted World”.

A growing body of academic evidence demonstrates just how serious the

problem is. Gloria Mark of the University of California, Irvine, discovered that interruptions, even short ones, increase the total time required to complete a task by a significant amount. A succession of studies have shown that multitasking reduces the quality of work as well as dragging it out. Sophie Leroy of the University of Minnesota has added an interesting twist to this argument: jumping rapidly from one task to another also reduces efficiency because of something she calls “attention residue”. The mind continues to think about the old task even as it jumps to a new one.

A second objection is that, whereas managers may notice the benefits of collaboration, they fail to measure its costs. Rob Cross and Peter Gray of the University of Virginia’s business school estimate that knowledge workers spend 70-85% of their time attending meetings (virtual or face-to-face), dealing with e-mail, talking on the phone or otherwise dealing with an avalanche of requests for input or advice. Many employees are spending so much time interacting that they have to do much of their work when they get home at night. Tom Cochran, a former chief technology officer of Atlantic Media, calculated that the mid-sized firm was spending more than \$1m a year on processing e-mails, with each one costing on average around 95 cents in labour costs. “A free and frictionless method of communication,” he notes, has “soft costs equivalent to procuring a small company Learjet.”

Mark Bolino of the University of Oklahoma points to a hidden cost of collaboration. Some employees are such enthusiastic collaborators that they are asked to weigh in on every issue. But it does not take long for top collaborators to become bottlenecks: nothing happens until they have had their say—and they have their say on lots of subjects that are outside their competence.

The biggest problem with collaboration is that it makes what Mr Newport calls “deep work” difficult, if not impossible. Deep work is the killer app of

the knowledge economy: it is only by concentrating intensely that you can master a difficult discipline or solve a demanding problem. Many of the most productive knowledge workers go out of their way to avoid meetings and unplug electronic distractions. Peter Drucker, a management thinker, argued that you can do real work or go to meetings but you cannot do both. Jonathan Franzen, an author, unplugs from the internet when he is writing. Donald Knuth, a computer scientist, refuses to use e-mail on the ground that his job is to be “on the bottom of things” rather than “on top of things”. Richard Feynman, a legendary physicist, extolled the virtues of “active irresponsibility” when it came to taking part in academic meetings.

| *What gets measured...*

Why have organisations been so naive about collaboration? One reason is that collaboration is much easier to measure than “deep work”: any fool can record how many people post messages on Slack or speak up in meetings, whereas it can take years to discover whether somebody who is sitting alone in an office is producing a breakthrough or twiddling his thumbs. The more junior the knowledge worker is, the more likely he is to spend his time doing things that are easy to measure rather than engaging in more demanding but nebulous work. A second reason is that managers often feel obliged to be seen to manage: left to their own devices they automatically fill everybody’s days with meetings and memos rather than letting them get on with their work.

What can be done to restore balance in a world gone collaboration-mad? Few people have the freedom of a Franzen or a Feynman to unplug themselves from the world. But employees—particularly young ones—need to recognise the long-term costs of working in a constant state of distraction. The *HBR* article points out that there is an overlap of only 50% between “the top collaborative contributors in any organisation and those individuals deemed to be the top performers.” About 20% of company stars

keep themselves to themselves. So organisations need to do more to recognise that the amount of time workers have available is finite, that every request to attend a meeting or engage in an internet discussion leaves less time for focused work and that seemingly small demands on people's time can quickly compound into big demands. Helping people to collaborate is a wonderful thing. Giving them the time to think is even better. ■



熊彼特

协作的诅咒

让员工协作的时尚过犹不及

在现代企业中，协作的重要性仅次于虔诚。公司把员工塞进开放式办公室，以此鼓励偶遇。在电邮和电话等已有协作工具之外，管理者强令下属再添上Slack和Chatter等新工具。管理思想家们呼吁员工成为优秀的企业公民，无时不刻互相帮助。

协作的时尚有些道理。组织的意义在于人们能共同完成他们不能单独完成的事。和同事交谈能激发有价值的见解。与不同部门的人往来很有帮助。但是，这很难构成迫使人们共用嘈杂的空间或者被电子信息轰炸的正当理由。奇怪的是，对协作的狂热已经在知识工作领域登峰造极，而正是在这个领域，不受干扰的专注也处在价值的顶峰。在知识密集型企业中，开放式办公室近乎无所不在。Facebook公司为员工兴建了据称是世界上最大的这类开放空间，面积达4万平方米。

迄今为止，由于知识工作者的晋升机会受到其协作意愿的影响，他们总体上都在沉默中忍受或只在私底下抱怨。但是，一种抵制情绪正在蔓延：最近一期《哈佛商业评论》（HBR）发表了一篇关于“协同过度”的封面文章；乔治敦大学（Georgetown University）的卡尔·纽坡特（Cal Newport）刚出版了一本书，名为《深度工作：在心神涣散的世界获得专注成就的法则》（Deep Work: Rules for Focused Success in a Distracted World）。

越来越多的研究证据表明问题十分严重。加利福尼亚大学尔湾分校（University of California, Irvine）的格洛丽亚·马克（Gloria Mark）发现，即使时间很短的干扰也会令完成任务所需的总体时间大幅增加。一系列研究表明，同时处理多重任务会降低工作质量、拖延时间。明尼苏达大学（University of Minnesota）的索菲·勒罗伊（Sophie Leroy）为此论点增添了一个有趣的转折：从一项任务迅速跳转到另一项任务也会降低效

率，原因即是她所讲的“注意力残留”。大脑会继续思考旧任务，尽管它已跳转到了新的任务中。

另一种反对意见是，虽然管理者或许能察觉到协作的好处，但他们没有估量协作的成本。弗吉尼亚大学商学院的罗布·克罗斯（Rob Cross）估计，知识工作者70%至85%的时间都花在参加会议（虚拟的或面对面的）、处理电子邮件、打电话，或是应对铺天盖地的要求，要他们给出意见或建议。许多员工耗费大量时间与人互动，只得将很大一部分工作带回家在夜间完成。大西洋传媒（Atlantic Media）的前首席技术官汤姆·科克伦（Tom Cochran）计算过，这家中型企业每年花费超过100万美元处理电子邮件，花在每封邮件上的人力成本平均约为95美分。他指出，电子邮件是“一种免费而且无障碍的通信方法”，但它有“软性成本，其金额可以用来购买一架小型里尔公务飞机（Learjet）”。

俄克拉荷马大学（University of Oklahoma）的马克·博利诺（Mark Bolino）指出，协作有隐性成本。有些员工对协作高度热衷，以至于被邀请参与每项议题。但过不了多久，这些顶级协作者就成为了瓶颈：在他们发言之前事情就没法定下来。而且，他们对许多自身能力以外的议题拥有发言权。

协作最大的问题就是，它致使纽坡特所说的“深度工作”即便不是全无可能展开，也将变得很困难。深度工作是知识经济的杀手级应用：你只有聚精会神才能掌握一门困难的学科或解决一个棘手的问题。许多最高产的知识工作者都竭力避免开会并排除电子设备的干扰。管理思想家彼得·德鲁克（Peter Drucker）认为，你可以做实际工作或者参加会议，但不能同时做这两件事。作家乔纳森·弗兰岑（Jonathan Franzen）写作时会拔掉网线。计算机科学家高德纳（Donald Knuth）拒绝使用电子邮件，原因是他的工作是“基础性的”而不是要“尽在掌握”。传奇物理学家理查德·费曼（Richard Feynman）在谈到参加学术会议时，高度赞扬“积极的不负责任”是一种美德。

| 被衡量的是什么.....

为什么众多机构对于协作会如此天真？一个原因是，协作远比“深度工作”更容易衡量：任何一个傻瓜都能记录下来有多少人在Slack上发帖或是在会议上发言，但要发现一个独坐办公室的人是在取得突破还是无所事事，可能需要好几年。知识型工作者的资历越浅，越可能把时间花在做容易衡量的事情上，而非完成要求更高但模糊不清的工作。另一个原因是，管理者往往感到必须让别人看到自己在做管理：任其自由发挥时，他们会自动地用会议和备忘录占满所有人的时间，而不是让他们继续各自的工作。

在一个对协作着迷的世界里，能做些什么来恢复平衡？很少人拥有像弗兰岑或费曼那般的自由，让自己可以离群独思。然而，员工——特别是年轻员工——需要意识到在注意力持续分散状态下工作的长期成本。《哈佛商业评论》的文章指出，在任何组织中，“顶级协作贡献者和那些被认为表现最佳的个人之间”只有50%的重合。大约20%的公司明星独来独往。因此，企业需要更多地认识到员工可供工作的时间有限，因而，每一次要求他们参加会议或互联网讨论都会减少留给专注工作的时间，对人们时间看似微小的需求会迅速汇聚成巨大的需求。帮助人们协作是很好的事，而能给他们时间思考就更好了。■



Talent versus hard work

Best or Keegan?

Recruiters and investors think talent counts for more than determination

IT MIGHT be described as the “George Best versus Kevin Keegan” question. In their day, each was considered the finest footballer in Europe. But the first was a natural talent for whom the game came easily. The second was less gifted but reached the top through unstinting determination. Which would represent the better signing?

Choosing whether to hire someone who displays innate ability over a hard worker is not just a question for fantasy-football punters. Investors and recruiters sometimes face the same choice.

In a soon-to-be-published paper, Chia-Jung Tsay of University College London (UCL) tested whether investors prefer to back “naturals” or “strivers”. As Ms Tsay accepts, things are rarely that black-and-white. Few people—Messrs Best and Keegan included—are successful without being at least a bit of both. But often the scales are tipped in one direction, at least in people’s perceptions.

In an experiment, Ms Tsay presented would-be investors with profiles of a group of fictional entrepreneurs, including attributes such as their leadership experience, management skills, IQ and the amount of capital they had raised. In one variant of the experiment, it was hinted that each entrepreneur had reached his position more through natural ability or talent. In another variant, it was stated explicitly that they were either naturals or strivers, though the investors were not told that this was the factor of most interest to the researcher. The study then calculated how much, on average, the investors would be willing to trade off any of the entrepreneurs’ other attributes in order to choose a natural or a striver.

The investors were divided between those with real-life investment experience and those without. Both groups showed a clear preference for the supposed naturals. To gain backing from an experienced investor, for example, a striver would need on average 4.5 more years of leadership experience, 9% better management skills, a 28-point higher IQ and nearly \$40,000 more accrued capital than a natural. Yet before the experiment, most participants had expressed a proclivity for someone who could demonstrate motivation and hard work. This suggests that the bias for natural talent over hard work is unconscious.

Achieving goals through determination is a recurring cultural meme—think of the American dream, say, or the Protestant work ethic. So maybe it is not surprising that people parrot it as an ideal. When it comes to investing, however, the UCL experiment suggests that such puritan values fall by the wayside.

The same may apply for employers. In a 2012 study, Michael Norton of Harvard Business School found that recruiters show a “preference for potential”. That is, they will choose someone unproven for whom they think glory may lie ahead, over someone who can demonstrate a glorious past. It may be that those who have reached their position through hard work do themselves no favours by over-stressing their achievements so far at the expense of other qualities. Ms Tsay suggests that naturals may be chosen because they are deemed to be better at adapting to an uncertain future.

If people do have a predisposed bias for naturals, then they may end up nursing some regrets. Let George Best serve as a salutary tale. While his football career fizzed brightly it also fizzled out early. He quickly got distracted by champagne and the serial pursuit of Miss Worlds. As a penniless Best later lamented: “I spent a lot of money on booze, birds and fast cars. The rest I just squandered.” ■



天才与努力

贝斯特还是基冈？

招聘者及投资者认为才华比毅力更重要

我们要讨论的问题也许可概括为“选乔治·贝斯特还是凯文·基冈？”两人当年都曾被认为是欧洲最好的足球运动员。前者天赋异禀，球场竞技对他来说轻而易举。后者天资稍逊，但通过不懈努力达到巅峰。谁更值得招致麾下？

取展现天赋之人而舍勤学苦练者？这不单是“梦幻橄榄球”（fantasy-football）玩家下注球员时需要思考的问题，投资者及招聘人员有时也面临同样的抉择。

在即将发表的一篇论文中，伦敦大学学院（UCL）的蔡佳蓉对于投资者在“天才”与“奋斗者”之间的取舍做了测试。正如蔡佳蓉承认的，事情很少非黑即白。成功人士多多少少是天才和勤奋相结合的结果，贝斯特和基冈也一样。但选择尺度往往偏重一个方向，至少在人们的观念上是如此。

在一项实验中，蔡佳蓉向意向投资者展示了一组虚构的企业家简介，内容包括其领导经验、管理技能、智商及已筹得的资本。实验的一个版本暗示每位企业家都是主要靠天分达到如今的地位，而另一版本则明确说明这些企业家是靠天分还是奋斗成功的，但投资者没有被告知这是研究人员最关注的因素。该研究接着计算了平均而言投资者为选择一名天才或一名奋斗型企业家，愿意在多大程度上放弃对其他特质的要求。

这些投资者按有无实际投资经验分为两组，两组人员均明显倾向选择假定的天才型企业家。例如，要得到一位资深投资者的支持，平均而言，奋斗型企业家需要比天才型企业家多四年半的领导经验，在管理技能上有9%的优势，智商要高出28分，累积资本要多出接近四万美元。但在实验前，大部分参与者都曾表示偏爱能展现干劲和努力的人选。这显示了人们对天才的偏爱是无意识的。

靠毅力实现目标是一个反复出现的文化模因，比如美国梦之说或新教的工作伦理。所以大家众口一词地以此为理想或许不足为奇。然而，谈到投资，伦敦大学学院的实验表明人们会舍弃这类清教价值观。

对雇主而言，也许同样如此。在2012年一项研究中，哈佛商学院的迈克尔·诺顿（Michael Norton）发现招聘人员“偏爱潜质”。也就是说，相比能展示辉煌业绩的候选人，招聘人员更偏爱那些目前尚未有建树但显现出潜质的人。如今看来，通过努力达到现有成就的人如果过分强调过往成绩而忽略了其他优点，可能对自己并没有好处。蔡佳蓉表示，天才们之所以成为首选，也许是大家认为他们更善于应对不确定的未来。

假如人们真的偏爱天才，最终也许难免有所遗憾。乔治·贝斯特的故事不妨引以为戒。他的足球生涯闪亮耀眼，但也早早熄灭。他成名后不久就分心于香槟美女，追逐一位又一位的世界小姐。后来身无分文的贝斯特感叹道：“我在酒、美女和跑车上花了很多钱。剩下的也挥霍一空了。”■



South Korean exporters

Films are the new stars

Ships and steel suffer, but the entertainment industry shines

FOR an export juggernaut, South Korea's recent losing streak is alarming: for 14 straight months its exports have fallen in value terms compared with a year earlier. In January they plummeted by 18.8% to just under \$37 billion—the steepest drop since 2009. Petrochemical products are a key South Korean export, so low global oil prices partly explain the numbers. Still, the country's longtime engines of growth, including steel mills, shipyards and car plants, appear to be running out of puff.

Last year POSCO, a steel giant set up in 1968, posted its first annual net loss. It had already been bumped down the global rankings by Chinese and Japanese rivals, from third- to fifth-largest producer, between 2010 and 2014. In March Daewoo Shipbuilding & Marine Engineering (DSME), one of the world's biggest shipbuilders, recorded its worst deficit on record, losing more than 5 trillion won (\$4 billion) in 2015. Its sales fell by almost a quarter. It laid off 13,000 workers last year; now it says it will dismiss a further 12,000. In January Hyundai Motor, a carmaker, reported a drop in profits for an eighth straight quarter. It expects sales (combined with those of its affiliate, Kia Motors) to inch up by 1.5% this year—a fraction of the 24% growth achieved in 2010.

Such firms are being hurt by growing output among Chinese producers and by the won's recent strength against the yen, which is helping Japanese rivals. South Korea's exports are equivalent to around half of its GDP, and a quarter of them go to China, where growth has been faltering. Ryu Seung-sun, head of research at Mirae Asset Securities in Seoul, says that because South Korea exports parts for consumer goods, like screens and chips for Chinese smartphones, it is bound to be among the first to suffer from a

worldwide slowdown.

However, Park Sangin, an economist at Seoul National University, thinks internal factors are the bigger culprits: after all, the country's economy weathered the recent global recession with relative ease, he says. Many of its sprawling conglomerates are built around the smokestack industries that powered the country's industrial take-off under Park Chung-hee, a former dictator (and father to the current president, Park Geun-hye) over four decades ago, with the result that manufacturing accounts for as much as a third of South Korea's GDP today. Over the years these *chaebol*, as the conglomerates are known, have expanded into all sorts of sectors. One-tenth of their offshoots are now unprofitable "zombie" firms, kept on life support through cross-shareholdings.

Some industrial groups have begun to shed ailing, non-core businesses; DSME, for example, is selling a subsidiary that runs golf courses. However, others are continuing to diversify in pursuit of new sources of growth. As Samsung's electronics affiliate has lost market share to plucky smartphone-makers in China, the group has moved, among other things, into biopharmaceuticals, the pet project of the conglomerate's de facto boss, Lee Jae-yong. Samsung BioLogics recently broke ground on its third production plant which, when up and running, will make it the world's largest manufacturer of such drugs.

Other businesses are thriving despite the downturn. Seven of the ten best-performing stocks last year in the MSCI Asia Pacific Index, a benchmark followed by big investment funds, were South Korean, among them pharmaceutical, cosmetics and aerospace firms.

Media stocks have been buoyed recently by the success of CJ E&M, a subsidiary of CJ Corp, another *chaebol*. The affiliate established itself as an export star with the hit 2013 film, "A Wedding Invitation" (pictured), made

for the Chinese market with Chinese actors but a Korean crew. In November last year MSCI added CJ E&M to its Korea index, as it bumped out Daewoo Shipbuilding and Hyundai Merchant Marine, a struggling shipping line. As media firms profit from the popularity of Korean soap operas, films and music in China and South-East Asia, more are partnering with Chinese firms to produce or promote content.

It is doubtless a good thing that the South Korean economy no longer has all of its export eggs in a handful of heavy-industrial baskets. But cultural and fashion businesses are no less volatile and vulnerable to global trends than ones that make stuff out of lumps of metal. In February, South Korea's two biggest cosmetics-makers, Kolmar Korea and Cosmax, which now depend heavily on the Chinese market, announced lacklustre earnings. Even a more diverse export base is not enough to protect South Korea entirely from the chill winds blowing across Asia. ■



韩国出口商

电影是新明星

船舶和钢铁业痛苦不堪，但娱乐业欣欣向荣

作为一个出口大国，韩国近来不断丢城失地，令人担忧：以价值计，其出口连续14个月同比下跌。1月出口额暴跌18.8%至不到370亿美元，这是2009年以来的最大跌幅。石油化工产品是韩国主要的出口产品，国际油价如此之低，是出口额猛跌的原因之一。而且该国长期以来的增长引擎，包括钢铁厂、造船厂和汽车制造厂，似乎也渐渐力不从心。

去年，成立于1968年的韩国钢铁巨头浦项制铁公司（POSCO）首次公布了年度净亏损。从2010年到2014年，在中国和日本对手的夹攻下，它的全球排名已从世界第三跌至世界第五。三月，全球最大的造船厂之一大宇造船海洋株式会社（Daewoo Shipbuilding & Marine Engineering, DSME，以下简称大宇造船）录得史上最严重的赤字，2015年亏损超过5万亿韩元（40亿美元）。公司的销售额几乎下跌了四分之一。大宇造船去年裁减了13000名员工，现在公司称还将进一步裁员12000人。一月，现代汽车公布盈利下滑，这已经是连续第八个季度如此。该公司预计今年的销售额（加上其下属公司起亚汽车）将微增1.5%，还不到2010年24%增长的零头。

中国生产商的产出越来越多，加上韩元近来对日元的升值又给了日本对手助力，因而这些韩国公司身受重创。韩国的出口约等于其GDP的一半，其中四分之一出口到中国，而中国的增长已经放缓。首尔未来资产证券（Mirae Asset Securities）的研究部主管柳承顺（音译，Ryu Seung-sun）认为，因为韩国出口消费品的零部件，如中国制造智能手机所用的显示屏和芯片，所以在全球经济放缓时注定首当其冲。

但是国立首尔大学的经济学家朴尚义（音译，Park Sangin）认为内因才是罪魁祸首：毕竟，韩国经济相对较轻松地熬过了最近的全球衰退，他说。该国很多不断扩张的企业集团集中在重工业领域，这些行业在四十多年前，前独裁者朴正熙（也是现任总统朴槿惠的父亲）当政期间曾推动韩

国工业腾飞，结果今天制造业占韩国GDP高达三分之一。时过经年，这些被称作“财阀”（chaebol）的企业集团已经扩展到各个经济部门。它们的分支有十分之一现在是没有利润的“僵尸”公司，靠着交叉持股而存活。

有的产业集团已经开始摆脱境况不佳的非核心业务；例如大宇造船正出售一家经营高尔夫球场的子公司。但是其他公司仍在继续多元化，以追求新的增长点。三星旗下电子公司的市场份额被中国胆识过人的智能手机生产商们所抢夺，因此公司转向生物制药等领域，这是集团实际老板李在镕个人偏爱的计划。三星生物制剂公司（Samsung BioLogics）的第三座生产厂最近破土动工，待其建成运营时将成为世界上最大的生物制药厂。

尽管经济低迷，其他行业却仍然欣欣向荣。去年，在被大型投资基金引为基准的摩根士丹利资本国际亚太指数（the MSCI Asia Pacific Index）里，表现最佳的十只股票中有七只来自韩国，其中有制药、化妆品和航空航天公司。

近来由于另一家韩国财阀CJ集团旗下CJ E&M的成功，媒体股票得以提振。这家下属公司凭借2013年的卖座影片《分手合约》（见图）树立了自己出口明星的地位，该片瞄准中国市场，由中国演员出演，但由韩国团队制作。去年11月，MSCI将CJ E&M纳入其韩国指数，而把大宇造船和一家苦苦挣扎的航运公司现代商船（Hyundai Merchant Marine）剔除在外。由于媒体公司的盈利来自韩国肥皂剧、电影和音乐在中国及东南亚的流行，它们越来越多地与中国公司联合制作或推广内容。

韩国经济不再把所有的出口鸡蛋都放在那几个重工业篮子里，这无疑是一好事。但是和用金属块制造产品的行业相比，文化和时尚行业同样变化多端，容易受到全球趋势的影响。二月，韩国最大的两家化妆品生产商，科玛（Kolmar Korea）和科丝美诗（Cosmax）宣布盈利不佳，这两家公司现在非常倚重中国市场。冷风吹遍亚洲，即便出口基础更加多元也无法保护韩国全然不受其影响。 ■



Italian coffee firms

Not so espresso

The country's roasters have been slow to adapt to a new coffee era

CAFÉ culture may be quintessentially Italian, but it took an American firm to make it global. Howard Schultz says visiting Milan and its cafés in the 1980s inspired him to develop Starbucks into what it is today. More than three decades later, the Seattle coffee giant is poised to enter the Italian market itself. On February 26th Mr Schultz announced a deal with Percassi, a retail developer, to open the chain's first location in the country next year, in Milan.

Starbucks is not the only firm to have stolen a march. An Italian developed the first espresso machine, but a Swiss firm, Nestlé, conquered the market for personal espresso-makers with its Nespresso system. The world's second- and third-largest coffee groups, which merged in 2015 to create Jacobs Douwe Egberts, were American and Dutch, respectively.

Italy's coffee firms are trying to grab more of the global industry for themselves. Italy's re-exports of beans, mostly roasted, have more than doubled over the past decade, to the equivalent of 3.2m standard 60kg sacks, increasing their share of global trade from 6.7% to 8.9%.

Last year Lavazza, Italy's biggest coffee firm, bought Douwe Egberts' Carte Noire premium brand for €800m (\$870m), making it the market leader in France. That followed an initial public offering of 40% of Massimo Zanetti, to raise capital for expansion. Zanetti owns a score of brands, including Boncafé, an Asian roaster; and it is buying a stake in Club Coffee, a Canadian firm with which it has developed compostable capsules. Besides continuing to develop its business-to-business side, Illycaffé is expanding its younger direct-to-consumer arm. It has opened flagship coffee shops in

big cities, from Seoul to San Francisco, and plans to open more.

Jeffrey Young of Allegra World Coffee Portal, a consulting firm, doubts if all this is enough in what has become a highly competitive and consolidated market. Many Italian firms have rested on their laurels, he says, believing their product to be superior. That was once true, but the emergence of coffee-shop chains, and then of craft coffee brands, has changed that. Quality is now a given; branding and the ambience of coffee shops are ever more important.

The industry is now in the grip of a fad for the “science” of coffee-making—improved grinding methods, better monitoring of water quality, and so on. Illycaffé was an early innovator, having pioneered the use of pressurised cans when most others were still selling coffee in paper bags. More recently it has created an app that lets coffee-lovers design and buy their ideal blend—it will be rolled out in some of the firm’s shops later this year. But if innovation and product development continue to be important routes to growth, even Italy’s biggest firms may be outgunned by global giants with much deeper pockets. ■



意大利咖啡公司

不那么浓缩

意大利咖啡生产商未能及时适应咖啡的新纪元

咖啡文化也许是典型的意大利文化，但让它流行全球的是一家美国公司。霍华德·舒尔茨（Howard Schultz）说20世纪80年代游历米兰和那里的咖啡馆给了他灵感，将星巴克发展成如今的规模。30多年后，这一西雅图咖啡巨头准备进入意大利市场。2月26日，舒尔茨宣布与零售商Percassi达成协议，明年该连锁店将在意大利开设第一家门店，地点选在米兰。

抢得先机的公司不只是星巴克。意大利人发明了第一台浓缩咖啡机，但是瑞士公司雀巢凭借它的Nespresso胶囊咖啡机占领了个人用浓缩咖啡机市场。世界第二大和第三大咖啡集团则分别来自美国与荷兰，它们于2015年合并成为Jacobs Douwe Egberts。

意大利的咖啡企业正努力抓住这一行业更多的全球份额。过去十年，意大利再出口咖啡豆的数量翻了一倍多，其中大多数经过烘焙，这相当于320万包标准60公斤装麻袋包，在全球贸易中的份额由6.7%升至8.9%。

去年，意大利最大的咖啡公司Lavazza以8亿欧元（8.7亿美元）收购了Douwe Egberts的高端品牌Carte Noire，成为法国市场的领头羊。这之后是Massimo Zanetti首次公开发行40%的股份，募集资金以备扩张。Zanetti拥有20个品牌，包括亚洲咖啡商Boncafé；它正购买加拿大公司Club Coffee的股份，Zanetti已与这家公司合作研发了可堆肥降解的胶囊。Illy咖啡（Illycaffé）在继续发展B2B业务之余，也在扩展其较新的直接面向消费者的部门。它在从首尔到洛杉矶的各大城市开设了咖啡旗舰店，并且还计划开设更多门店。

咨询公司Allegra World Coffee Portal的杰弗瑞·杨（Jeffrey Young）怀疑在一个竞争已十分激烈、高度整合的市场，这些做法是否足够。他认为很多意大利公司一直躺在功劳簿上，相信自己的产品是最优质的。这曾经是事

实，但连锁咖啡馆的出现，以及继而出现的手工精制的咖啡品牌，已经改变了这一点。现在，质量好是理所当然的，品牌和咖啡店的氛围则更为重要。

这一行业正在兴起讲究咖啡制作“科学”的风潮，比如改进研磨方法、更好地监控水质等等。Illy咖啡是较早的创新者，在大多数同行还在用纸袋售卖咖啡粉时已率先使用压力罐装。最近它还开发了一个应用，让咖啡爱好者可以设计并购买他们理想的口味配搭，今年晚些时候该应用将在公司的一些店面推广。但如果创新和产品研发仍然是增长的重要途径，那么即便是意大利最大的几家公司可能也抵挡不住财力雄厚得多的国际巨头们。





Travel in Africa

Let Africans fly

Air travel in Africa is needlessly hard and costly. Open skies would make it cheaper

FEW places still capture the romance (and frustration) of the early days of flight quite as Africa does. Although air travel in the continent is safer and more common than ever before, it still has some charming anachronisms. In Nigeria everyone applauds when the plane touches down. On tiny propeller-driven planes in Botswana the cabin attendants hand you a little bag of *biltong*, the dried meat that once fed people on long overland treks. In Tanzania, where on some flights almost half the passengers are taking to the skies for the first time, many of the faces in the cabin betray a sense of wonder tinged with fear.

Yet African airlines feel like a prop-blast from the past in regrettable ways, too. In most places, schedules are about as reliable as they were when planes could take off or land only in clear weather. Tickets are costly. Routes are convoluted: a passenger wanting to fly from Algiers to Lagos may have to go via Europe, turning a four-and-a-half-hour journey into one that takes at least nine hours. Most airlines are state-owned and protected from competition. Like a lot of national carriers elsewhere, they tend to be chronically unprofitable and to need frequent bail-outs from taxpayers.

Across Africa, airlines wanting to fly new routes from one country to another need the agreement of both governments first. Getting this can take years of lobbying and, in some cases, bribes. If the airline is not owned by one of the two states, its chances of winning permission nosedive. Fastjet, a London-listed low-cost carrier with operations across Africa, had to wait three years for a green light to fly between Tanzania and neighbouring Kenya. Zimbabwe recently announced that it would not let any airline besides its national carrier fly from Harare to London—although

Air Zimbabwe does not currently service this route, for fear that as soon as its planes land they will be impounded by creditors.

Closed markets carry jumbo-sized costs. It is not just that badly run African state airlines lose money (\$300m last year, or \$3.84 for every airline ticket sold on the continent). Far bigger are the opportunity costs. Lousy air links inhibit trade, exports and investment. In many parts of the world air travel grows about twice as fast as GDP. In Africa it has been expanding by about 5% a year, which is slower than the 6% or so that economic growth has averaged over the past decade.

The lesson from other parts of the world is that when markets are freed, fares fall. This stimulates a huge increase in air travel and gives a boost to all the businesses that depend on mobility. In African countries that have liberalised a bit, this has indeed happened: after a bilateral open-skies deal, fares between South Africa and Zambia fell by almost 40% and passenger numbers rose nearly as much. After Morocco opened its market to European airlines in 2005, the number of passengers jumped by 160% and the number of routes more than tripled, from 83 to 309 in eight years.

A study commissioned by the International Air Transport Association (IATA), a club of big airlines, estimates that if just 12 of Africa's bigger economies opened their skies to one another, fares would fall by more than a third and traffic between them would soar by 81%, to roughly 11m passengers. More than 155,000 new jobs would be created, and \$1.3 billion would be added to GDP. This may well be an underestimate, given Africa's vast size and sparse, shoddy road network, which is about a fifth as dense as the world average and mostly unpaved. Where air travel expands, so do unexpected new industries, such as growing roses in Kenya for export to Europe.

| *Fly freedom*

In 1988 most African governments signed up to the Yamoussoukro Declaration, pledging to open their skies. To date not one has done so fully (although some, such as South Africa, have opened up a lot). Rather than encouraging competition, most African leaders seem more concerned with mollycoddling their bust national carriers. This provides jobs for pals and jets that can be commandeered for presidential shopping trips to Paris. But it is terrible for Africa. The continent will struggle to take off economically while its people are stuck on the runway. Time to let Africans fly. ■



非洲航运

让非洲人起飞

由于不必要的原因，非洲航空旅行艰巨而昂贵。开放领空可降低成本

少有地方能像非洲那样，仍保有早期航空旅行的浪漫色彩（以及挫折感）。虽然非洲大陆上的航空旅运比早前更安全也更普遍，但依然有不少可爱的特色，令人有时光倒流之感。在尼日利亚，飞机着陆时，机上所有人会鼓掌。在博茨瓦纳的小型螺旋桨飞机上，乘务员会给你递上一小包比尔通（biltong）——以前人们长途跋涉时用以充饥的肉干。在坦桑尼亚，一些航班上，几近半数的乘客是第一次坐飞机，机舱里许多人的脸上半带惊叹半带恐惧。

然而，让人遗憾的是，非洲的航空公司也像一股过去喷出的气流。在大多数地方，时刻表的准确性跟以往飞机只能在晴天起飞降落的年代差不多。机票价格昂贵。航线复杂混乱：乘客若想从阿尔及尔飞往拉各斯可能须经欧洲转飞，原本四个半小时的旅程变成至少要九个小时。非洲大多数航空公司为国有企业，被保护免受竞争挑战。与其他地方的许多国有航空公司一样，它们往往长期亏损，经常需要纳税人的资金纾困。

在非洲各国，航空公司想要开通跨国新航线，首先需获两国政府同意。这可能需要多年的游说，在某些情况下甚至需要行贿。如果航空公司属第三国所有，获批机会更将大跌。业务遍及非洲的伦敦上市廉价航空公司Fastjet等候三年才获批开辟从坦桑尼亚飞往邻国肯尼亚的航线。津巴布韦最近宣布不允许其国家航空公司以外的其他公司经营从哈拉雷飞往伦敦的航线——尽管津巴布韦航空公司（Air Zimbabwe）目前并未开通这一航线，怕的是飞机一着陆便被债权人扣押。

封闭的市场背负着巨大的成本。不但经营不善的非洲国有航空公司在亏损（去年亏了三亿美元，即在非洲每卖出一张机票就亏掉3.84美元），机会成本更是大得多。差劲的航线网络限制了贸易、出口及投资。在全球许多地方，航空旅运的增长速度是GDP的两倍。但在非洲，该行业的年增长一

直约为5%，低于过去十年6%左右的平均经济增长率。

世界其他地区的经验是，市场开放，票价便会下降。这会刺激航空旅运大幅增长，促进所有依赖流动性的行业发展。在市场稍有放开的非洲国家，这的确已发生：签署开放领空的双边协议后，南非和赞比亚之间的航班票价下降了近40%，客运量增长也接近40%。摩洛哥在2005年向欧洲航空公司开放市场后，乘客数量跃升160%，航线数量增加了两倍多，在八年间从83条增加至309条。

由国际航空运输协会（IATA，大型航空公司的联盟）委托进行的一项研究估计，只要非洲12个最大经济体相互开放领空，机票价格便可下降超过三分之一，而这些国家之间的客运量将飙升81%，到约1100万人次。将因此创造超过15.5万个新职位，增加13亿美元的GDP。这很可能还低估了实际情况，毕竟非洲辽阔荒芜，劣质的公路网络分布密度约为全球平均水平的五分之一，而且大多为非铺装道路。航空旅运扩展之处，意想不到的新产业也会发展起来，比如在肯尼亚种植出口欧洲的玫瑰。

| 自由飞行

1988年，非洲大多数国家签署了《亚穆苏克罗宣言》（Yamoussoukro Declaration），承诺开放领空。迄今，没有一个国家完全履行了当初的承诺（但南非等一些国家已经开放了很多）。大多数非洲国家领导人似乎更关注保护亏损的国有航空公司，而非鼓励竞争。这能为亲信输送职位，也方便总统到巴黎购物时征用飞机。但对非洲来说，这是坏事。非洲大陆的经济将难以起飞，民众会被困跑道。是时候让非洲人起飞了。■



Facebook

Imperial ambitions

Mark Zuckerberg prepares to fight for dominance of the next era of computing

NOT since the era of imperial Rome has the “thumbs-up” sign been such a potent and public symbol of power. A mere 12 years after it was founded, Facebook is a great empire with a vast population, immense wealth, a charismatic leader, and mind-boggling reach and influence. The world’s largest social network has 1.6 billion users, a billion of whom use it every day for an average of over 20 minutes each. In the Western world, Facebook accounts for the largest share of the most popular activity (social networking) on the most widely used computing devices (smartphones); its various apps account for 30% of mobile internet use by Americans. And it is the sixth-most-valuable public company on Earth, worth some \$325 billion.

Even so, Mark Zuckerberg, Facebook’s 31-year-old founder and chief executive, has even greater ambitions. He has plans to connect the digitally unconnected in poor countries by beaming internet signals from solar-powered drones, and is making big bets on artificial intelligence (AI), “chatbots” and virtual reality (VR). This bid for dominance will bring him into increasing conflict with the other great empires of the technology world, and Google in particular. The ensuing battle will shape the digital future for everyone.

| *Empires built on data*

Facebook has prospered by building compelling services that attract large audiences, whose attention can then be sold to advertisers. The same is true of Google. The two play different roles in their users’ lives: Google has masses of data about the world, whereas Facebook knows about you and your friends; you go to Google to get things done, but turn to Facebook

when you have time to kill. Yet their positions of dominance and their strategies are becoming remarkably similar. Unparalleled troves of data make both firms difficult to challenge and immensely profitable, giving them the wealth to make bold bets and to deal with potential competitors by buying them. And both firms crave more users and more data—which, for all the do-gooding rhetoric, explains why they are both so interested in extending internet access in the developing world, using drones or, in Google’s case, giant balloons.

The task is to harness data to offer new services and make money in new ways. Facebook’s bet on AI is a recognition that “machine learning”—in which software learns by crunching data, rather than having to be explicitly programmed—is a big part of the answer. It already uses AI techniques to identify people in photos, for example, and to decide which status updates and ads to show to each user. Facebook is also pushing into AI-powered digital assistants and chatbot programs which interact with users via short messages. Next week it is expected to open up its Messenger service (which can already be used to do things like order an Uber car), to broaden the range of chatbots. And Facebook’s investment in VR—it bought Oculus, the cheerleader of this emerging field, for \$2 billion in 2014—is a bold guess about where computing and communication will go after the smartphone.

But Facebook faces rivals in all these areas. Google is using AI techniques to improve its internet services and guide self-driving cars, and other industry giants are also investing heavily in AI—though with the deepest pockets and the most data to crunch, Facebook and Google can attract the best researchers and most promising startups. Facebook lags behind Amazon, Apple, Google and Microsoft when it comes to voice-driven personal assistants; when it comes to chatbots, it faces competition from Microsoft and a host of startups eager to prove that bots are the new apps. And its push into VR—which Mr Zuckerberg sees as a stepping stone to “augmented reality” (AR), where information is superimposed on the real

world—pits it against formidable rivals, too. Microsoft has jumped straight to AR with its HoloLens headset, its most impressive product in years, and Google, already active in VR, has invested in Magic Leap, a little-known AR startup.

The scale of Facebook’s ambition, and the rivalries it faces, reflect a consensus that these technologies will transform how people interact with each other, with data and with their surroundings. AI will help devices and services anticipate your needs (Google’s Inbox app already suggests replies to your e-mails). Conversational interfaces will let you look things up and get things done by chatting to a machine by voice or text. And intelligent services will spread into a plethora of products, such as wearable devices, cars and VR/AR goggles. In a decade’s time computing seems likely to take the form of AR interfaces mediated by AI, using gestures and speech for inputs and the whole world as its display. Information will be painted onto the world around you, making possible new forms of communication, creativity and collaboration.

This is the ambitious vision that Facebook, Google, Microsoft and other technology giants are working towards. But along the way there are certain to be privacy and security concerns. Crunching all that information to provide personalised services looks a lot like surveillance, and will cause a backlash if consumers do not feel they are getting a good deal in return for handing over their personal details (as the advertising industry is discovering to its cost)—or if security is inadequate.

| *Power from the people*

There will also be worries about concentration and monopoly, and the danger of closed ecosystems that make it hard for people to switch between services. Facebook’s plan to offer free access to a limited subset of websites was blocked by India’s telecoms regulator, which argued that it was “risky” to allow one company to act as a gatekeeper. And Germany’s competition

authority is investigating the way Facebook handles personal data. As its dominance grows, Facebook can expect to face more such cases, as Microsoft and Google did before it.

Striking a balance between becoming ever more intimately entwined in billions of peoples' lives, making huge profits as a result and avoiding a backlash will be one of the biggest business challenges of the century. Even in ancient Rome, emperors could find that the crowd suddenly turned against them. So applaud Mr Zuckerberg—and fear for him, too. ■



Facebook

帝国野心

马克·扎克伯格准备为争夺下一个计算时代的统治地位而战

自罗马帝国时代以来，“竖起大拇指”这一手势就成为了公开且有力的权力象征。成立仅十二年之后，Facebook已成为一个伟大的帝国，人口众多、财富无数、领袖魅力非凡，且影响力和影响范围令人难以想象。这一全球最大的社交网络拥有16亿用户，其中十亿每天平均使用时间超过20分钟。在西方世界，Facebook在最广泛使用的计算设备（智能手机）上的最受欢迎的活动（社交网络）中所占份额最大；它各种各样的应用占美国人移动互联网使用的30%。它是全球市值第六大的上市公司，价值3250亿美元。

即便如此，31岁的Facebook创始人及首席执行官马克·扎克伯格（Mark Zuckerberg）仍有更宏伟的志向。他计划用太阳能供电的无人机发送互联网信号，以连接贫困国家尚未连入数字世界的人，他在人工智能（AI）、聊天机器人和虚拟现实（VR）上押下重注。对统治地位的角逐会令他和科技世界其他伟大帝国之间的冲突不断增加，尤其是同谷歌之间。今后的战斗将为每个人塑造数字化的未来。

| 数据上的帝国

Facebook打造多个引人瞩目的服务吸引大量用户，继而将用户的关注卖给广告商，以此取得成功。谷歌也是如此。这两大公司在其用户的生活中扮演着不同的角色：谷歌拥有关于这个世界的大量数据，而Facebook了解你和你的朋友；你用谷歌是为了完成任务，但要打发时间时你会找Facebook。然而它们的统治地位和战略正变得越来越相似。无与伦比的数据宝藏让两家公司都难有敌手，且获利颇丰，它们的财富足以掷下豪注并且通过收购解决潜在竞争者。这两家公司渴求更多用户、更多数据，用冠冕堂皇的说法，这解释了为何它们都对在发展中国家扩展互联网连接兴趣浓厚，Facebook使用无人机，谷歌则使用巨型气球。

现在的任务是利用数据提供新的服务，以新的方式赚钱。Facebook在人工

智能方面的赌注是对“机器学习”的认可，即软件通过分析数据学习，而不需要精确编写程序。例如，它已经利用人工智能技术来辨识照片中的人像，也用这一技术确定向每个用户展示什么样的状态更新和广告。Facebook还在推动由人工智能支持的数字助手和聊天机器人程序，它们通过简短的信息与用户互动。下周它计划开放Messenger服务（它已经可以用来做一些事情，例如从优步叫车），并且拓宽聊天机器人的适用范围。Facebook在虚拟现实上的投资是对计算和通信在智能手机之后将何去何从的大胆预测，它于2014年以20亿美元收购了这一新兴领域的领头羊Oculus。

但是在所有这些领域Facebook都有对手。谷歌正利用人工智能技术提升其互联网服务、指引无人驾驶汽车，其他业界巨头也不惜重金投资人工智能，不过Facebook和谷歌钱袋最鼓、有最多数据可供分析，因此能吸引到最优秀的研究人员和最具潜力的创业公司。在由语音控制的个人助理领域，Facebook落后于亚马逊、苹果、谷歌和微软；而在聊天机器人领域，它的对手是微软以及诸多急于证明机器人是新应用的创业公司。虚拟现实领域被扎克伯格视作“增强现实”（AR）的踏脚石，AR即信息被叠加在真实世界上的技术。进军这一领域也让Facebook和强敌正面交锋。微软凭借其多年来最引人瞩目的产品HoloLens头盔直接挺进AR，而在VR领域已十分活跃的谷歌已经投资了Magic Leap，一家鲜为人知的AR创业公司。

Facebook的雄心壮志及其面临的竞争反映出一个共识，即这些技术将转变人与人之间、人与数据之间、人与周围环境之间的互动方式。人工智能会帮助设备和服务预测你的需求（谷歌的Inbox应用已经能对如何回复电子邮件提出建议）。会话接口能让你通过语音或文字与机器对话来查阅信息和完成任务。智能服务将扩展到太多产品中，如可穿戴设备、汽车和VR/AR眼镜等。十年之内，计算看似有可能采取增强现实界面，以人工智能为媒介，用手势和语音进行输入，将整个世界作为它的显示器。信息将被叠映在你周围的世界之上，让新形式的交流、创造与合作成为可能。

这是Facebook、谷歌、微软及其他科技巨头为之努力奋斗的恢弘愿景。但沿途必定会有隐私和安全问题。分析所有信息以提供个性化的服务看起来

很像监控，并且如果消费者感觉在提交个人详细资料后并没有获得大量回报（广告业吃过苦头后正在明白这一点），又或者安全性不足，会引发激烈反对。

| 人的力量

也有人会担心集中、垄断以及封闭式生态系统的危险，让人很难在各种服务之间切换。Facebook提供免费接入一些指定网站的计划被印度电信监管部门阻拦，它们认为让一家公司来把关“太过危险”。德国的竞争主管机构正在调查Facebook处理个人信息的方式。随着其统治地位的不断加强，可以预见Facebook会遭遇更多此类情况，正如微软和谷歌所经历的那样。

既能和数十亿人的生活更紧密地交织在一起，又可借此获得巨额利润并且避免强烈反对，如何在其间取得平衡将成为本世纪最大的商业挑战之一。即便是在古罗马，帝王们也会发现民众会突然转而反抗他们。所以为扎克伯格鼓掌，也为他担忧吧。■



Business in Africa

Making Africa work

The continent's future depends on people, not commodities

“IS ANYONE here actually hoping to make any money, or are you all just trying to minimise your losses?” The question, asked at a dinner in London for investors who specialise in Africa, showed how the mood has changed in the past year. The financiers around the table—mostly holders of African bonds—all said they were simply trying not to lose money.

Only a few years ago people were queuing up to invest in Africa. As recently as 2012 Zambia paid less than Spain to borrow dollars. Private-equity funds dedicated to Africa raised record sums to invest in shopping malls and firms making everything from nappies to fruit juice. Businessfolk salivated at the prospect of selling to the fast-growing African middle class, which by one measure numbered 350m people. Miners sank billions into African soil to feed China's appetite for minerals.

Now investors are glum. In the short run, they are right to worry. In the long run, as our special report on African business shows this week, the potential rewards from a market of 1.2 billion people are too juicy to ignore, despite the risks.

| *From oil in the gears to sand in the wheels*

For decades, sentiment about Africa has followed commodity prices, rising and falling like a bungee-jumper at Victoria Falls. The recent plunge has caused a 16% drop in sub-Saharan Africa's terms of trade (the ratio of the price of its exports to that of its imports). Growth across the region will slow to about 3% this year, predicts the World Bank, down from 7-8% a decade ago. That is barely ahead of population growth of 2.7%. Nigeria and Angola, two big oil exporters, will probably need bail-outs from the IMF

within a year.

Yet Afro-pessimists should remember two things about commodity busts. They don't last for ever. And they don't hurt everyone: 17 African countries with a quarter of the region's population will show a net benefit from the current one, thanks to cheaper energy. More important, by focusing on the minerals markets it is easy to miss some big trends that are happening above ground—and these are mostly positive.

The first is that Africa is far more peaceful than it was even a decade ago. The wars that ripped apart the Democratic Republic of Congo and sucked in its neighbours, causing millions of deaths, have largely been quelled. A few states, such as Somalia, South Sudan and the Central African Republic, are in chaos. But overall the risk of dying violently in Africa has tumbled. The latest ranking of the world's most violent countries by the Geneva Declaration includes just two African states (tiny Lesotho and Swaziland) among its top ten.

Africa is also far more democratic than it was. In the 1960s, 1970s and 1980s, only one sub-Saharan government was peacefully voted out of office. Now nearly all face regular elections, which are harder to rig thanks to social media. Voters have real choices—one reason why policies have improved.

Old-style governments favoured nationalisation, printing money and (in some cases) rounding peasants up at gunpoint and forcing them onto collective farms. Small wonder Africa grew poorer between 1980 and 2000. Now inflation has largely been tamed, most central banks are islands of excellence and many ministers boast of cutting red tape. Five of the ten fastest reformers in the World Bank's latest report on the ease of doing business are African. Better government has led to better results. The proportion of Africans living in absolute poverty has fallen from 58% to 41% since 2000. In that time primary-school enrolment has risen from

60% to 80%. Annual malaria deaths have fallen by more than 60%.

Pessimists fret that much of this progress will reverse now that Africa faces economic headwinds. There are some worrying signs. Leaders once hailed as democrats are amending constitutions to escape term limits. In Congo, Joseph Kabila's efforts to cling to power risk restarting a civil war, as the president of neighbouring Burundi already has. The continent's two biggest economies are making needless and costly policy errors. Nigeria is trying to prop up its overvalued currency by, in effect, banning imports. Instead it is driving up inflation. South Africa, meanwhile, has prompted capital flight and brought economic growth to a halt by keeping in power a president who was found to have breached the constitution and on whose watch corruption has flourished.

But massive missteps like these are now the exception rather than the rule. Most countries in Africa are following sound economic policies, controlling government deficits and keeping inflation in check. Dig beneath the headlines, and even in countries that are making big errors there is momentum for reform: in South Africa once-taboo policies such as privatisation are back on the table, and in Nigeria the government is clamping down on corruption and trimming a bloated civil service. Ethiopia is sucking in foreign investment, and smaller economies such as Ivory Coast and Rwanda are growing rapidly after making it easier to do business. ■



非洲商业

让非洲发展起来

非洲的前途依赖人，而非大宗商品

“在座的有没有任何人希望能赚到钱，还是大家都只是想把损失降到最低？”这个问题在伦敦一个为专事非洲投资的投资者举办的晚餐会上提出来，体现出过去一年的情绪变化。在座的各位金融家大部分手中都持有非洲债券，他们都说自己只是想不要亏钱。

然而仅仅在几年前，大家都还挤破头要在非洲投资。就在2012年，赞比亚美元贷款的利息比西班牙还低。专注投资非洲的私募股权基金筹得破纪录的资金用于投资购物中心和企业，这些公司生产的产品从尿片到果汁一应俱全。非洲的中产阶级正在快速成长，一项数据显示其人数可达3.5亿，商界人士一想到这些人是他们未来的销售对象便垂涎三尺。矿产公司也向非洲的土地中砸入数十亿美元以满足中国对矿产资源的需求。

但现在投资者们个个愁容满面。短期来看，他们确实有理由担心。长期来说，我们本周对非洲经济的特别报道显示，这个有着12亿人口的市场潜在回报巨大不容忽视，尽管风险也不小。

| 从一路顺风到磕磕绊绊

数十年来，对非洲的投资情绪一直随大宗商品价格波动，如同在维多利亚瀑布蹦极跳一样忽上忽下。最近大宗商品价格大跌已令撒哈拉以南非洲的贸易比率（出口商品与进口商品价格的相对价格比率）下降了16%。世界银行估计整个地区今年的经济增长将会从十年前的7%到8%放缓至3%，勉强高于2.7%的人口增幅。石油出口大国尼日利亚和安哥拉恐怕年内就会需要IMF的紧急救助。

然而对非洲持悲观情绪的人们就大宗商品价格大跌的问题需要记住两点：第一，价格不会永远下跌；第二，不是所有人都从中受害。由于能源价格低廉，非洲有17个国家（占非洲总人口四分之一）将会在这一轮大跌的情

况下获得净收益。更为重要的是，过于关注矿产品市场会容易忽略矿产行业以外的一些大趋势——而这些趋势多数都令人乐观。

首先，非洲要比十年前太平多了。内战曾一度令刚果民主共和国四分五裂，且波及多个邻国，令数百万人丧生。如今，战火已基本平息。还有一些国家，如索马里、南苏丹和中非共和国，仍然处于混乱之中，但总体来说在非洲死于暴乱的危险已大为降低。《日内瓦宣言》最近列出的十个暴力情况最为严重的国家中，只有两个是非洲国家（小国莱索托和斯威士兰）。

其二，非洲如今也更为民主了。在上世纪六十、七十和八十年代，在撒哈拉以南非洲只有一个政府通过投票和平下台。现在几乎各国都会定期选举，而且在社交媒体的监督下，操纵选举愈发困难。选民们有了真正的选择——这也是政策有所改善的一个重要原因。

老派的政府喜欢国有化、印制钞票和（在有些情况下）用枪杆逼着农民加入集体农场。难怪在1980至2000年期间，非洲变得更穷了。现在，通货膨胀已经得到了极大遏制，大多数央行表现卓越，很多部长级高官都以简化政府流程为夸耀的资本。世界银行最近一次的营商便利度报告中，十个改进速度最快的国家中有五个都在非洲。更好的政府带来了更好的发展。非洲的赤贫人口占比已从2000年的58%下降至41%，同期的小学入学率从60%升至80%。每年因疟疾致死的人数已经下降了超过60%。

持悲观态度的投资者担心非洲经济遇到强劲逆风，大多所取得的进步都会倒退。现在也的确有一些令人担忧的征兆。一些曾被尊为民主主义者的领导人们正在试图修改宪法以突破任期限制。在刚果，约瑟夫·卡比拉

（Joseph Kabila）对权力撒手不放，有可能会再次引发内战，邻国布隆迪的总统就是前车之鉴。非洲两个最大的经济体在政策方面正在犯下不必要且成本高昂的错误。尼日利亚实际上在试图通过禁止进口来支撑其估值过高的货币，然而事与愿违，这反而推高了国内的通货膨胀。同时，南非因保留了已被发现违宪且纵容腐败的总统，导致资本外逃，经济停滞。

然而这种弥天大错仅仅是例外，并不具有普遍性。非洲大部分国家都在遵循明智的经济发展政策，控制政府赤字，遏制通货膨胀。深挖到新闻头条背后就会发现，即使在犯下大错的国家，仍然有着改革的动力：在南非，如私有化等政策不再是禁忌，又重新得以讨论；在尼日利亚，政府正在打击腐败，精简庞大的公务员队伍；埃塞俄比亚正在吸收外资；而一些小经济体，如科特迪瓦和卢旺达，在改善营商环境之后增长迅速。 ■



Russia's central-bank governor

Putin's right-hand woman

The Russian economy is in a bad way, but Elvira Nabiullina has saved it from worse

ELVIRA NABIULLINA'S first encounter with capitalism came during her university days, when she enrolled in a course called "Critique of Western Economic Theory". It was an unusual start for a modern central banker. These days she embodies another contradiction. Russia's economy has been held back for years by corruption and rent-seeking, and more recently by Western sanctions and the low price of oil and gas, the country's main exports. Yet the Central Bank of Russia (CBR) is a model of competent, technocratic policymaking. Since Ms Nabiullina became governor in 2013, the CBR has kept Russia's economy, awful though it is, out of worse trouble.

The soft-spoken Ms Nabiullina has humble roots. Her mother worked in a factory; her father was a chauffeur. For years she has been at the centre of Russia's turbulent transition to a market economy. When Vladimir Putin became president in 2000, he proclaimed a break with the chaos of the 1990s. But when it came to economics "Putin didn't have clear ideas," says Yevgeny Yasin, a former economy minister. He thus entrusted economic policy to a cadre of professionals with orthodox views, including Ms Nabiullina, who became deputy economy minister in 2000 and minister in 2007, an experience she calls "the most influential" on her approach to economics.

The crisis of 2008-09, when oil prices fell and the world economy stagnated, revealed that the Russian economy was dependent on flighty foreign hedge funds and retail investors. As they pulled money out, the CBR tried to prop up the value of the rouble, losing over \$200 billion of foreign-exchange reserves in a matter of months (see chart). Lending shrivelled across the economy. In 2009 GDP shrank by 8%.

That prompted Russia to enact two sets of reforms, in preparation for the inevitable next oil-price crash. First, it diversified its sources of funding. In 2013, for instance, Russian regulators made it possible for Euroclear and Clearstream, two international securities depositories, to begin handling certain Russian bonds. That helped to attract institutional investors, who tend to shrug off market gyrations and like to buy assets when they are cheap, says Jan Dehn of Ashmore, a fund manager.

On Ms Nabiullina's watch Russia's domestic investment market, another source of stable funding, has also deepened. The share of Russia's public debt in domestic hands rose from 66% to 70% in 2013 alone. Goldman Sachs, a bank, reckons that the assets of Russian pension funds, which are regulated by the CBR, will increase from about \$60 billion today to about \$200 billion by 2020.

This diversification of funding, Mr Dehn says, has left the Russian economy less starved of capital than it would otherwise have been. Relative to the size of the economy, private-sector capital flight was smaller in 2014-15 than in 2008-09. In 2015 GDP shrank by 4%, a better performance than in 2008-09, despite a bigger drop in the oil price.

The second big change in policy since 2008-09 concerns Russia's international reserves. They grew by \$140 billion in 2009-13 to more than \$500 billion (about a fifth of Russian GDP), thanks to high oil prices. This big cushion is one reason why Russia has been able to pursue an aggressive, anti-Western foreign policy, since it has not needed to turn to the IMF for a bail-out, as it did in 1998. Ultimately that will not work to Russians' advantage. But it also gave Ms Nabiullina room for manoeuvre.

To maintain reserves when the oil price began to fall, Ms Nabiullina accelerated a plan to allow the rouble to float. It fell by 40% against the dollar in 2015 alone. Propping up the rouble would have been popular, since

it would have preserved ordinary Russians' purchasing power, but it would have meant burning through the country's reserves again. Instead the CBR channelled dollars to sanction-hit banks and energy companies, to help them repay external debt. Reserves have also been used to finance the budget deficit. As oil prices recover, so the CBR is again accumulating reserves, with a view to hitting the \$500 billion mark once again.

The rouble's fall has stoked inflation, as imports have become more expensive. As a result, real (ie, adjusted for inflation) wages have fallen by more than 10% since 2014. (They are still triple what they were when Mr Putin took office in 2000.) Interest rates, which in 2014 were jacked up to 17%, have been the only tool the CBR has used to stem the rouble's fall. High rates also help to bring down inflation, currently 7%, towards the CBR's target of 4%. These decisions have "reflected the capacity of the institution to do what is right for the country regardless of the political situation", says Birgit Hansl of the World Bank.

Such steps have been "painful, but necessary", in Ms Nabiullina's words. To ease the pain, the government is spending 3% of GDP recapitalising well-managed banks and compensating Russians with savings in bad ones. In addition, banks were temporarily allowed to revalue foreign-exchange liabilities at a pre-crisis exchange rate, making their balance-sheets seem healthier than they really were, and thus allowing them to lend more. The CBR also allowed banks to offer forbearance on souring debts, a move cautiously welcomed by the IMF. All these measures may be paying off: non-performing loans remain at a lower level than in 2008-09. Credit is inching up.

At the same time Ms Nabiullina has tightened supervision. "She received *carte blanche* from the president to go after those banks that were earlier untouchable," says Oleg Vyugin, chairman of MDM Bank and a former deputy governor of the central bank. About 200 banking licences have been

rescinded since 2014, roughly one-fifth of the total.

Nonetheless, the long-term economic outlook is poor. Ms Nabiullina's critics say the CBR's tight monetary policy is the culprit, since it cripples investment. But corporate profits rose by 50% last year as the rouble value of foreign earnings jumped; companies have plenty of cash to invest. In regular surveys, manufacturers cite policy uncertainty, not high interest rates, as a big constraint. Ms Nabiullina agrees. "Our economic downturn is mostly the result of structural factors," she says. What worries her most is not protracted low oil prices, but "how quickly and dynamically" Russia can improve its business environment. Until then, the CBR will have an outside role in keeping the Russian economy going. ■



俄罗斯央行掌门人

普京的巾帼干将

俄罗斯的经济处境不佳，但埃莉维拉·纳比乌琳娜已经让它免于更糟

埃莉维拉·纳比乌琳娜（Elvira Nabiullina）最初接触到资本主义时还在上大学，当时她选了一门课，名叫《西方经济理论批判》。对于一位现代中央银行行长而言，这是个不寻常的开头。如今她体现出另一种矛盾。因为腐败和寻租行为，多年来俄罗斯的经济发展遭到抑制，近来又受到西方制裁以及石油和天然气——俄罗斯主要的出口产品价格下跌的冲击。俄罗斯中央银行则是有能力的技术官僚制定政策的典范。自纳比乌琳娜2013年出任行长以来，尽管俄罗斯经济仍旧糟糕，但俄罗斯央行做到了防止它跌入更糟的境地。

轻言细语的纳比乌琳娜出身平民家庭。她的母亲在工厂工作，父亲是名司机。多年来她都处在俄罗斯向市场经济动荡转型的中心。普京2000年当选总统时曾公开表示要和20世纪90年代的混乱一刀两断。但是涉及到经济，“普京并没有清晰的思路，”前经济部长叶夫根尼·亚辛（Yevgeny Yasin）说。因此他把经济政策委托给一批持正统观点的专业人士，其中包括纳比乌琳娜，她于2000年出任经济副部长，2007年升任部长，她认为这段经历对她处理经济的方式“影响最大”。

2008年至2009年，油价下跌，世界经济停滞，这场危机暴露出俄罗斯经济依靠的是反复无常的国外对冲基金和散户投资者。当它们将资金撤出时，俄罗斯央行想要支撑住卢布的币值，仅数月就损失了两千多亿美元的外汇储备（见图表）。整个经济信贷萎缩。2009年俄罗斯GDP缩水8%。

这促使俄罗斯颁布了两套改革方案，为不可避免的下次油价暴跌做准备。首先，它让资金来源多元化。例如，2013年俄罗斯监管部门允许两大国际证券存管机构，欧洲债券结算系统（Euroclear）和明讯银行（Clearstream），开始经手某些俄罗斯债券。基金管理公司安石（Ashmore）的简·德恩（Jan Dehn）称，这有助于吸引机构投资者，它

们往往对市场波动不屑理睬，喜欢在低价时买进资产。

在纳比乌琳娜的照管下，俄罗斯另一个稳定的资金来源，即国内投资市场，也已深化。仅2013年，国内持有的俄罗斯国债的比例就从66%升至70%。高盛银行估算，到2020年由俄罗斯央行监管的俄罗斯养老基金的资产将从现在的约600亿美元升至约2000亿美元。

德恩认为，资金来源多元化减轻了俄罗斯经济资本匮乏的程度，否则情况可能更糟。相对于经济规模而言，2014年至2015年私营部门的资本外流少于2008年至2009年。2015年GDP缩水4%，表现好于2008年至2009年，尽管油价跌幅更大。

自2008年到2009年以来政策上的第二大变革是俄罗斯的外汇储备。2009年至2013年因为油价高涨，外汇储备增加了1400亿美元，达到5000多亿美元（约为俄罗斯GDP的五分之一）。这一巨大的缓冲是俄罗斯能够贯彻激进的、反西方外交政策的原因之一，因为它不需要再像1998年那样求助于国际货币基金组织要求纾困。这最终不会对俄罗斯有利，但这也给了纳比乌琳娜回旋的空间。

为了在油价开始下跌时维持储备，纳比乌琳娜加快推进一项计划，允许卢布浮动。仅2015年一年，卢布兑美元就下跌了40%。支撑卢布会受欢迎，因为这样做能够保持普通俄罗斯民众的购买力，但是这也意味着要再次耗尽该国的外汇储备。所以俄罗斯央行转而将美元调配到遭受经济制裁的银行和能源公司，帮助它们偿还外债。储备也用来填补财政预算赤字。因此随着油价恢复，俄罗斯央行正再次积累外汇储备，想再度冲击5000亿美元的规模。

卢布下跌已经引发了通货膨胀，因为进口商品已变得更加昂贵。所以2014年以来，实际（即考虑通胀因素后）工资下降超过10%。（但仍是2000年普京上台时的三倍。）2014年涨至17%的利率已经成为俄罗斯央行用来阻止卢布下跌的唯一工具。高利率也有助于将目前7%的通胀水平降至俄罗斯央行4%的目标。世界银行的比吉特·汉苏尔（Birgit Hansl）认为这些

决定“反映出无论政治环境如何，央行能够做出对国家正确的事”。

用纳比乌琳娜的话来说，这些步骤“很痛苦，但十分必要”。为了缓解痛苦，政府用3%的GDP为管理良好的银行重组资本，并且补偿在管理不善的银行存款的俄罗斯人。另外，允许银行暂时按经济危机前的汇率对外汇债务重新估价，这样它们的资产负债表看起来比实际上更健康，因而可以更多放贷。俄罗斯央行还允许银行为不良债务展期，国际货币基金组织对这一举措表示了谨慎的欢迎。所有这些措施或许正在起效：不良贷款仍保持在比2008年至2009年更低的水平，信贷规模正逐渐提升。

与此同时，纳比乌琳娜加强了监管。莫斯科商业世界银行（MDM Bank）的董事长、央行前副行长奥列格·维尤金（Oleg Vyugin）说，“总统全权委托她追查那些银行，以前那都是碰不得的。”2014年以来大概200个银行牌照被撤销，约占总数的五分之一。

不过，经济长期展望堪忧。批评纳比乌琳娜的人认为俄罗斯央行紧缩的货币政策是罪魁祸首，因为这一政策削弱了投资。但由于以卢布计价的外汇收入的激增，去年公司利润提升了50%；公司有大量现金可用于投资。在定期调查中，制造商将政策不确定性、而不是高利率视为一大障碍。纳比乌琳娜也赞同，她说：“我们的经济衰退主要是结构性因素的结果。”她最为担忧的并非旷日持久的低油价，而是俄罗斯能够“多迅速、多积极”地改善商业环境。到那时，俄罗斯央行将在维持俄罗斯经济方面起到巨大的作用。 ■



The 21st-century economy

How to measure prosperity

GDP is a bad gauge of material well-being. Time for a fresh approach

WHICH would you prefer to be: a medieval monarch or a modern office-worker? The king has armies of servants. He wears the finest silks and eats the richest foods. But he is also a martyr to toothache. He is prone to fatal infections. It takes him a week by carriage to travel between palaces. And he is tired of listening to the same jesters. Life as a 21st-century office drone looks more appealing once you think about modern dentistry, antibiotics, air travel, smartphones and YouTube.

The question is more than just a parlour game. It shows how tricky it is to compare living standards over time. Yet such comparisons are not just routinely made, but rely heavily on a single metric: gross domestic product (GDP). This one number has become shorthand for material well-being, even though it is a deeply flawed gauge of prosperity, and getting worse all the time. That may in turn be distorting levels of anxiety in the rich world about everything from stagnant incomes to disappointing productivity growth.

| *Faulty speedometer*

Defenders of GDP say that the statistic is not designed to do what is now asked of it. A creature of the 1930s slump and the exigencies of war in the 1940s, its original purpose was to measure the economy's capacity to produce. Since then, GDP has become a lodestar for policies to set taxes, fix unemployment and manage inflation.

Yet it is often wildly inaccurate: Nigeria's GDP was bumped up by 89% in 2014, after number-crunchers adjusted their methods. Guesswork prevails: the size of the paid-sex market in Britain is assumed to expand in line with

the male population; charges at lap-dancing clubs are a proxy for prices. Revisions are common, and in big, rich countries, bar America, tend to be upwards. Since less attention is paid to revised figures, this adds to an often exaggerated impression that America is doing far better than Europe. It also means that policymakers take decisions based on faulty data.

If GDP is failing on its own terms, as a measurement of the value-added in an economy, its use as a welfare benchmark is even more dubious. That has always been so: the benefits of sanitation, better health care and the comforts of heating or air-conditioning meant that GDP growth almost certainly understated the true advance in living standards in the decades after the second world war. But at least the direction of travel was the same. GDP grew rapidly; so did quality of life. Now GDP is still growing (albeit more slowly), but living standards are thought to be stuck. Part of the problem is widening inequality: median household income in America, adjusted for inflation, has barely budged for 25 years. But increasingly, too, the things that people hold dear are not being captured by the main yardstick of value.

With a few exceptions, such as computers, what is produced and consumed is assumed to be of constant quality. That assumption worked well enough in an era of mass-produced, standardised goods. It is less reliable when a growing share of the economy consists of services. Firms compete for custom on the quality of output and how tailored it is to individual tastes. If restaurants serve fewer but more expensive meals, it pushes up inflation and lowers GDP, even if this reflects changes, such as fresher ingredients or fewer tables, that customers want. The services to consumers provided by Google and Facebook are free, so are excluded from GDP. When paid-for goods, such as maps and music recordings, become free digital services they too drop out of GDP. The convenience of online shopping and banking is a boon to consumers. But if it means less investment in buildings, it detracts from GDP.

| *Stop counting, start grading*

Measuring prosperity better requires three changes. The easiest is to improve GDP as a gauge of production. Junking it altogether is no answer: GDP's enduring appeal is that it offers, or seems to, a summary statistic that tells people how well an economy is doing. Instead, statisticians should improve how GDP data are collected and presented. To minimise revisions, they should rely more on tax records, internet searches and other troves of contemporaneous statistics, such as credit-card transactions, than on the standard surveys of businesses or consumers. Private firms are already showing the way—scraping vast quantities of prices from e-commerce sites to produce improved inflation data, for example.

Second, services-dominated rich countries should start to pioneer a new, broader annual measure, that would aim to capture production and living standards more accurately. This new metric—call it GDP-plus—would begin with a long-overdue conceptual change: the inclusion in GDP of unpaid work in the home, such as caring for relatives. GDP-plus would also measure changes in the quality of services by, for instance, recognising increased longevity in estimates of health care's output. It would also take greater account of the benefits of brand-new products and of increased choice. And, ideally, it would be sliced up to reflect the actual spending patterns of people at the top, middle and bottom of the earnings scale: poorer people tend to spend more on goods than on Harvard tuition fees.

Although a big improvement on today's measure, GDP-plus would still be an assessment of the flow of income. To provide a cross-check on a country's prosperity, a third gauge would take stock, each decade, of its wealth. This balance-sheet would include government assets such as roads and parks as well as private wealth. Intangible capital—skills, brands, designs, scientific ideas and online networks—would all be valued. The ledger should also account for the depletion of capital: the wear-and-tear of machinery, the deterioration of roads and public spaces, and damage to the

environment.

Building these benchmarks will demand a revolution in national statistical agencies as bold as the one that created GDP in the first place. Even then, since so much of what people value is a matter of judgment, no reckoning can be perfect. But the current measurement of prosperity is riddled with errors and omissions. Better to embrace a new approach than to ignore the progress that pervades modern life. ■



21世纪经济

繁荣该如何衡量

GDP不是衡量物质福祉的好标准，是时候换一种新方法了

你是愿意做中世纪的国王呢，还是当现代的上班族？国王仆役成群，身穿最精美的丝绸，享用山珍海味，但却拿牙疼没辙，而且有可能因为感染而丧命。坐马车来往于不同宫殿之间要一周的时间，总听那帮弄臣讲笑话也会生厌。只要想到现代牙科、抗生素、乘飞机旅行、智能手机和YouTube，就会觉得当21世纪的上班族看起来更有吸引力。

这个问题可不仅是个游戏，它说明了要比较不同时代的生活标准有多么棘手。但是，人们不但经常做这样的比较，而且还非常依赖单一的标准：国内生产总值（GDP）。这一数字已经成了物质福祉的代名词，尽管它作为衡量繁荣的指标存在严重缺陷，而且还一直都在变得更糟。它可能会进而让富裕世界对一切都更加焦虑——从收入停滞不前，到生产率增长令人失望。

| 有缺陷的测速表

维护GDP的人认为，它本来就不是用来衡量繁荣水平的。GDP是上世纪三十年代经济大萧条时期以及四十年代二战期间紧急状态的产物。它最初的用途是衡量一国的生产能力。自那以后，GDP已成为设置税率、扭转失业和管理通胀等相关政策的指南针。

但是GDP经常很不准确：2014年统计人员调整了统计方法之后，尼日利亚的GDP陡增89%。估计的成分也很大：英国就假设有偿性服务市场的增长与男性人口的增速一致，并以艳舞俱乐部的收费标准作为性服务的价格。GDP数据还经常被修正，而且在除美国以外的富裕国家，修正后的数字往往更高。由于修正后的数据少有关注，这加深了一种通常被夸大的印象，即美国的经济大大好于欧洲。这也意味着决策者制定政策时依赖的是错误的数字。

如果说作为衡量一国经济附加值的指标，GDP本身已问题多多，那么作为衡量福祉的基准，它就更不可靠了。而且其实它一直不可靠：环境卫生带来的好处、医疗的改善以及供暖或空调造就的舒适几乎可以肯定地表明，自二战以来的数十年里，GDP增速不足以反映实际生活水平的提高。但是至少两者之间是一种正向关系。GDP快速增长，生活质量也大幅提高。现在GDP仍在增长（尽管慢了许多），但人们却认为生活水平止步不前。原因之一是不平等加剧：考虑通胀因素之后，美国家庭收入的中位数在过去25年里几乎没有变化。然而，越来越多为人们所看重的东西却不在GDP这一主要价值指标的考量范围之内。

除电脑等个例之外，GDP假设生产和消费的产品品质保持恒定。这一假设在大批量生产标准化产品的时代行得通。但当服务业在经济中占比越来越高时，它就不那么可靠了。企业争抢客户靠的是其产出的质量及是否能够迎合个人品味。如果餐厅菜品减少而价格提高，即使其中体现了客户所希望的改变，如食材更新鲜、桌数更少，这仍然会推高通胀、拉低GDP。谷歌和Facebook提供给用户的服务免费，也就没有计算在GDP之内。一旦地图和音乐唱片等有偿产品变成免费数字服务，它们也会被从GDP中剔除。网上购物和网银的便利对于消费者而言是福音，但如果这些意味着建筑投资的减少，同样也会拉低GDP。

| 别算了，分级吧

要更好地衡量繁荣需要三方面的改变。改进GDP对生产的衡量最为易行。全盘抛弃不能解决问题：GDP历久不衰的吸引力就在于它能够，或者说看似能够给出一个汇总的统计量，告诉人们一个经济体的运行情况。不能抛弃GDP，统计工作者应该改进GDP数据收集和呈现的方式。为了最大程度地减少修正，他们不应仅仅依靠对企业或消费者的标准调查，而应该更多地依赖税收记录，互联网搜索数据以及其他大量被忽视的同期统计数据，如信用卡交易记录。私营企业已经指明了方法，比如从电子商务网站收集大量价格信息，以便得出更高质量的通胀数据。

其二，服务业占主导的富裕国家应该开始探索一种全新的、范围更广的年度衡量标准，以便更准确地反映生产和生活标准。这个称为“GDP+”的新指

标首先应该在概念上做出一个早就应该有的变化：把无偿的家庭工作纳入到GDP之中，比如照顾亲人。GDP+还应该测算服务品质的变化，比如在估算医疗产出时考虑到寿命的延长。它还会更多地考虑全新产品和选择增多所带来的益处。而且在理想的情况下，可以将其分成几部分来反映高中低各收入水平人群的实际支出模式：比如穷人的主要支出是购买商品而不是哈佛的学费。

尽管GDP+对现有的衡量方法做了很大改进，它仍是一个对收入流的估算。为了能够核对一个国家的繁荣程度，第三个衡量指标还应该每十年对财富的存量进行估算。这一资产负债表会包含道路、公园等政府资产，涵盖私人财富，还会评估技能、品牌、设计、科学理念以及在线网络等无形资本的价值。表中还应计入资本的损耗：设备的磨损、道路及公共空间的老化以及对环境的毁坏。

建立这些基准需要国家统计机构的变革，如同当年创造GDP一样大胆果敢。即便如此，由于人们珍视的东西大多非常主观，没有哪个测算会是十全十美的。但目前对繁荣的测量错漏百出，与其忽视现代生活的种种进步，不如接受一个全新的方法。■



Self-help for the Ivy League

Getting the most out of one's self

White-collar improvement

THE world has quietly been undergoing a performance revolution. In nearly all areas, people are continuously getting better at what they do. This is obvious when measured on running tracks and tennis courts. But it is happening in myriad other areas as well, from surgery to management—and even violin-playing. Better training is largely responsible, by breaking down activities into discrete parts, and measuring how people perform best.

Two new books promise to help people improve their abilities with a generous mix of fascinating anecdotes and a romp through the academic literature. In “Smarter, Faster, Better”, Charles Duhigg of the *New York Times* looks at the numerous ways that people can become more effective, whether in improving motivation, setting goals, making decisions or thinking creatively. Basically, Mr Duhigg's is a self-help book for white-collar professionals.

Readers learn how the American army welcomes new recruits who have little drive and teaches them to take responsibility and achieve goals. (The secret: transform mundane tasks into decisions that need to be made.) One learns how organisations like Google and the original cast of “Saturday Night Live”, an American comedy show, produce great teams. (The crux: create a feeling of trust so people can freely express themselves; this is more important than having superstars in the group.) And one finds out how Toyota took over one of the worst carmaking factories from GM and turned it into one of the best. (The solution: give line workers more control.)

One of the best vignettes is on the making of the children's film "Frozen". It's 18 months before the release and the creators have hit an impasse: Anna is a bossy brat, Elsa is a jealous prat and Olaf the cynical snowman conspires in a coup d'état. In short, the draft storyline is a wreck. No one sympathises with the main characters. "I f'ing hate Olaf," confesses one writer after an early screening. "Kill the snowman."

How did Disney turn it around? Part of the method, readers learn, was to get the team to tap into their own life experiences, try new combinations and sense what felt right. Such advice is mildly plausible when applied to Hollywood screenwriters; it is doubtful the rest of humanity could employ it successfully. However, another approach rings more true: Disney shook things up by generating even more creative tension: a new co-director was added. A little disturbance to the customary workflow helped turn the grit into a pearl.

Mr Duhigg is an effective storyteller with a knack for combining social science, fastidious reporting and entertaining anecdotes. It is the same technique he used in an earlier book, "The Power of Habit", in 2012. Yet in his latest work the stories jump around so much that they produce mental whiplash. No sooner is the reader knee-deep in Israeli military analyses in the 1970s (to understand goal-setting) than the narrative swerves to General Electric's human-resources woes. And by distilling individual performance down to eight main traits—each with its own chapter—the book oversimplifies its subject.

"Peak" by Anders Ericsson, a psychologist studying expertise, and Robert Pool, a science writer, avoids these shortcomings. The book is a popular-science telling of Mr Ericsson's research. Most notable is the "10,000 hour rule": the idea that anyone can become an expert if they put in the time, a theme popularised by writers like Malcolm Gladwell.

At the heart of Mr Ericsson's thesis is that there is no such thing as natural ability. Not for Mozart, nor for Garry Kasparov. Traits favourable to a task, such as perfect musical pitch, help at the outset but confer no advantage at higher levels. Rather, after a basic ability, it all comes down to effort.

Such mastery is possible because of what Mr Ericsson calls "deliberate practice". This is focused training with an expert who can push an individual to a higher understanding of the craft. The key ingredient is mental representations: the ability to perform a task excellently without needing deliberate thought because similar situations have been so well practised that they seem second nature.

Both books offer an optimistic anti-determinism that ought to influence how people educate children, manage employees and spend their time. Both place stock in developing mental models of activities, aspiring to an ideal form of the task at hand. And both emphasise setting "stretch goals". The good news is that to excel one need only look within—provided one buys the books to learn how. ■



精英自励

人尽其才

白领提升

世界正悄然经历一场绩效革命。在几乎所有领域，人们不断取得进步。跑道和网球场上的表现如何显而易见。而在无数其他领域，从外科手术到经营管理甚至是小提琴演奏，情况也是如此。这主要归功于更好的训练，通过把任务拆解为不同部分然后测量人们如何获得最佳表现。

结合大量有趣轶闻及对相关学术文献的轻松解读，两本新书宣称可以帮助人们提升个人能力。在《更聪明、更快、更强》（Smarter, Faster, Better）一书中，《纽约时报》记者查尔斯·杜希格（Charles Duhigg）纵览各种方法，帮助人们在调动积极性、制订目标、决策或创意思维等方面提高效率。基本上，杜希格的这一著作是针对白领专业人士的励志自助之书。

在书中，读者可以了解美国军队如何迎接缺乏斗志的新兵、如何教会他们承担责任并实现目标。秘诀在于：把平凡杂务变为必要的决定。读者了解到谷歌这类机构及美国喜剧节目《周六夜现场》（Saturday Night Live）的制作班底如何打造出色团队。核心是：营造信任感，便于人们各抒己见，这比巨星人物在团队坐阵更为重要。另外，读者可得知丰田如何接手通用汽车表现垫底的工厂而将其业绩提升至数一数二的水平。方法是：给予生产线工人更大的管控权力。

最佳例子之一是儿童电影《冰雪奇缘》的制作。在电影发布前18个月，创作团队陷入僵局：安娜霸道任性，艾尔莎嫉妒无用，冷言冷语的雪人奥拉夫在密谋政变。总之，初稿的故事大纲糟透顶。没有谁会 and 这些主角产生共鸣。“我恨透奥拉夫了，”一位编剧在前期试映后说道，“毙了那雪人吧。”

迪士尼是如何扭转局面的？读者从书中可得知，办法之一是让制作团队利

用自己的生活经验，尝试重新组合内容，摸索对路的感觉。这些建议对好莱坞编剧们可能还有点用，但其他人能否成功运用，则是个疑问。然而，另一方法貌似更实际有效——迪士尼制造了更大创意张力来改组团队，做法是加入一位新的联合导演。稍微打乱常规流程有助于化沙砾为明珠。

杜希格擅长讲故事，谙熟把社会科学、详细报道及趣事轶闻共冶一炉。他在2012年出版的《习惯的力量》（The Power of Habit）里也运用了同样的技巧。但这部最新作品中内容跳跃幅度之大，让人难免神思动荡。读者前一刻还沉浸于20世纪70年代以色列的军情分析中（为解释“目标设定”），随后话锋即转到通用电气的人力资源困境上。该书把“个人表现”提炼为八个主要特征（分别设一章详述），过分简化了主题。

由心理学研究专家安德斯·埃里克森（Anders Ericsson）及科普作家罗伯特·普尔（Robert Pool）合著的《巅峰》（Peak）则避免了这些缺点。该书是有关埃里克森所做研究的科普读物。最值得注意的是所谓“一万小时规则”：即只要投入足够时间任何人都可成为专家，这最初是由马尔科姆·格拉德威尔（Malcolm Gladwell）等作家宣扬的理念。

埃里克森论点的核心是，世上并无天生才能这回事。莫扎特没有，加里·卡斯帕罗夫（Garry Kasparov）也没有。有利于完成某一任务的特质（如完美音准）一开始有帮助，但在更高层次并不能带来任何优势。实际上，在掌握基本能力后，一切便归结于努力。

成就专才，靠的是埃里克森所说的“刻意练习”，即在专家指导下的重点训练，这些专家能加强个人对技艺的深层理解。关键要素是心理表征：有能力不假思索地出色完成任务，因为已在类似情景中训练有素，技能就如同是第二本能。

这两本书展示了乐观的反宿命主义理念，应该能影响人们教育子女、管理员工及支配时间的方式。两者均重视活动心智模式的建立，就手头任务寻求理想形式。而且两者均强调制订“延伸目标”。好消息是，只消往内探寻便可出类拔萃——前提是买下这些书来学习如何自助自强。■



Television

Changing the channel

A startup seeks to keep the conventional TV station alive in the digital era

THE received wisdom of the on-demand era of television is that people, young ones especially, want to watch their favourite shows anytime, anywhere and on any device; the “linear” viewing of a succession of programmes chosen by a TV station will fade, as viewers dine à la carte from Netflix, Amazon and Hulu. The wisdom is not entirely wrong, but what if young consumers were offered channels more attuned to their tastes?

Pluto.tv, a three-year-old American startup, offers free television over the internet on the assumption that many viewers are still couch potatoes at heart: they want to sit back and watch whatever happens to be on the telly. The firm has developed more than 100 channels, curated by humans with guidance from data (and the occasional hunch) on what people like to watch. Among the offerings are “Classic Toons TV”, “News 24/7”, “Cats 24/7”, an all-Beyoncé pop channel and another that plays nothing but Kung Fu movies. Sky, an early investor along with Universal Music Group, also streams its news channel on the service. Pluto splits advertising revenue with its content partners.

This might seem a challenging business model, given the direction of travel in televised entertainment. Not only do viewers increasingly want to consume shows on demand, they also want to skip the ads. The Boston Consulting Group (BCG) projects that such “non-linear” television-watching in America will double to 40% of all viewing by 2018.

Tech giants with huge user bases—Amazon and Google—are streaming video and commissioning original shows, and Apple may soon join them.

As for the cable firms, they still enjoy an advantage in that many customers have to rely on them for their broadband-internet service.

But there is one crack in these formidable content platforms that a niche service could exploit. They cost money, and millennials are said to hate paying for stuff. Cable in particular is coming to be seen as too pricey. There is a lot of waste in their expensive pay-TV packages, says Ken Parks, Pluto's executive chairman and a former executive at Spotify, a music-streaming service. The cable giants' bundles of channels include many that viewers will never watch, and their cost can exceed \$150 a month. BCG estimates that the number of pay-TV subscriptions in America has just about peaked and will decline substantially, albeit gradually.

Until the next generation of mobile technology, "5G", arrives, bringing lightning-fast wireless-broadband speeds, many consumers will still have to hand over some money to the cable guys for their internet access. But Pluto (which does not yet release financial results) says it already has more than 2m people viewing its channels at least once a month. About 40% of those are aged 18-34. The service plans to add a premium, paid-for tier, but for now Mr Parks is banking on frugal young couch potatoes. ■



电视

转换频道

一家创业公司想让传统电视台在数码时代焕发生机

电视点播时代的共识认为，人们——尤其是年轻人——希望能随时随地在任意设备上观看自己喜爱的节目；随着观众日渐从Netflix、亚马逊和Hulu上点播节目，按电视台安排“线性”观看连串节目的方式日渐式微。这一想法不完全错误，但假如电视台能向年轻消费者提供更多符合其口味的频道，情况又会如何？

三年前创立的美国创业公司Pluto.tv通过互联网提供免费电视，其理念是许多观众实质上仍是电视迷：他们只想轻松地坐在电视前观看恰好在播放的节目。该公司通过数据（偶尔按直觉）分析人们的观看喜好，已由专人开发100多个频道。其中包括“经典卡通电视”（Classic Toons TV）、“全天候新闻”（News 24/7）、“全天候喵星人”（Cats 24/7）、一个只播碧昂丝歌曲的流行音乐频道及另一个只播功夫电影的频道。与环球唱片（Universal Music Group）一起作为早期投资者的天空广播公司（Sky）也在该平台上流播自己的新闻频道。Pluto与内容合作伙伴分享广告收益。

考虑到电视娱乐的走向，这也许是个有挑战性的商业模式。观众不仅越来越希望点播节目，他们还想跳过广告。波士顿咨询公司（BCG）预测，到2018年，美国这类“非线性”观看将翻倍，达到观看总数的40%。

亚马逊及谷歌这类拥有庞大用户群的科技巨头已在流播视频并投资制作原创节目，苹果公司也可能很快将加入其中。有线电视公司则仍占有优势，因为许多顾客依赖它们提供的宽带上网服务。

但这些强大的内容平台存在一道缝隙，使得小众服务得以乘虚而入。这些平台需要付费，而千禧一代据说讨厌要付钱的东西。尤其是有线电视，被认为过于昂贵。那些高价的付费电视套餐包含大量浪费，Pluto的执行总

裁肯·帕克斯（Ken Parks，音乐流播服务商Spotify的前高管）说。有线电视巨头们捆绑提供的内容中包含了许多观众从来不看的频道，而每月费用有可能超过150美元。波士顿估计，美国付费电视的用户量已几近见顶，未来将大幅下降，虽然速度相对和缓。

在下一代移动技术“5G”带来超高速无线宽带之前，许多消费者为接入互联网，仍需向有线电视公司付费。但Pluto（仍未公布财务业绩）表示已有超过200万人每月至少观看其频道一次。其中40%的观众年龄介乎18至34岁之间。该公司计划日后增加付费项目，但目前，帕克斯仍要指望那些不愿花钱的年轻电视迷。 ■



Buttonwood

Tough choices

State spending will be hard to cut given rising inequality

VOTERS' anger over inequality is one explanation for the rise of politicians as varied as Donald Trump, Bernie Sanders and Marine Le Pen. This anger also makes it very difficult for the free-market right to realise one of its key aims: the shrinking of the state. In Britain a plan to reduce spending on benefits for the disabled has been sabotaged by the resignation of a government minister and a backbench rebellion. In America mainstream Republicans are horrified by the rise of Mr Trump, who does not share their small-government ideals.

Ideally, conservatives would like people to be more self-reliant, owning their own homes and funding their own retirements. But many people do not have enough spare income to meet those goals. One study found that 21% of Americans lacked a savings account and 62% had less than \$1,000 in their rainy-day funds. Similarly, in Britain, nearly 60% had less than £1,000 (\$1,417) in liquid savings. Many of those people will have savings in another form, as part of a workplace pension scheme. Still, a Federal Reserve study found that around 31% of Americans had no private retirement savings at all, including nearly a quarter of those aged over 45.

This leaves people very dependent on the state. Around 60m Americans currently receive payments from the Social Security system. The average retirement benefit is \$16,000 a year. A person with average earnings who retires at 65 can expect to receive around 40% of their final salary. More than half of retired people depend on Social Security for the majority of their income; for more than a third, it comprises over 90% (see chart). In short, this is a vital benefit for tens of millions of Americans, which they would have no way to replace. No wonder that cutting Social Security has

long been known as the “third rail” of American politics.

Yet Social Security makes up around a quarter of all federal spending. Add in Medicare, a health programme for those over 65, which cost \$546 billion in 2015, and 39% of the budget goes toward benefits for the elderly. With an ageing population, these figures are likely to go up, not down.

Meanwhile, attempts by government to encourage private saving for pensions have run into difficulties. Tax breaks may simply prompt workers to shift their savings from accounts that are more heavily taxed rather than to increase their savings overall. And the biggest gainers from tax shelters tend to be the better-off, blowing a hole in government revenues without helping the poor much.

Pushing up the retirement age would reduce the burden a bit. But many workers leave the jobs market before the official retirement age: figures show that such people account for around half of the marked decline since 2007 in the share of working-age Americans who are actually in work. In Europe, many of those who retire before earning a full pension still get state support of various kinds, reducing the saving for governments.

Then there is housing. High prices and stagnant wages make it harder for young people to own homes. Figures from the 2011 census showed that the proportion of British households that were owner-occupiers had fallen to 64% from 69% in 2001—the first decline in that figure in a century. The ratio of house prices to the incomes of first-time buyers in Britain is 5.2, close to the peak reached in 2007; in London, the ratio is a staggering 10.1, well above previous highs.

Attempts to encourage home ownership via tax breaks, such as the new lifetime individual savings account, may only push prices even higher. The fastest way to make prices more affordable would be a government-backed

house-building programme, something that would be incompatible with attempts to cut the budget deficit and shrink the state.

Then there is automation, which may turn into the big policy challenge of the coming decades. Innovations such as driverless cars may threaten millions of jobs. Some academics, such as Erik Brynjolfsson and Andrew McAfee of the Massachusetts Institute of Technology, envision a two-tier labour market, divided between workers who complement machines and those who compete against them. At the least, this may mean increased government spending on retraining; it may also mean higher welfare bills. It could create demand for public-sector employment to absorb surplus labour.

In short, it is very hard to see how rising levels of inequality can be squared with a smaller state. Voters will surely demand that politicians either reduce inequality or maintain the safety net. ■



梧桐

艰难抉择

鉴于不平等状况加剧，政府开支将很难削减

选民对不平等状况的愤怒是政治家冉冉升起的原因之一，无论是唐纳德·特朗普（Donald Trump）、伯尼·桑德斯（Bernie Sanders）还是玛琳·勒庞（Marine Le Pen），都是如此。这种愤怒也让信奉自由市场的右翼很难实现他们最核心的目标之一：不断缩小政府。在英国，一项旨在削减残疾人福利支出的计划已经因一位政府大臣的辞职和后坐议员的反对而搁浅。在美国，主流共和党人对特朗普的崛起感到震惊，此人可不赞同他们“小政府”的理想。

理想状况下，保守派希望人们更加自力更生，有自己的房子，退休后自给自足。但是很多人没有足够的剩余收入来达到这些目标。一项研究发现，21%的美国人没有储蓄账户，62%的人只有不到1000美元以备不时之需。英国的情况也类似，近60%居民的流动储蓄不到1000英镑（1417美元）。这些人中很多会有其他形式的储蓄，做为工作退休金计划的一部分。然而，美联储的一项研究发现约31%的美国人完全没有私人退休储蓄，这其中近四分之一的人超过45岁。

这令人们非常依赖政府。目前约有六千万美国人从社保系统领取津贴。平均退休金为一年16000美元。收入达到平均水平的人如果在65岁退休，则可领取他们最后收入的约40%。一半以上退休人员的大部分收入依靠社保；对超过三分之一的退休人士来说，社保金占收入的90%以上（见图表）。总而言之，社保是数千万美国人至关重要的福利，无可取代。无怪乎削减社保一直被认为是美国政治的“雷区”。

但是社保占联邦所有支出的约四分之一。加上联邦医疗保险

（Medicare），这一为65岁以上居民提供的医保计划2015年花费了5460亿美元，政府预算有39%用于老年人福利。随着人口日渐老龄化，这些数字可能还会上涨，而非下降。

与此同时，政府鼓励私人储蓄用于退休金的努力频频受阻。税收减免可能只会促使员工把他们的储蓄从收税较重的账户转移，而不会整体增加储蓄。不过避税手段最大的受益者往往是较富裕的人，损害了政府收入但却并不能真正帮到穷人。

延迟退休年龄可以稍微减轻一些负担。但很多员工还未到法定退休年龄就退出就业市场：2007年以来，就业年龄的美国人中真正在职者的比例明显下降，数字显示提前退休者约占下降比例的一半。在欧洲，在挣够全额退休金之前退休的很多人仍然能获得各种各样的政府支持，这削减了政府的结余。

还有住房问题。高房价加上工资停滞，让年轻人更难拥有自己的房子。2011年人口普查的数据显示住在自有住房中的英国家庭比例从2001年的69%降至64%，一百年来这个数字首次下降。英国房价与首次购房者收入的比率达到5.2，接近2007年的峰值；在伦敦这一比率是令人震惊的10.1，远高于之前的记录。

通过税收减免鼓励拥有住房的尝试，例如新的终生个人储蓄账户，可能只会进一步推高房价。让房价更可接受的最快方式是政府支持的住房建设计划，而这和削减预算赤字、缩减政府权力相矛盾。

还有自动化的问题，这可能在今后几十年成为巨大的政策挑战。诸如无人驾驶汽车之类的创新可能威胁到数以百万计的工作职位。有些学者，如麻省理工学院埃里克·布林约尔松（Erik Brynjolfsson）和安德鲁·麦卡菲（Andrew McAfee）构想了一个双层的劳动力市场，分为与机器互补的员工和与机器竞争的员工。至少，这可能意味着政府在再培训上的开支要增加；这还可能意味着更高额的福利账单。这将产生公共部门就业的需求，以吸收剩余劳动力。

简言之，很难想象如何在缩小政府的同时还能解决不平等程度不断增加的问题。选民们一定会要求政治家要么降低不平等程度，要么维持现在的安全网。 ■



Free exchange

No exit

Global financial integration is tying central bankers' hands

IN THE weeks after December 17th, when the Federal Reserve raised its benchmark interest rate for the first time in nearly ten years, confident Fed officials told markets to expect four additional rate hikes in 2016. It has been obvious for a while that this guidance was wildly optimistic. Economists have been downgrading growth forecasts and markets have been retreating. At its meeting in early March the Fed acknowledged reality: it not only left rates unchanged, but also signalled in its projections that it expects to raise them by just two notches this year. This climbdown was not a surprise, but it does conceal a surprising admission: that American monetary policy is constrained, in part, by conditions in global financial markets.

The Fed is a collegial, consensus-driven central bank, but over the past six months an internal debate has politely unfolded. One group, led by Stanley Fischer, the vice-chairman, hews to a fairly conventional view of the Fed's task. Mr Fischer argues that low unemployment leads inexorably to upward pressure on wages and prices. In late 2015 hiring roared ahead, even though unemployment stood at just 5%. A jump in inflation seemed inevitable. In order to keep rising prices and wages under control, Mr Fischer's side reckoned, the Fed needed to act pre-emptively, if gradually, to raise interest rates. This camp won the day in December, when projections published by the Fed suggested that the federal funds rate would climb to 1.25-1.5% by the end of 2016.

The decision to raise rates in December was unanimous, but there was no consensus on the appropriate pace for subsequent increases. A second group, led by Lael Brainard, a member of the Fed's Board of Governors,

worried that the global nature of financial markets, and the dollar's critical role within them, required the Fed to move slowly. In a speech in February Ms Brainard estimated that global market movements, in the form of a rising dollar and a growing gap between the rates at which governments and riskier private companies could borrow, in effect added 0.75 percentage points of additional tightening to the 0.25 percentage-point increase the Fed made in December. The planned procession of additional hikes, if amplified in a similar way, might well tip America and much of the world into recession. At the Fed's meeting in March, Ms Brainard's side seems to have had the better of the argument.

Ms Brainard reckons that in an era of deep financial-market integration there can be no "Great Divergence" between policy in America and the rest of the world. Over the past two decades a global glut of savings has depressed long-run interest rates all over the place. Savings have piled up as skittish emerging-market central banks stockpiled foreign-exchange reserves and as the share of income flowing to the savings-prone rich grew. Meanwhile, investment lagged, thanks to reduced expectations for growth in the ageing countries of the rich world and, more recently, China. In an effort to mobilise this sluggish capital and perk up growth, central banks around the world have pushed down the cost of borrowing.

In December the Fed calculated that American firms and households were confident enough to keep spending even if rates rose above zero. But capital flows freely around the world, and any country offering a safe financial return even a bit above the norm attracts waves of money. Similarly, a shift in the relative economic outlook—such as a downgrading in growth prospects in China relative to those in America—can lead to sudden moves in financial markets as a torrent of capital seeks safety.

In late 2015 the expectation of a rate rise in America sent capital gushing into the country, pushing up the value of the dollar and tightening credit

conditions elsewhere in the world. An expensive dollar makes American exports less competitive and places a drag on growth and inflation in the American economy. The effect on investors' appetite for risk is more immediate.

Between the Fed's December meeting and early February, American stocks dropped by 10%; share prices in Europe and Asia fell by more. The spread between corporate-bond yields and those on safe government debt rose sharply (see chart). Not until mid-February, as policymakers around the world sought to soothe markets with promises to support growth, did the panic dissipate. Since then, share prices have recovered and the dollar has fallen in value; with its decision on March 16th, the Fed confirmed investors' suspicion that it would not continue on its planned tightening path.

| *Hell is other people's money*

The forces inhibiting the Fed are, if anything, getting stronger. Central banks in Europe and Japan are loosening monetary policy in response to lacklustre economic conditions; China is easing, too. Meanwhile, America's recovery continues thanks to its monetary reprieve, and various measures of inflation are moving back toward the Fed's 2% target with surprising speed. If the Fed continues to stand pat, inflation may soon move above 2%, but if it attempts to raise interest rates well above the global level it may be inviting destabilising financial flows and an economy-choking rise in the dollar.

The balance of risks suggests the Fed should tolerate rising inflation. A faster pace of increase in wages and prices would be a healthy development for the American economy. Inflation has been below 2% for four years; exceeding that level would affirm the Fed's claim that 2% is a symmetrical target for inflation, rather than a ceiling. A temporarily higher inflation rate might be an annoyance for some Americans, but it is preferable to

imploding portfolios and a risk of recession.

Even though Ms Brainard prevailed in March, the debate is sure to continue. The Fed is bound to raise rates again at some point, as inflation rises. Another torrent of mobile capital will then flood in, perhaps swamping the Fed's attempts to go its own way. The world should brace for more financial storms. ■



自由交流

别无出路

全球金融一体化束缚了央行的手脚

去年12月17日，美联储近十年来首次上调了基准利率，在那之后的几周里，自信的美联储官员向市场表示，预计2016年会再加息四次。显而易见，在一段时间内这种引导过于乐观了。经济学家已经下调增长预测，市场也一直在回撤。在三月早些时候的会议上，美联储承认了现实：它不但保持了利率不变，而且表示，预计今年只加息两次。这种让步并不意外，但的确掩盖了一个事实，即美联储令人惊讶地承认：在某种程度上，全球金融市场的状况制约了美国的货币政策。

美联储是一个由共识驱动的合议制中央银行，但在过去六个月里，一场内部论战已经礼貌地展开。以副主席斯坦利·费希尔（Stanley Fischer）为首的一方对美联储的任务坚持相当传统的观点。费希尔认为，低失业率必然导致工资和物价的上涨压力。2015年底，尽管失业率仅为5%，招聘市场还是热火朝天。通胀的上扬似乎不可避免。为了控制物价和工资的上涨，费希尔一方认为，即使逐渐加息，美联储也需要先发制人。这个阵营在去年12月获胜，当时美联储发布的预测表明，联邦基金利率到2016年底将上升至1.25%到1.5%。

12月加息的决定被一致通过，但是，对随后适当的加息速度并没有达成共识。以美联储理事雷尔·布雷纳德（Lael Brainard）为首的另一方担心，金融市场的全球性以及美元在其中的关键作用要求美联储采取缓慢的行动。布雷纳德在2月的一次演讲中估计，随着美元的升值，以及政府与更冒险的私人企业之间借款利率差距的不断扩大，全球市场的变动在美联储12月加息0.25个百分点的基础上实际上又增加了0.75个百分点的紧缩。如果计划中的额外加息以类似的方式被放大，就很可能把美国和世界大部分地区推入经济衰退。在3月的美联储会议上，布雷纳德一方似乎在争论中占了上风。

布雷纳德认为，在金融市场深度一体化的时代，美国和世界其他地区的政策不可能有“重大分歧”。在过去的二十年里，全球储蓄过剩压低了各地的长期利率。随着新兴市场善变的央行大量积累外汇储备，以及倾向于储蓄的富人所占收入份额的增长，储蓄已经大量积聚。同时，由于老龄化的富裕国家增长预期降低，加之最近中国经济放缓，投资也滞后了。为了调动这些不活跃的资本并刺激增长，各国央行已经压低了借贷成本。

美联储12月估计，即使利率上升至正数，美国企业和家庭也有足够信心继续开支。但是，资本在全世界自由流动，任何一个国家提供的安全财务回报即使只超过基准一点点，都会吸引大量资金涌入。同样，相对经济前景的转变——比如说，相对于美国，中国增长前景的下调——可能导致金融市场因大量资本寻求安全的去处而突然变动。

2015年底，对美国加息的预期促使资本涌入美国，推动美元升值，并导致世界其他国家信贷环境收紧。昂贵的美元使美国的出口竞争力下降，并拖累美国的增长与通胀。它对投资者风险偏好的影响则更为直接。

从12月美联储会议至2月初，美国股市下跌了10%；欧洲和亚洲股市的跌幅更大。企业债券收益与安全的国债之间利差大幅上升（见图表）。直到2月中旬，世界各地的政策制定者试图用支持增长的承诺来安抚市场，恐慌才得以消散。自那以后，股市恢复，美元也已贬值；美联储3月16日的决定证实了投资者对于它不会继续其紧缩计划的怀疑。

| 别人的钱是地狱

总之，抑制美联储的力量正在加强。欧洲和日本的央行正在放松货币政策以便应对低迷的经济状况；中国也是如此。同时，由于货币政策暂缓收紧，各种通胀指标也正以惊人速度回归美联储2%的目标，美国经济继续复苏。如果美联储继续按兵不动，通胀可能很快就会超过2%，但如果它试图加息至远高于全球的水平，那或许将引发不稳定的资金流动，导致美元升值而抑制经济增长。

权衡风险后发现，美联储应该容忍通胀上升。就美国经济而言，工资和物

价的增速加快应该是健康的发展。通胀率已连续4年低于2%；超过这个水平将证实美联储的说法，即2%的通胀是对称的目标，而非上限。暂时较高的通胀对于有些美国人可能是一种烦恼，但相较于投资组合崩溃以及经济衰退的风险，这是更好的选择。

尽管布雷纳德在3月获胜，但辩论必然会继续下去。随着通胀上升，美联储必定会在某个时间点再次加息。那时，另一股流动资本将涌入美国，也许会破坏美联储坚持己见的尝试。这个世界应该做好准备来迎接更多的金融风暴。 ■



Global house prices

Hot in the city

Valuations in globalised cities are rising much faster than in their hinterlands

GLOBALISATION has created a handful of metropolises that attract people, capital and ideas from all over the world, almost irrespective of how their national economy is doing. House prices in such places, unsurprisingly, outpace the national average. In our latest round-up of global housing, we find that prices have risen in 20 of the 26 countries we track over the past year, at an (unweighted) average pace of 5.1% after adjusting for inflation. Prices in pre-eminent cities in these countries, however, have risen by 8.3% on average.

In a survey conducted last year, fewer than one in nine residents of Amsterdam, Berlin, London, Paris, Stockholm and Zurich thought that it was easy to find reasonably-priced housing. In these cities, house prices have risen at an average pace of 6.5% a year over the past three years (again, unweighted), compared with a national average rise of just 3.2%. The value of homes in four cities on the Pacific—San Francisco, Vancouver, Sydney and Shanghai—has increased by 12% a year over the past three years, twice the average national pace.

The supply of housing is rather inelastic, so in the short term house-price inflation is driven more by demand factors, such as the number of households, disposable income, interest rates and the yield available on other assets. In recent years all of these have helped to push house prices steadily upwards, especially in big cities.

In the conurbations in question, the number of households is rising fast as hordes of ambitious millennials pour in. Two in five of Zurich's residents were born outside Switzerland; 44% are between the ages of 20 and 44. The

boom towns also have tight labour markets and therefore relatively high income growth: the unemployment rate in San Francisco and Stockholm is around a percentage-point lower than the national averages. Some are havens for second homes and money seeking safety: foreigners snap up half of London's princeliest dwellings, according to Savills, an estate agent. Finally, they provide a decent return: net yields in Vancouver were 11% in 2015, according to MSCI, a data provider, three percentage points above the average for Canadian housing.

Whenever the supply of a good is limited, there is potential for exuberance. San Francisco's property market is intertwined with the technology sector: since 2008 there has been a 93% correlation between the monthly movements in the NASDAQ and house-price inflation in its metropolitan area. Since bottoming out in early 2012, prices in Silicon Valley have risen by 73%, compared with 31% in America as a whole.

To determine whether homes are fairly valued *The Economist* looks at the relationship between prices and disposable income (an indicator of affordability) and between prices and rents (a substitute for buying a home). If rising prices move these ratios above their long-run averages, then either incomes or rents are likely to rise, or house prices to fall.

Across America house prices, after falling by 25% from their peak between 2007 and 2012, are now at fair value compared with rents and incomes. In San Francisco, too, they are at fair value when compared with rents, but 45% overvalued relative to incomes. Thanks largely to their big cities, housing appears to be more than 40% overvalued in Australia, Britain and Canada, according to the average of our two measures. Between 2002 and 2012 the typical London home sold for seven times the city's average annual salary. That figure has since risen to 12 times.

As property developers from Las Vegas to Limerick will attest, when supply

does eventually respond to soaring demand, property prices fall. Restrictive planning laws curb new construction in the area around San Francisco Bay; the narrow peninsula that San Francisco itself occupies compounds the problem. London suffers from an even more severe planning regime. Yet housing starts are at a nine-year high in San Francisco. In London, too, builders are finding a way: construction began on 24,000 new homes in the capital in 2015, the highest rate for ten years. ■



全球房价

城中大热

国际化大都市的房价增速比偏远城市快得多

全球化进程催生了一些国际大都会，它们总能吸引世界各地的人才、资本及创意，几乎不受本国经济状况的影响。毫不出奇，这些地方的房价增速超越全国平均水平。我们对全球住房情况的最新综合报道显示，过去一年，所追踪的26个国家中，房价上涨的有20个，平均涨幅为5.1%（非加权值，已考虑通胀因素）。然而，在这些国家的一线城市，房价平均上涨了8.3%。

去年一次调查显示，在阿姆斯特丹、柏林、伦敦、巴黎、斯德哥尔摩和苏黎世，只有不到九分之一的居民认为能轻松在当地找到价格合理的住房。过去三年，这些城市的房价平均年涨幅为6.5%（非加权值），而全国的平均增速仅为3.2%。太平洋沿岸四大城市——旧金山、温哥华、悉尼、上海——的房价在过去三年每年上升12%，是本国平均涨幅的两倍。

住房供应相当缺乏弹性，所以在短期内，房价上涨更多是由需求因素带动，比如家庭数量、可支配收入、利率及从其他资产上可获得的收益。近年来，所有这些因素都助推了房价稳步上升，尤其是在大城市。

在上述这类中心城市，随着野心勃勃的千禧一代大量涌入，家庭数量急速上升。苏黎世的居民有五分之二不在瑞士出生；44%的人口年龄在20至44岁。繁荣发展城市的劳动力市场也很紧俏，所以收入增速相对较高：旧金山和斯德哥尔摩的失业率比本国平均水平约低一个百分点。部分城市成为购置第二套住房及稳健投资的天堂：据地产代理第一太平戴维斯（Savills）的数据，伦敦最贵的住宅中有一半被外国人抢购。最终，这些房产回报不俗：据数据供应商MSCI的数字，2015年温哥华房产的净收益率为11%，高于加拿大全国平均值三个百分点。

只要商品供应有限，就存在繁荣的潜力。旧金山的房地产市场与其科技产

业密不可分：自2008年以来，纳斯达克每月走势与旧金山都会区的房价涨幅有93%的相关度。硅谷房价在2012年初触底反弹以来，至今已上升73%，而美国整体仅上涨31%。

为确定房价估值是否合理，《经济学人》对房价与可支配收入（承受能力指标）以及房价与房租（购房的替代选择）之间的关系作了研究。假如房价上涨致使这些比例高于其长期平均值，那么收入或租金就很可能上涨，或者房价会下跌。

从2007年至2012年，美国各地房价从高峰下跌25%，如今较租金和收入而言处于合理水平。旧金山的房价租金比也算合理，但相对收入，房价被高估了45%。根据我们两项指标的平均值，澳大利亚、英国及加拿大的房价看来被高估超过40%，这主要是受其大城市房价飙升的影响。在2002年至2012年间，伦敦的一般住宅售价是该市平均年薪的七倍，如今这一数字已上升至12倍。

正如从拉斯维加斯到爱尔兰利默里克的房地产开发商将证明的那样，当房屋供应最终跟上暴涨的需求时，房地产价格就会下跌。限制性规划法规抑制了在旧金山湾区附近开展新建设；旧金山本身建城于狭窄的半岛上，令问题加剧。伦敦则面对更为严格的规划监管。但在旧金山，房屋开工率升至九年来的高位。伦敦也如此，建筑商正渐渐找到出路：2015年伦敦共有2.4万套新房开建，创下十年新高。■



China's M&A boom

Money bags

China's global investment spree is fuelled by debt

“WE ARE on a wild ride,” Tom Mangas, the boss of Starwood, an American hotel group that owns the Westin and Sheraton brands, wrote to employees in early April. He was referring to the bidding war over Starwood between Marriott, another American hotel operator, and a group led by Anbang, a Chinese insurer. Anbang two weeks ago raised its offer to \$14 billion. But Mr Mangas could just as well have been talking about the wave of China-led mergers and acquisitions that is sweeping over the world economy.

Chinese firms with little international experience and lots of debt have emerged as the biggest buyers of global assets. They have announced nearly \$100 billion in cross-border M&A deals this year, already more than their \$61 billion of foreign acquisitions last year (see chart). To be sure, announcing deals is not the same as closing them. Between losing out to other bidders and rejection by regulators, China's investment tally could fall. Nevertheless, the trend is unmistakable. In recent years China has consistently accounted for less than a tenth of announced cross-border M&A deals; this year its share is nearly a third.

For the world economy this investment boom is, in some respects, a welcome development. Global M&A is on track to fall by 25% in the first quarter of this year from a year earlier. Without China's voracious appetite, the decline would be even more precipitous. The action has also been spread across a wide range of industries, from cosmetics to construction equipment and from film-making to fertilisers. China seems to have outgrown its fixation with commodities and energy.

Politically the deals have also been relatively uncontroversial. According to

Rhodium Group, a consultancy, there has been an increase in reviews by the Committee on Foreign Investment in the US (CFIUS), which examines takeovers in America for security threats, but it has been proportionally smaller than the increase in Chinese investments.

Instead, a new concern is growing: that the surge in outbound investment is a sign of weakness in the Chinese economy. This view is easily exaggerated. The yuan's gradual depreciation against the dollar over the past two years has indeed changed calculations, as has slower domestic growth. But rather than sparking a stampede to the exits, it is more accurate to say that these changes have alerted Chinese firms to the fact that they are still woefully underinvested abroad.

China's share of cross-border M&A has averaged roughly 6% over the past five years, despite the fact that it accounts for nearly 15% of global GDP. "China punches below its weight in outbound deals and has room to accelerate," says Fred Hu of Primavera Capital, an investment firm that is part of the consortium bidding for Starwood. Chinese insurers such as Anbang are becoming more adventurous, but less than 2% of the industry's assets are foreign.

A senior banker working with Chinese firms says the prospect of a further depreciation of the yuan is at most "a nice add-on" when making deals. Strategic considerations—acquiring technology and brands that China lacks—are more important for buyers, both to bolster their position at home and to speed expansion abroad. When deals are actually completed, they will lead to substantial one-off outflows of capital. But if the investments are any good, they should generate a regular stream of inflows, in the form of profits from the companies concerned.

A second category of concerns, about the financial structure of the deals, is more unsettling. Chinese buyers, by and large, are far more indebted than

the firms they are acquiring. Of the deals announced since the start of 2015, the median debt-to-equity ratio of Chinese buyers has been 71%, compared with 44% for the foreign targets, according to *The Economist's* analysis of S&P Global Market Intelligence data. Cash cushions are generally also much thinner for Chinese buyers: their liquid assets are roughly a quarter lower than their immediate liabilities. The forbearance of their creditors makes these heavy debts more bearable in China than they would be elsewhere. But the Chinese buyers are financially stretched, all the same.

Where, then, are they getting the money for the deals? For many, the answer is yet more debt. Chinese banks see lending to Chinese firms abroad as a safe way of gaining more international exposure. The government has encouraged them to support foreign deals. As long as the firms to be acquired have strong cash flows, the banks are happy to lend against the targets' balance-sheets, bringing debt to levels usually only seen in leveraged buy-outs.

Foreign banks are also getting involved in some of the deals: HSBC, Credit Suisse, Rabobank and UniCredit are helping to arrange syndicated loans for ChemChina, which agreed to buy Syngenta, a Swiss seed and pesticide firm, for \$43 billion. When the acquirers' finances look shaky, bankers say they find solace in two things: that the deals themselves will generate returns and that the political pedigree of the buyers, especially that of state-owned companies, will protect them. "You have to trust that the acquirer has become too big to fail," says an M&A adviser.

For the buyers, there are two strong financial rationales for the deals, albeit ones that highlight distortions in the Chinese market. First, debt-funded buyouts can actually make their debt burdens more tolerable. Take the case of Zoomlion, a construction-equipment maker with 83 times more debt than it earns before interest, tax, depreciation and amortisation. It wants to buy Terex, an American rival with debt just 3.5 times larger than its

earnings, for \$3.4 billion. Even if the purchase consists entirely of borrowed cash, the combined entity would still have a debt-to-earnings multiple of roughly 18, a marked improvement for Zoomlion.

Second, Chinese buyers know that one key financial metric works to their advantage: valuations in the domestic stockmarket are much higher than abroad. The median price-to-earnings ratio of Chinese buyers is 56, twice that of their targets. In effect, this means they can issue shares domestically and use the proceeds to buy what, from their perspective, are half-price assets abroad. This also gives them the firepower to outbid rivals in bidding wars. To foreign eyes, it might look like the Chinese are overpaying. But so long as their banks and shareholders are willing to stump up the cash, Chinese companies see a window of opportunity. ■



中国的并购热潮

钱袋子

债务推动下的中国全球投资热潮

“我们踏上了疯狂之旅。”拥有威斯汀（Westin）和喜来登（Sheraton）品牌的美国酒店集团喜达屋（Starwood）的老板汤姆·曼格斯（Tom Mangas）四月初向员工写道。他说的是另一家美国酒店运营商万豪（Marriott）与中国保险公司安邦为首的财团之间对喜达屋的竞标争夺战。安邦两周前把出价提高到140亿美元。但曼格斯的话也可以用于评论由中国带动并正在席卷世界经济的并购浪潮。

没有多少国际经验却有大量债务的中国企业已经成了全球资产的最大买家。今年，它们宣布的跨境并购交易已经接近1000亿美元，超过了去年610亿美元的国外并购额（见图表）。可以肯定，宣布一笔交易不等同于真正成交。在输给其他竞标者和被监管机构否决之间，中国的投资统计总额可能会下降。然而，趋势显而易见。近年来，中国在宣布的跨境并购交易中占比一直不到十分之一，今年它的份额接近三分之一。

对于世界经济而言，这轮投资热潮在某些方面值得欢迎。今年第一季度，全球并购同比下降25%。没有了中国贪婪的胃口，下降还会更为急剧。这种现象也被扩散到各行各业，从化妆品到建筑设备，从电影制作到化肥。中国似乎已经超越了对大宗商品和能源的痴迷。

在政治上，这些交易也相对没有争议。咨询公司荣鼎集团（Rhodium Group）表示，为安全威胁而审查在美收购案的美外国投资委员会（CFIUS）所做的审查数量有所上升，但这一增长赶不上中国投资增加的迅猛势头。

相反，一种新的担忧正在蔓延：境外投资激增是中国经济疲软的迹象。这种观点很容易被夸大。在过去两年中，随着国内经济增长放缓，人民币兑美元的逐渐贬值实际上改变了计算口径。但是，这并没有导致资金争相逃

离，更准确的说，这些变化已经提醒中国企业注意到一个事实，即它们在海外的投资仍然严重不足。

过去五年中，中国在跨国并购中的占比平均约为6%，尽管中国占全球GDP接近15%。参与喜达屋投标财团的投资公司春华资本的胡祖六表示：“中国在海外交易方面表现与其体量不相符，拥有加速的空间。”安邦等中国保险公司正在变得越发冒险，但保险业资产中只有不到2%是国外资产。

与中国企业合作的一位资深银行家表示，在做交易时，人民币进一步贬值的前景是“一个很好的副产品”。无论是加强国内市场地位，还是加快海外扩张，获取中国缺少的技术和品牌等战略考量对于买家都更为重要。交易实际完成后，它们将导致大量的一次性资金外流。但如果投资是优质的，它们应该以相关公司利润的形式产生定期资金回流。

另一类对交易金融结构的担忧更令人不安。大体而言，中国买家的负债远远超过它们正在收购的公司。根据《经济学人》对“标准普尔全球市场情报”（S&P Global Market Intelligence）数据的分析，自2015年初以来宣布的交易中，中国买家债务股本比的中位数为71%，而相比之下，外国收购目标的债务股本比是44%。中国买家的现金缓冲通常也更薄弱：它们的流动资产比流动负债大约要低四分之一。债权人的宽容让这些沉重的债务在中国比其他地方会更容易负担。但是，中国买家在财务上仍然很困难。

那么，它们从哪里得到资金来支持交易呢？对于许多买家来说，答案是更多的债务。中国的银行把贷款给海外的中国企业作为获取更多国际收入的安全方式。政府鼓励银行支持海外并购。只要被收购的公司有强劲的现金流，银行就很乐意以目标公司的资产负债表作为抵押来贷款，这把债务提高到通常只在杠杆收购中才有的水平。

外资银行也参与了一些交易：汇丰银行、瑞士瑞信银行（Credit Suisse）、荷兰合作银行（Rabobank）和裕信银行（UniCredit）正在帮助中国化工（ChemChina）进行银团贷款，后者同意以430亿美元收购瑞士的种子与杀虫剂公司先正达（Syngenta）。收购方的财务状况看起来摇摇

欲坠之时，银行家们表示他们在两件事中找到慰藉：这些交易本身会产生回报，买家尤其是国有企业的政治背景会保护它们。一位并购顾问表示：“你必须相信收购方已经变得大而不倒了。”

对于买家来说，进行交易有两个充分的财务理由，尽管这些理由凸显了中国市场的扭曲。首先，债务融资收购实际上可以使它们的债务负担变得更易容忍。以建筑设备制造商中联重科为例，它的负债相当于税息折旧及摊销前利润（EBITDA）的83倍。它想以34亿美元收购债务收益比仅为3.5倍的美​​国竞争对手特雷克斯（Terex）。即使这次收购全部使用贷款，合并后实体的债务收益比仍然会在18倍左右，对中联重科来说改善明显。

其次，中国买家知道，一个关键的金融指标对它们有利：国内股市的估值远高于国外。中国买家市盈率的中位数为56，是其收购目标的两倍。实际上，这意味着它们可以在国内发行股票，使用所募集的资金以在它们看来是打五折的价格收购海外资产。这也在竞标大战中给了它们出高价压过对手的火​​力。在外国人看来，中国人似乎花了冤枉钱。但是，只要它们的银行和股东愿意掏腰包，中国企业就会看到转瞬即逝的良机。 ■



Myanmar's economy

The Burma road

A long and painful journey awaits Myanmar's new government

SPEND a day in Yangon, shuttling among new high-rises and bars before retreating to your boutique hotel, and you can almost believe that after decades of isolation, Myanmar is squarely on the road to prosperity. Spend more than a few days, however, and the cracks start showing: intermittent power cuts, ancient sewage systems, insufficient housing for an influx of migrants from the countryside.

The situation is worse in rural Myanmar, where much of the population lives not just in extreme poverty, but also mired in debt. Bad roads make it costly to get goods to market and impede investment. Around three-quarters of the country's children live in homes that lack electricity. Myanmar's voters hope their first freely elected government since the 1960s, which took office in April, will change things for the better.

The task ahead is daunting: within South-East Asia, only Cambodia has a lower GDP per person. Its infrastructure (both physical and financial) is somewhere between crumbling and non-existent; its laws are archaic and, after decades of isolation and underinvestment in education, its skills base is woeful. Government revenue is another problem: corporate and individual tax rates are high, but few people pay. The incoming government of Aung San Suu Kyi's National League for Democracy (NLD) will inherit high inflation, sizeable budget and current-account deficits, a volatile exchange rate and institutions both ossified and hollow after decades of corruption, stagnation and top-down rule.

Still, potential abounds. Myanmar has a young and cheap workforce, a long coastline, abundant agricultural land and an ideal location, wedged

between the massive markets of China, India and South-East Asia. Expatriate Burmese are returning in droves, bringing enthusiasm and professional expertise with them.

Meanwhile, the baby steps taken under the outgoing government of Thein Sein have become a proper toddle. Preliminary figures show that GDP grew by around 8.3% in 2015; the Asian Development Bank forecasts much the same this year. Yangon's new stock exchange saw its first listing on March 25th; as many as ten other companies may list this year. Foreign investment, particularly in telecoms and energy, is flowing in. Thanks to Miss Suu Kyi's election victory, Myanmar has the world's goodwill.

Miss Suu Kyi's government says that agriculture will rank among its top priorities, which makes sense: directly or indirectly the sector employs around 70% of the labour force. Before a military junta seized control of Myanmar in 1962 it was the world's leading rice exporter—a title many believe it could reclaim. But most farmers grow low-value crops without decent fertiliser or seeds. Bad infrastructure and Byzantine internal trade rules keep the domestic market fragmented and productivity low: in 2012 average annual income from agriculture in Myanmar was \$194 per worker, compared with \$507 in Bangladesh and \$706 in Thailand.

In the near term, making it easier for farmers to get affordable credit would help. The main (and for decades, the only) source of rural credit is the state-run Myanmar Agricultural Development Bank, which provides only tiny loans. This sends farmers into the arms of informal moneylenders, who charge as much as 10% a month, fuelling a cycle of debt that often ends with farmers losing their land.

Myanmar's new government will also have to tackle land rights: confusing and poorly enforced land-use laws impede foreign investment and leave rural farmers vulnerable to confiscation. The NLD's election manifesto

promises land reform, but given that it will require the new government to confront the still-powerful army, that is easier promised than delivered.

That hints at the first of two huge questions hanging over Myanmar's economic reform: will the army and the NLD, inveterate foes until recently, be able to work together? And after 50 years of military rule, will the creaking bureaucracy be able to adapt and at least try to meet the citizenry's high expectations? As one foreign investor in agriculture notes, "The ministers may understand what needs to be done. But there are so many layers below of people who have been living differently for so long that [change] will take a long time." ■



缅甸经济

缅甸之路

缅甸新政府面临着漫长而痛苦的前程

如果你在仰光花上一天时间，在新建的高楼和酒吧间穿梭，然后回到精品酒店，你几乎会相信，经过几十年的与世隔绝之后，缅甸已然迈上了走向富裕的康庄大道。然而，如果你多待几天，马脚就开始显露出来：时不时的断电、老旧的排污系统，住房也无法满足汹涌而来的农村移民。

缅甸农村的情况更糟。大部分人口不只是极端贫困，更是债台高筑。糟糕的道路让货物难以运达市场，还造成投资障碍。全国有四分之三的儿童家中没有通电。自上世纪60年代以来首次自由选举产生的政府4月就职，缅甸选民希望新政府能够改变这一切。

任务是艰巨的：在东南亚，比缅甸的人均GDP更低的只有柬埔寨。基础设施（包括实体的和金融的）要么摇摇欲坠，要么根本不存在；法律已经过时，在几十年的与世隔绝和教育投资不足之后，劳动力技能也不容乐观。财政收入是另一问题：企业和个人的税率都很高，但交税的人却几乎没有。昂山素季领导的全国民主联盟（NLD）组建的新任政府将接手的是高通胀、庞大的预算和经常账户赤字、波动剧烈的汇率，以及数十年腐败、停滞和自上而下统治带来的僵化而空心的机构。

尽管如此，潜力还是很大。缅甸拥有一群年轻而廉价的劳动力、漫长的海岸线、充足的农业用地和理想的地理位置——夹在中国、印度和东南亚的庞大市场之间。海外缅甸侨民正在成批回国，带来热情与专业技能。

与此同时，吴登盛即将离任的政府的蹒跚学步也已渐行渐稳。初步数据显示，GDP在2015年增长8.3%左右；亚洲开发银行预测今年也大致如此。仰光的新股票交易所在3月25日有了第一支股票上市，今年最多还会有十家公司上市。外国投资正在涌入，尤其是在电信和能源领域。由于昂山素季在大选中获胜，全世界都对缅甸心怀好感。

昂山素季政府表示，农业将是其首要任务，这很有道理：这个行业直接或间接地雇用了约70%的劳动力。在军政府于1962年控制缅甸之前，缅甸是全球第一的大米出口国，很多人认为它能够夺回这一头衔。但是，大多数农民种植的作物价值低，也没有像样的化肥和种子。糟糕的基础设施与错综复杂的国内贸易规则，导致国内市场支离破碎，生产力低下：2012年，缅甸的农业年人均收入是194美元，而孟加拉国是507美元，泰国是706美元。

在短期内，让农民更易获得能够负担得起的贷款会有所帮助。农村贷款的主要（在几十年间是唯一的）来源是国营的缅甸农业发展银行。它仅提供小额贷款。这把农民逼到了非正规放贷者那里，他们收取的月息高达10%，它造成的连环债务往往会导致农民失去土地。

缅甸新政府还必须解决土地权利问题：混乱的土地使用法律加上执行不力，使外国投资望而却步，而农民的土地却容易被没收。民盟的竞选宣言承诺土地改革，但这意味着新政府必须对抗依旧强大的军队，这个承诺兑现起来并不容易。

这暗示着缅甸在经济改革上悬着的一个巨大的问题：直到不久前，军队和民盟都是根深蒂固的敌人，他们能不能合作？另一个问题是，经过50年的军人统治，运转不灵的官僚机构是否能够适应，或至少试图满足民众的高期望？正如一位外国农业投资者所言：“部长可能知道需要做什么。但下面有太多层级的人，他们以另一种方式生活了那么久，[改变]需要很长的时间。”■



Retailing

Shops to showrooms

Why some firms are opening shops with no stock

THE Bonobos shop on lower Fifth Avenue, in Manhattan, sits in a row of familiar fashion brands, including J.Crew, Zara and Gap. As at those stores, shoppers at Bonobos can survey racks of clothes, try on this shirt and those trousers, then decide which items to purchase. Unlike in those stores, shoppers at Bonobos may not buy any clothes to take home. When Bonobos first tried this idea, in 2011, it seemed like a lark. The company now has 20 such shops, from Texas to California, and plans to open at least seven more this year.

Bricks-and-mortar stores are in the throes of an identity crisis. The growing threat from online shopping has spurred some physical retailers to do more than just sell goods. Lululemon lures shoppers with both yoga clothes and yoga classes; Louis Vuitton displays fine art beside its frocks. Among the most interesting models to emerge, however, are chains such as Bonobos, whose outlets have no stock to sell.

The idea is to divorce the purchase of a product from its distribution. Until recently, this business model was largely restricted to sellers of big, non-portable things like furniture: people like to examine sofas before they buy them, but they do not fit neatly into shopping bags. Now, clothing retailers are seeing the downsides of conventional shops, too.

If a retailer stores and sells goods in the same place, it must lease space, often in an expensive central location, for the store room as well as the shop floor. Staff may be needed to unpack deliveries overnight, which raises costs further. Employees spend much of the day restocking shelves, which means less attention paid to customers. Companies can never

predict perfectly which items will sell in which shops. Inevitably some clothes linger unsold for too long, and must be marked down, which squeezes margins.

Online-only shops have less of a problem with this sort of thing, but there are still many consumers who like to check the fit and the feel of a garment before buying. So Paul Evans and Jack Erwin, two young shoe companies, have showrooms in New York where shoppers can inspect loafers and brogues, then order them online. Warby Parker does the same for glasses.

The most prominent American example is Bonobos, which began as an online-only men's retailer before realising customers wanted shops, too. Its outlets house many styles and many sizes, but not every style in every size. Salesmen have the sole job of helping each shopper find clothes he likes, identify the proper fit and order the clothes online. "We do a better job of selling clothes because we don't stock the clothes," boasts Andy Dunn, the firm's founder. Bonobos need not guess which trousers will sell at which store. All its stock is at one central warehouse.

In Asia, Zalora offers a variation on this theme. The four-year-old online retailer displays its clothes in pop-up showrooms in Singapore, Malaysia, Hong Kong, Indonesia and the Philippines. Such temporary installations, explains Tito Costa, Zalora's marketing chief, are "a way to build confidence either in a new way of shopping or in a young brand." Shoppers can try on Zalora's clothes, chat with its stylists and order items online, either from computer stations or by scanning a QR code with their phones, using Zalora's app.

It is no coincidence that the companies that are testing out such showrooms began online. Big, established retailers are unlikely to convert stores to showrooms, at least in the foreseeable future. They have trained millions of customers to expect immediate gratification—buy a Zara dress

in the afternoon, for example, and go dancing in it that same evening. Delivering to individuals rather than shipping in bulk to stores would also require established retailers to upend their distribution networks, says Neil Saunders of Conlumino, a consulting firm. But for many younger retailers, selling online and in showrooms may be the future, not least because showrooms are cheaper to run than conventional shops. That means they can open more of them, more quickly. ■



零售业

商店变展厅

为什么有些公司会开设没有库存的店面

纽约下城第五大道的Bonobos商店夹杂在J. Crew, Zara和Gap等多个人们熟知的时尚品牌之中。与其他商店一样，顾客在Bonobos商店中可以浏览货架上的衣服、试穿这件衬衫那些裤子，然后决定要买什么。而与其他商店不同的是，来Bonobos的顾客无法买衣服带回家。2011年当Bonobos第一次尝试这个点子时，看起来像是闹着玩的。现在公司已开设了20间这样的店铺，从德州到加州，而且计划今年再开至少七家。

实体店正在一场认同危机中苦苦挣扎。网上购物的威胁越来越大，已经促使一些实体零售商做出销售产品之外的努力。露露柠檬（Lululemon）以瑜伽服和瑜伽课程吸引顾客；路易威登将艺术品和它的连衣裙一同展出。不过，最有趣的新兴模式是像Bonobos这样的连锁店，它们的店面并无库存可售。

这一想法是要将商品的采购与销售分离。直到最近，这样的业务模式大多还是仅限于不便搬运的大件商品的卖家，例如家具：人们在购买前想仔细查看沙发，但沙发没法方便地塞进购物袋里。现在服装零售商也在审视传统商店的不足之处。

如果零售商在同一个地方存放并售卖商品，那么它在租店面的同时还必须租储藏室，而这些店面通常都在昂贵的中心地段。店员可能得通宵卸货拆包，这进一步增加了成本。员工一天要花大量时间补货，这意味着对客户关注的减少。公司永远无法完美预测哪些商品在哪家店好卖。有些衣服不可避免地会长时间卖不出去，不得不降价出售，而这压缩了利润。

仅做在线销售的店铺在这方面的问题会少一些，但是仍有很多消费者喜欢在买衣服前试穿并且感受质地。因此Paul Evans和Jack Erwin这两家年轻的鞋业公司在纽约开设了展示店，顾客可以在那儿看看乐福鞋和布洛克鞋，

然后在网上下单。Warby Parker也开设了类似的眼镜店。

最突出的美国范例是Bonobos，它从在线销售男装起家，之后意识到客户也喜欢实体店面。它的店铺有众多款式与很多码数，但并非每种款式都码数齐全。店员唯一的职责是帮每位顾客找到他想要的衣服，确定合适的尺码，然后在网上下单。“我们在卖衣服上做得更好，因为我们不存货，”公司创始人安迪·杜恩（Andy Dunn）夸耀道。Bonobos不需要猜测哪些裤子会在哪些店会热卖。所有的库存都集中在一个中央仓库。

在亚洲，Zalora提供的是这种模式的一个变体。这家成立四年的在线零售商在新加坡、马来西亚、香港、印尼和菲律宾的快闪展示店里展示它的衣服。Zalora的市场主管提托·科斯塔（Tito Costa）称，这样临时搭建的展厅是“新的购物方式或者一个年轻品牌树立信任的途径”。顾客可以试穿Zalora的服装，和设计师交谈，然后在网上订货，既可以通过店里的计算机也可以用手机扫描二维码使用Zalora的应用下单。

检验这些展厅的公司都以在线销售起步，这一点绝非偶然。大型的老牌零售商不可能将店面转成展厅，至少在可预见的未来不会。它们已经训练出数以百万计的顾客期盼自己获得即时满足感，例如下午买条Zara的裙子，当晚就穿上去跳舞。咨询公司Conlumino的尼尔·桑德斯（Neil Saunders）认为，配送给个人，而不是成批送货到店铺也要求老牌零售商重构它们的分销网络。但对很多较年轻的零售商而言，在线销售和展厅销售可能是未来之路，尤其因为运营展厅比传统店面要便宜，这意味着它们能更快更多地开设展厅。■



Rotterdam

The shipping news

Europe's biggest port is a barometer of the world economy

UNLESS you are a hermit, you own and consume things that have passed through the port of Rotterdam. Last year the port handled 466m tonnes of cargo, more than double the amount of Europe's second port, Antwerp. The endless shifts in the size and composition of these flows provide an instant indicator of the state of the world economy. And the trends that are transforming the port's operations—automation and the shift away from fossil fuels—give a sense of the future too.

Thanks to its easy access for big ships from the Atlantic and for barges from the interior, Rotterdam has been Europe's dominant port for much of modern history. Its success is man-made: in the mid-19th century, when the Ruhr region of Germany was industrialising, Rotterdammers dug a channel to connect the Maas river, which runs through the city, to the Rhine, creating the most shipworthy route from Europe's industrial heartland to the North Sea.

The port has been evolving in sympathy with the global economy ever since: in the mid-20th century, new handling and storage facilities for oil and chemicals were built to cater to the post-war boom. As globalisation gathered pace in the 1990s and 2000s, the port expanded further into the sea, to provide berths for the mega-ships bringing sneakers and flat screens from Asia to Europe.

Activity at the port today bears witness to four trends currently shaping the world economy: the low price of oil, slow growth in China and emerging markets, the sluggish euro-area recovery and the global slowdown in manufacturing and trade. From his office overlooking the Maas, Eelco

Hoekstra, the boss of Vopak, the world's largest independent storage company of "all things liquid", sees the physical manifestation of movements in energy markets sailing by each day.

In 2014, he recalls, when fracking was flooding America with cheap natural gas, huge cargoes of American coal suddenly started floating past. Gas was displacing coal in America but remained expensive in Europe, since America had little export capacity. So European utilities began snapping up the unwanted American coal instead: more of it was exported to the Netherlands than to any other country in 2014 and the first half of 2015.

Soon after, the price of oil collapsed. Big consumers expected a relatively prompt revival, however, judging by the price of futures contracts. Rotterdam's vast storage tanks quickly filled, as traders bought cheap crude on the spot market and sold futures at a higher price, locking in a profit. The low oil price, meanwhile, has helped pad margins at refineries and chemical plants, spurring a flurry of activity in Rotterdam's sprawling industrial complexes.

The oil price fell thanks in part to slowing growth in China, which is also evident in the sudden appearance of Chinese ships offloading surplus steel. This in turn means fewer barges are taking iron ore down the Rhine to German steel mills. Declining sales of German cars in China compound the problem, as carmakers consume less steel. The drop in shipments of bulk goods arriving in Rotterdam, says Allard Castelein, CEO of the port, is a direct result of this baleful cycle.

The relative strength of the American and British economies is some compensation. In 2015 so-called "RoRo" (roll-on roll-off) traffic of lorries crossing the North Sea to Britain increased by 13% compared with the year before. America-bound cargo has also held up well. There are also a few countries from which imports to Rotterdam are growing fast. As wages in

China have risen, says Roderick de la Houssaye of van Uden, a logistics firm, his clients—particularly makers of shoes and clothes—are relocating. Some have gone to places with lower wages, such as Indonesia and Vietnam; others to closer manufacturing regions such as Turkey, which are less likely to suffer from transport disruption.

Some people see “near-shoring” to places like Turkey as a sign that globalisation is ebbing. The Baltic Dry Index, which tracks the cost of moving raw materials by sea, hit a record low in February. That is partly the result of a ship-building binge, but also of faltering demand. For the past few years world trade has been growing no faster than the world economy—the reverse of the usual pattern; in dollar terms, it declined by almost 14% in 2015.

All this can clearly be felt in Rotterdam, where one in four containers originates in China. “When Singapore’s harbour is empty, it’s hard to see how we can be full,” says Mr Castelein. Although the volume of goods handled in the port grew by 4.9% last year, this was almost entirely thanks to the increased trade in oil and oil products. Container volumes dropped by 1.1% and agricultural bulk by 3.8%.

Whether this slowdown is just a temporary dip or a permanent one is the subject of a heated debate. Mr Hoekstra is convinced that intercontinental trade will continue to grow. In the past 15 years he has seen shipments of oil and refined products quadruple. The main driver, he says, is a growing imbalance between those who have natural resources and those who need them. As oil and gas production becomes ever more concentrated in a few places, the need to ship and store the stuff will only grow, he thinks. Russia and the Middle East have too much oil; Asia too little. Europe has a shortage of diesel but a surplus of gasoline, which South Africa, in turn, wants more of—and so on.

But Bart Kuipers of Erasmus University argues that a number of trends all push in the same direction: less container traffic. Economies are shifting from industry to services; advances in logistics and technology, such as near-shoring and 3-D printing, are making it more practical to manufacture things in the rich world; recycling drives are sapping the incentive to import.

Rotterdam provides much more conclusive evidence of another trend that will shape the world economy: automation. Earlier this year its crane-drivers, often referred to as “the kings of the terminal”, went on a 24-hour strike that paralysed large parts of the port for the first time in 13 years. They were protesting against competition from robots. In 2013 the opening of “Maasvlakte 2”, which extended the port by a fifth by reclaiming land from the sea, was welcomed as a feat of engineering not just because it made the Netherlands 20km² (8 square miles) bigger, but also because its new “ghost” terminals run with almost no human intervention. In an episode of “The Wire”, a hit American TV drama, a stevedore at the port of Baltimore declares a jazzy promotional video about Rotterdam to be a “horror movie”.

In this part of the port, there is no hustle and bustle. Crane-drivers have been replaced by “remote crane operators”, who sit in a distant office in front of computer screens, using joysticks to control as many as three cranes at once. The cranes lift containers onto self-driving, battery-powered automated guided vehicles (AGVs), which deliver them to stacks to be distributed by truck, train or barge. When their batteries run out, the AGVs drive to a depot where robots remove the spent ones and insert replacements. It is eerily quiet and dark, as the AGVs do not need light to navigate.

Humans’ main role is to stay out of the way; an AGV is about as heavy as a

small aircraft and the whole system shuts down if any unexpected people or vehicles enter the terminal. APM Terminals, which operates part of Maasvlakte 2, hopes each crane will be able to move over 40 containers per hour in this way, compared with 30 or so in less advanced facilities. That cuts shipping times, saving lots of money. It is also far safer and, as one shipping executive notes, “Robots don’t take breaks or strike.” Sensing mortal danger to their livelihoods, workers are threatening more strikes unless the management promises to preserve their jobs and salaries.

Another area of evolution concerns how the new parts of the port are powered. The AGVs and cranes in the new terminals are all electric, and an increasing number of windmills and solar panels provide much of the power the port consumes. All this reduces emissions of greenhouse gases, in keeping with increasingly restrictive European rules. The port is also investing in all sorts of climate-friendly experiments, from using residual heat from industry to warm homes and offices in the city to storing carbon under the seabed.

Nonetheless, notes Jan Rotmans of Erasmus University, “Everything in the port breathes fossil.” Much of its business comes from the shipping and storing of oil, coal and other polluting fuels. Shell and ExxonMobil recently announced that they would spend some €2 billion (\$2.2 billion) expanding their refineries in Rotterdam.

Mr Rotmans wonders whether this business will continue to grow. That depends on whether the rest of the world will follow the port’s lead in terms of curbing its emissions. Rotterdam and other ports are not perfect bellwethers for the world economy: they give little indication, for instance, of what is happening in services, since lawyers and consultants don’t tend to travel in ships. But, horror movie or not, it is hard to deny that Rotterdam’s docks reflect glimmers of the future. ■



鹿特丹

航运新闻

欧洲最大的港口是世界经济的晴雨表

除非你隐居遁世，你所拥有和消费的东西都会经过鹿特丹港。去年，该港吞吐了4.66亿吨货物，超过欧洲第二大港安特卫普（Antwerp）货运量的两倍。这些货物流的规模和构成在无休止地变化着，为世界经济状况提供了一个即时指标。自动化和减少化石燃料使用这两大趋势正在改变港口的经营，也给人一种未来感。

由于来自大西洋的大型船舶和来自内陆的驳船都能很容易驶入鹿特丹，在现代历史的大部分时间里，它一直是欧洲的主要港口。它的成功是人力而为的：19世纪中期，德国鲁尔地区正在经历工业化，鹿特丹人挖掘出一条运河将穿过该市的马斯河（the Maas river）与莱茵河相连接，创建了一条最适于航行的、从欧洲工业中心地带通向北海的航线。

自那以后，这个港口的发展就一直与全球经济表现一致：20世纪中期，为顺应战后的繁荣，它兴建了装卸和储存石油及化学品的新设施。上世纪90年代和本世纪头10年，随着全球化步伐加快，港口进一步向大海延伸以提供巨轮的泊位，这些巨轮把运动鞋和平板显示屏从亚洲运到欧洲。

港口如今的活动见证了当前塑造世界经济的四大趋势：低油价、中国和新兴市场增长缓慢、欧元区复苏的停滞以及全球制造业和贸易放缓。荷兰皇家孚宝集团（Vopak）是世界最大的独立储罐公司，可储存“一切液态产品”，其老板艾尔克·霍克斯特（Eelco Hoekstra）的办公室俯瞰马斯河，在这里他亲眼目睹着能源市场的变动实实在在地体现在每天驶过的船只上。

他回忆说，在2014年水力压裂技术让廉价天然气充斥美国之时，装载美国煤炭的巨大货船突然开始驶过。天然气在美国代替了煤炭，在欧洲却依然很贵，因为美国的出口能力很小。因此，欧洲的发电企业开始抢购美国不

想要的煤炭：2014年和2015年上半年，美国出口到荷兰的煤炭比到其他任何国家都多。

不久之后，油价暴跌。然而，从期货合约的价格判断，消费大户预期它的恢复会相对迅速。鹿特丹的巨大储油罐迅速被填满，因为交易员在现货市场上买入便宜的原油并以较高价格出售期货，以此锁定利润。同时，低油价有助于提高炼油厂和化工厂的利润，也为鹿特丹庞大的工业区带来了一片繁忙的景象。

油价下跌的原因之一是中国经济增长放缓，当中国船只卸下过剩钢材的场景突然出现时，这一点也显而易见。而这意味着把铁矿石顺着莱茵河运到德国钢厂的驳船会随之减少。德国汽车在中国的销量下滑让问题更为复杂，因为汽车制造商消耗的钢材会减少。鹿特丹港的CEO阿拉德·卡斯特兰（Allard Castelein）表示，这个恶性循环直接导致运抵该港的散装货物量下降了。

美国和英国经济的相对走强可以给到些许补偿。2015年，载满卡车横穿北海到达英国的滚装船同比增加了13%。运往美国的货物增长良好。还有另外几个国家运送到鹿特丹的货物也在快速增长。物流公司van Uden的罗德里克·德·拉·何赛（Roderick de la Houssaye）表示，由于中国工资上涨，他的客户，尤其是鞋类和服装制造商，正在搬迁。一些人已经搬到印尼和越南等低工资的地区；其他的则搬到土耳其等距离欧洲更近的制造业地区，那里不太可能受运输瓶颈的干扰。

一些人认为像土耳其这些地方的“近岸外包”是全球化退潮的一个迹象。今年2月，跟踪原材料海运成本的“波罗的海干散货指数”（Baltic Dry Index）创历史新低。一方面是因为造船热潮，另一方面则由于需求下降。在过去的几年里，世界贸易的增速并没有高过世界经济的增速——这与通常的模式相反；按美元计算，世界贸易在2015年下降了将近14%。

所有这一切在鹿特丹都能清楚地感受得到，这里四分之一的集装箱来自中国。卡斯特兰说：“当新加坡港空空如也的时候，我们也很难做到满仓运

作。”尽管鹿特丹的货物吞吐量去年增长了4.9%，但是这几乎完全归功于石油和石油产品贸易的增长。集装箱数量下降了1.1%，而大宗农产品下滑3.8%。

这次放缓只是暂时下降还是长期走低，这个话题争论激烈。何赛相信，各大洲之间的贸易将继续增长。在过去的15年里，石油和成品油的运输已翻了两番。他说，主要驱动力是那些拥有自然资源的地区和那些需要资源的地区之间越来越不平衡。他认为，由于石油和天然气的生产越来越集中在少数几个地方，船运和储存这些资源的需求只会增长。俄罗斯和中东石油太多，而亚洲石油太少。欧洲柴油短缺，但汽油过剩，反过来南非却需要更多汽油，等等。

| 风暴中的港口

但是，伊拉斯姆斯大学（Erasmus University）的巴特·凯帕斯（Bart Kuipers）认为，几大趋势都朝着同一个方向发展：减少集装箱运输。经济体正从工业转向服务业；近岸外包和3D打印等物流和技术上的进步使在发达国家生产产品更为可行；回收利用的活动正在削弱进口的动机。

鹿特丹提供更确凿的证据证明了即将影响世界经济的另一大趋势：自动化。今年早些时候，那些常被称为“港口之王”的起重机司机进行了为期24小时的罢工，13年来首次使港口的大部分区域陷入瘫痪。他们抗议来自机器人的竞争。通过围海造地使港口扩大五分之一的马斯弗拉克特二号码头（Maasvlakte 2）于2013年开业，被誉为工程壮举，不仅因为它让荷兰的领土增加了20平方公里，还因为它那些新建的“幽灵”码头几乎没有人工干预。热播美剧《火线重案组》（The Wire）里有一集，一位巴尔摩港的装卸工说鹿特丹那段花哨的宣传视频是一部“恐怖电影”。

港口的这一区域没有喧嚣。起重机司机已被“远程起重机操作员”所取代，后者坐在遥远办公室的电脑屏幕前，用操纵杆同时控制多达三台起重机。集装箱被起重机抬上自行驱动、电池供电的无人搬运车（AGV），先运到堆场，再由卡车、火车或驳船运走。电池用完后，AGV会驶进到一个仓库，由机器人取出用过的电池并插入新电池。这里出奇地安静和黑暗，因

为AGV不需要光来确定路线。

人类的主要作用是置身事外。AGV的重量相当于一架小飞机，如果任何不速之客或车辆进入码头，整个系统都会关闭。负责经营马斯弗拉克特二号码头一部分区域的APM码头公司（APM Terminals）希望一架起重机能以这种方式每小时移动40多个集装箱，比较之下，不太先进的设施只能移动30个左右。这减少了运输时间，节省了很多资金。一位航运界高管指出，这也更安全，而且“机器人不会休息或者罢工”。工人们意识到自己的生计面临严重危机，威胁要举行更多罢工，除非管理层承诺保住他们的工作和薪水。

另一个发展领域与港口新建部分的供电方式有关。新码头的AGV和起重机都是电动的，越来越多的风力发电机和太阳能电池板提供了港口消耗电力的一大部分。所有这些都减少了温室气体排放，以符合欧洲日益严格的规定。该港口还投资于各种气候环保试验，从利用工业余热为城市家庭及办公室供暖到在海底储存碳。

尽管如此，伊拉斯姆斯大学的让·罗特曼斯（Jan Rotmans）指出，“整个港口都要依靠化石燃料”。港口的大量业务来自石油、煤等高污染燃料的运输和储存。壳牌和埃克森美孚最近宣布将花费大约20亿欧元（22亿美元）来扩建它们在鹿特丹的炼油厂。

罗特曼斯想知道这项业务能否继续增长。这取决于世界上其他地区是否会效法该港口控制排放的做法。鹿特丹以及其他港口都不是世界经济的最佳风向标：例如，关于服务业正在发生什么，它们没有给出指示，因为律师和咨询顾问往往不坐船。然而，无论是不是恐怖电影，无可否认，鹿特丹的码头折射着未来之光。 ■



Solar energy

Follow the sun

Solar power is reshaping energy production in the developing world

RAED KHADER, a Jordanian driver, has an alarming habit of thumbing his mobile phone while at the wheel—albeit on a straight road cutting across the desert. But after scrolling back through almost two years of photos, he finds a picture that tickles him: of camels against a sandy backdrop. Today that same spot outside Ma'an, a poverty-stricken city in south Jordan, is crawling with workers in the final stages of installing five square kilometres (almost two square miles) of solar panels.

He is enraptured by the photovoltaic (PV) modules that shimmer in the desert sunshine. “It’s amazing. I love it. It’s good to see my country develop its own source of energy,” he says. “We have such good sun here. It’s free. Why don’t we use more of it?” In his enthusiasm, he has convinced his daughter to become one of the first Jordanian women to study for a solar-energy engineering degree.

The 160-megawatt (MW) solar park, which is scheduled to open this summer, will mark the launch of Jordan’s effort to reduce its fossil-fuel imports, which generated 96% of its energy last year and cost about 10% of GDP. In a restive neighbourhood, it has good reason to become more self-reliant. Its liking for solar intensified after Egypt temporarily cut natural-gas supplies during the Arab spring in 2011.

The small steps sanctioned by Jordan’s cautious bureaucracy pale in comparison with the growth of solar energy in some other countries. But they illustrate the allure of the technology, as well as some of its teething problems.

Across the developing world, solar power is hitting its stride. Rather than the rooftop panels popular in Germany, countries where solar irradiance is much stronger than northern Europe are creating vast parks with tens of thousands of flexible PV panels supplying power to their national grids. Some countries, such as China, provide generous subsidies (though these are sometimes years overdue). But in other countries solar PV is becoming competitive even without financial support.

In 2015 China surged past Germany to become the biggest producer of solar energy, benefiting from its dominance of solar-panel manufacturing and policies to reduce dependence on dirtier fuels, such as coal. Solar power accounts for just 3% of the electricity mix, but China is now building its biggest plant, in the Gobi desert. Analysts expect the country to install 12 gigawatts (GW) of solar in the first half of this year. That would be one-third more than the record amount America plans to build for the full year. Coal, meanwhile, is in growing trouble.

India is determined to keep up. Its government is targeting a 20-fold increase in solar-power capacity by 2022, to 100GW. Though this might be over-ambitious, KPMG, a consultancy, expects solar's share of India's energy mix to rise to 12.5% by 2025, from less than 1% today. It thinks solar in India will be cheaper than coal by 2020. (Even Coal India, a mostly state-owned entity, plans to contract 1GW of solar power to cut energy bills.) Such is the frenzy that officials in sunny Punjab are urging farmers to lease their land to solar developers rather than till it.

Led by big projects in these two countries, global solar-energy capacity rose by 26% last year. More remarkable is the decline in its cost. Studies of the "levelised cost" of electricity, which estimate the net present value of the costs of a generating system divided by the expected output over its lifetime, show solar getting close to gas and coal as an attractively cheap source of power. Auctions of long-term contracts to purchase solar power

in developing countries such as South Africa, the United Arab Emirates, Peru and Mexico provide real-world evidence that such assumptions may even prove to be conservative (see chart).

In sunny places solar power is now “shoulder to shoulder” with gas, coal and wind, says Cédric Philibert of the International Energy Agency, a prominent forecaster. He notes that since November 2014, when Dubai awarded a project to build 200MW of solar power at less than \$60 a megawatt hour (MWh), auctions have become increasingly competitive.

Some renewable-energy developers are gaining global reputations as record-breakers. The Dubai bid was won by Acwa Power, a Saudi company that is taking big strides across the Middle East and Africa, despite the oil-rich kingdom’s own half-hearted plans for solar development. In Morocco it has built the first phase of the world’s largest solar-thermal plant, which is using mirrors to generate heat to drive electricity turbines. Moody’s, a rating agency, says the completed plant will cut Morocco’s oil-import bills by 0.3% of GDP.

| *Let the sunshine in*

Italy’s Enel Green Power (EGP) is also attracting attention. In February it won a tender to provide Peru with 20 years of power from solar PV at just under \$48 a MWh. Just over a month later Mexico awarded it a similarly lengthy contract to generate solar power in the arid northern state of Coahuila at a price of about \$40 per MWh. Bloomberg New Energy Finance (BNEF), a research firm, called it “the lowest subsidy-free solar contract we have ever seen”. EGP’s head of business development, Antonio Cammisecra, says there is a clear trend of falling prices. “We are trying to drive it,” he says.

The main factor behind the price drop is an 80% fall in the cost of solar panels since 2010, according to the International Renewable Energy

Agency, an industry body. But Mr Cammisecra says that may now be close to ending. He travelled to China last week to persuade panel manufacturers to invest more in technological improvements, in order to increase the amount of solar energy that can be converted into electricity.

Analysts are also concerned that some providers' auction bids may be over-aggressive, though companies can incur stiff penalties if they fail to complete a contract. Mr Philibert notes that some contracts may collapse because bidders are unable to raise finance.

Jenny Chase of BNEF says that in some cases "the model is being pushed to the absolute limit". Indian firms, for example, are calculating development costs well below comparable global benchmarks. "I struggle to see how they will do this without cutting corners," she says.

Jordan is a case in point. A Greek developer, Sunrise, last year agreed to charge \$61 per MWh to build a 50MW solar plant north of Amman, which rival developers thought too cheap because of relatively high financing costs in Jordan. Last month Acwa Power bought the Jordanian unit in order to rescue the contract. Analysts say it is hard to see how Acwa will make money from it, but the gesture may help it win solar contracts in the future.

The kingdom offers more lessons on potential pitfalls. Like many developing countries, its national electricity company, NEPCO, has failed to expand its grid as quickly as private firms can erect solar parks, though it now has funding to build high-voltage transmission lines to connect the solar plants to Amman, the capital, where most electricity is consumed. (This problem is shared with China, which sometimes forces solar and wind plants to "curtail" their electricity output because the grid lacks the capacity to absorb it.)

But Jordan is blessed with geographical features that will let it expand its

solar capacity once it has ironed out its problems. Engineers say that the area around Ma'an, with about 330 sunny days a year, has some of the best solar irradiance in the region. They add that, because of its altitude and terrain, heat and dust do not substantially lower the efficiency of the PV panels, as they do in neighbouring Saudi Arabia.

Support also comes from the top. King Abdullah has ordered solar panels to be installed on palaces and mosques, businessmen say. His most senior ministers drive Tesla electric vehicles. With more solar energy, the economic future of Jordan would be brighter and the country less at risk in a volatile region. All it needs is for the sun to energise its bureaucrats. ■



太阳能 追日

太阳能发电正在改变发展中国家的能源生产

约旦司机里德·卡德尔（Raed Khader）有个吓人的习惯——在开车的时候翻阅手机，虽然是在横穿沙漠的一条直路上。但在他翻过了将近两年的照片后，一张照片把他逗乐了：一群骆驼走在无边的沙漠上。如今，在南约旦这个一穷二白的马安（Ma'an）城外同一个地方，却满是正在为5平方公里太阳能电池板安装工作收尾的工人。

沙漠阳光下，闪闪发光的光伏（PV）模块让他眉飞色舞起来。“太棒了。我喜欢。看到我的国家发展自己的能源太好了，”他说，“我们这里太阳这么好，还不要钱。为什么不好好利用一下？”他满腔热血，还说服了他的女儿成为约旦攻读太阳能工程学士学位的第一批女生中的一员。

计划于今年夏天开张的160兆瓦的太阳能园区，标志着约旦努力减少化石燃料进口工作的启动。去年，进口化石燃料生产了约96%的能源，成本为GDP的10%左右。在这个动荡的地区，力图自力更生的理由很充分。在2011年阿拉伯之春期间，埃及一度切断天然气供应之后，约旦对太阳能的偏好就更明显了。

相比于其他一些国家的太阳能增长，约旦官僚机构迈出的步伐显得谨小慎微。不过，这些做法在展现技术魅力的同时，一些磨合问题也显现出来。

在整个发展中世界，太阳能发电都在大踏步地发展。和德国流行的屋顶太阳能板不同，那些太阳辐照度比北欧强得多的国家建立了宏大的园区，安装了数以万计的柔性光伏电池板来为国家电网供电。中国等国家则提供了慷慨的补贴（尽管有时已是滞后多年）。但是在其他国家，即使没有财政支持，太阳能光伏发电也开始有了竞争力。

2015年，中国突飞猛进，超过德国成为了太阳能最大的生产国，这得益于

其在太阳能面板制造方面的优势地位，以及减少对煤炭等肮脏燃料依赖的政策。虽然太阳能仅占供电总额的3%，如今中国正在戈壁滩上建设其最大的太阳能发电厂。分析师预计，中国在今年上半年安装的太阳能将达到12吉瓦。这比美国计划全年建设的创纪录容量还要多三分之一。与此同时，煤炭面临的麻烦越来越大了。

印度决心跟上潮流。印度政府计划到2022年，太阳能发电能力要增长20倍，达到100吉瓦。虽然这个胃口可能有点太大，但咨询公司毕马威（KPMG）预计，印度的能源结构中，太阳能份额将从今天的不到1%上升到2025年的12.5%。它认为，到2020年，印度的太阳能价格将比火力发电更低。（即使主要为国有的印度煤炭公司也计划签约1吉瓦太阳能发电以削减发电成本。）在这种热潮中，阳光明媚的旁遮普邦的官员甚至敦促农民不要种地了，而是把土地租赁给太阳能项目开发商。

在这两个国家的大项目带领下，全球太阳能发电能力在去年增长了26%。更令人瞩目的是其成本的下降。电力的“平准化成本”研究，即对发电系统成本的净现值除以整个生命周期的预期产出的估计，表明太阳能正在赶上天然气和煤炭，成为一种有吸引力的廉价能源。在南非、阿联酋、秘鲁和墨西哥等发展中国家采购太阳能电力长期合同的拍卖，真实地证明了这样的假设甚至还偏于保守（见图）。

著名的预测专家，国际能源署的塞德里克·菲利贝尔（Cédric Philibert）说，在阳光充足的地方，如今太阳能发电已是与天然气、煤炭和风力“并驾齐驱”。他指出，自2014年11月，迪拜以每兆瓦时不到60美元的价格获得了建造200兆瓦太阳能发电厂的项目后，拍卖的竞争日趋激烈。

一些可再生能源的开发商不断打破纪录，在全世界出了名。沙特的ACWA Power公司赢得了迪拜的招标，正在整个中东和非洲攻城掠地，尽管盛产石油的沙特王国自身对太阳能的发展犹豫不决。它在摩洛哥已建成世界上最大的太阳能热电厂，使用镜面产生热量来驱动涡轮机发电。穆迪评级机构表示，该工厂建成后，摩洛哥节约的石油进口开支可达GDP的0.3%。

意大利的Enel Green Power (EGP) 公司也引起了人们的注意。今年2月，它赢得了招标，以略低于48美元每兆瓦时的价格为秘鲁提供20年的太阳能光伏电力。仅仅过了一个月，墨西哥给了它一个同样漫长的合约，以每兆瓦时40美元的价格在北部贫瘠的科阿韦拉州进行太阳能发电。研究公司彭博新能源财经 (BNEF) 将其称为“我们所见过的最便宜的无补贴太阳能合同”。EGP的商业发展负责人安东尼·卡米赛克拉 (Antonio Cammisecra) 说，价格下跌的趋势很明显。他表示，“我们正努力因势利导。”

根据国际可再生能源署的说法，价格下降的主要因素是太阳能电池板的成本自2010年以来下跌了80%。但是卡米赛克拉说，这个趋势可能快结束了。他于四月初前往中国，游说太阳能面板厂商进一步投资于技术改进，让更多的太阳能转化为电能。

分析师们还担心，尽管如果无法完工，企业会招致严厉的处罚，一些供应商的投标价格可能还是过低。菲利贝尔先生指出，由于一些合同的投标方无法融资，合同可能会崩溃。

BNEF的珍妮·切丝 (Jenny Chase) 说，在某些情况下，“模型已经推到了绝对极限”。例如，有些印度公司计算的开发成本远低于可比较的全球基准。她说，“我是看不出他们不靠偷工减料怎么可能完成。”

约旦就是一个很好的例子。一家名为Sunrise的希腊开发商去年同意以每兆瓦时61美元的价格在安曼以北建设一个50兆瓦的太阳能发电厂，它的竞争对手认为这个价格太低了，因为在约旦的融资成本相对较高。上个月，Acwa Power收购了它的约旦分部来拯救这个合同。分析师们说，很难看出Acwa怎么从中盈利，但这种姿态可能会帮助它赢得未来的太阳能合同。

约旦王国给出了更多陷阱和教训。与许多发展中国家一样，其国家电力公司NEPCO拓展电网的速度赶不上私人企业建设太阳能园区的速度，虽然它现在拿到了资助来建设高压输电线路，把太阳能发电厂和消耗了大部分电力的首都安曼连接起来。（中国也有这个问题，电网吸收能力不足有时会

迫使太阳能和风能电厂“限制”电力产出)。

但约旦拥有得天独厚的地理优势，一旦问题理顺之后就可以扩大其太阳能发电量。工程师表示，马安周围的区域每年约有330个晴天，是该地区太阳辐射量最大的地方。他们补充说，由于约旦的海拔和地形条件，它不会像邻国沙特阿拉伯一样，让炎热和尘土显著降低光伏电池板的效率。

还有来自于最高层的支持。有商人说，阿卜杜拉国王已经下令在宫殿和清真寺安装太阳能电池板。他最资深的部长驾驶特斯拉电动汽车。随着太阳能的增长，在这个动荡的地区，约旦经济的未来将更加光明，国家面临的风险也会更低。它需要的，是让阳光为官僚体系注入活力。■



Structural reform

Don't stop believing

The IMF suggests some sweeteners to help the medicine go down

ASK a Greek government official what is ailing the economies of the European periphery, and he will almost certainly mention weak demand, before launching a tirade against austerity-obsessed politicians from northern Europe. Ask a German official, however, and the answer will be very different. In March, as the European Central Bank prepared a new salvo of stimulative measures, Jens Weidmann, the president of the Bundesbank, expressed his disapproval. Stimulus is no panacea, he warned, and “can’t replace urgently needed reforms.”

Structural reform is like exercise: nearly everyone could use a bit more of it. This newspaper has been known to recommend it to governments from time to time. Yet the extent to which economies stuck in a mire of low growth and low inflation should focus on structural reform, rather than stimulating demand, is a tricky question. Few economists would argue that Italy’s economy is a model of efficiency. Yet some economists reckon that making it easier to sack workers and cut prices is risky when a country is already facing high unemployment and deflation.

In its latest “World Economic Outlook”, the International Monetary Fund devotes a chapter to the debate. It affirms that structural reforms help raise an economy’s long-run growth prospects. Productivity stagnates when it is difficult to start new firms or expand healthy ones, or when labour cannot easily be shifted from moribund sectors to more efficient ones. Advanced economies still have plenty of room for reform, the IMF reckons.

However, some reforms, the IMF points out, take effect faster than others, and with a less painful adjustment. Reform of “product markets” aims to

boost competition among firms, through privatisation, deregulation, the liberalisation of trade and by making it easier to start a business or attract investment. Such reforms generate bigger benefits in the long run than in the short run, but can nonetheless boost output almost immediately. Deregulation of the energy sector, for example, can reduce costs and boost profits in other industries, and open new investment opportunities. These benefits begin to accrue almost at once, even in weak economic conditions (though the IMF does caution that short-run gains may be limited when credit markets are malfunctioning, a common feature of economic crises).

The short-run payoff to reform of labour markets is much more dependent on the state of the economy. Reforms which make it easier to hire and fire workers contribute to rapid growth in output and employment when an economy is already running on all cylinders (see chart). At times of economic weakness, however, firms respond by doing far more firing than hiring, deepening the downturn.

Cuts to unemployment benefits designed to encourage the jobless to seek work follow a similar pattern: in bad times, the benefits in terms of increased interest in work are outweighed by the squeeze such reforms place on spending. An exception to the pattern are reforms that peel away inefficient taxes on labour. This delivers the greatest bang when economies are weak. A one-percentage-point cut in overall taxes on labour during a slump boosts output by 0.7% in the year of the reform, the IMF finds, but yields no benefit at all during booms.

Governments presiding over weak economies could enact changes in ways that minimise nasty short-run effects, the IMF suggests. They could prioritise product-market reforms, and adopt labour-market reforms that would only take effect after a lag, to allow time for economic recovery. Reforms could also be coupled with fiscal stimulus, the IMF reckons, which could then be unwound as growth improves.

The big debts carried by the governments of the euro-area periphery will be difficult to sustain if the prospects for growth do not brighten in the long run. A short burst of deficit-financed stimulus might therefore prove a small price to pay for a much-needed dose of structural reform. In contrast, by adopting structural reforms at the same time as slashing spending, European politicians may be creating an association in voters' minds between reform and economic hardship—a reflex that would not bode well for the health of Europe's economy or for the survival of the euro. Stimulus is no substitute for urgently needed changes. It might prove an indispensable complement, however. ■



结构性改革 信念不息

国际货币基金组织（IMF）提出让良药不再苦口的方子

如果你去问问希腊政府官员，欧洲外围经济体的问题在哪儿，他几乎肯定会说需求疲软，然后对那些热衷紧缩的北欧政客大加指责。可要是去问德国官员，答案就会有天壤之别。今年三月，欧洲央行准备进行新一轮刺激措施时，德国央行总裁延斯·魏德曼（Jens Weidmann）就表达了他的不满。他警告说，刺激不是灵丹妙药，“不能代替迫在眉睫的改革。”

结构性改革就像锻炼：几乎每个人都需要再多一点。本刊不时给各国政府推荐这一药方已经出了名。然而，对于深陷低增长、低通胀泥潭中的经济体而言，到底应该把多少精力放在结构性改革而不是刺激需求上是个十分棘手的问题。几乎没有哪位经济学家会说，意大利经济是效率的典范。但一些经济学家认为，当一个国家已经面临高失业率和通缩时，让解雇工人和降价变得更方便是有风险的。

在最新一期《世界经济展望》（World Economic Outlook）中，IMF花了一章来进行讨论。它肯定了结构性改革有助于提振经济的长期增长前景。如果新公司的成立或健康公司的扩张很难，或劳动力不能很容易地从濒死的行业转移到更高效的行业，生产力发展就会停滞。IMF认为，发达经济体仍有很大的改革空间。

然而，IMF也指出，某些改革可能比其他改革见效更快，调整的痛苦也比较小。通过私有化、解除管制、贸易自由化、方便创办企业或吸引投资，“产品市场”的改革旨在促进企业间竞争。这种改革的好处更多地体现在长期而非短期，但仍然可以立即提高产量。比如，放松能源行业的管制可以降低成本，提高其他行业的利润并创造新的投资机会。即便经济状况疲软，这些好处也几乎立刻就开始显现（不过IMF确实提醒说，在出现信贷市场失灵这个经济危机的共同特征时，短期收益可能有限）。

劳动力市场改革的短期回报就更加取决于经济状况。如果经济已经开足马力，让雇用和解雇工人更为方便会促进产出和就业的快速增长（见图）。然而在经济疲软时，企业就会大规模解雇员工而雇用很少，让经济衰退愈发恶化。

削减失业救济，以鼓励失业者找工作，其效果也与此类似：经济不景气时，这种改革在提升工作意愿方面的好处还抵不上对消费的打压。该模式的一个例外是减除对劳动力的低效率税收。这在经济疲软时最为成效显著。IMF发现，在低迷时期，将对劳动力的整体税收削减一个百分点，可在改革当年将产出提高0.7%，但这在繁荣时期就没有任何好处。

IMF建议，疲软经济体的政府可以进行改革来最大限度地减少讨厌的短期效果。它们可以优先考虑产品市场改革，仅仅实施滞后生效的劳动力市场改革，给经济复苏留出时间。IMF认为，改革的同时还可以进行财政刺激，在增长改善时再逐步取消。

如果长期经济前景不能变好，欧元区外围国家政府的庞大债务将难以维持。要进行急需的结构性改革，赤字融资刺激的短期暴涨可能仅仅是个很小的成本。相比之下，如果在削减开支的同时进行结构性改革，欧洲的政治家可能会让选民把改革和经济困难联系在一起——这种心态对于欧洲经济或是欧元的生存都不是什么好兆头。改变是当务之急，激励并不能替代它，但却很可能是个不可或缺的补充。■



Urban planning

Listen up

How to map city soundscapes using social media

“VIBRANT” is a word often used in guide books to describe a particular quarter of a city: Soho, in London, for example. But what does that actually mean? To Daniele Quercia of Bell Labs in Cambridge, England, and his colleagues, the term has a literal truth to it. Soho is a place of good vibrations through the air—good sounds, in other words. It shares this with the Gothic quarter of Barcelona, for example, but not with much of Mayfair and Belgravia, upmarket London districts near Soho that Dr Quercia brands sonically “chaotic”.

He and his colleagues, who report their results in *Royal Society Open Science* in March, have been making sound maps of the two cities. In so far as city planners incorporate matters sonic into their thinking, Dr Quercia notes, they take most notice of noise. This form of sound, being by definition annoying, has political resonance, and planners do their best to minimise it. But sound can also be soothing, exhilarating, saddening, surprising and many other things besides. These aspects of the urban soundscape are little-studied. Dr Quercia thinks this is a pity. The spread of information technology, and in particular of social media, has created a pool of data about urban sounds that can be tagged to precise locations. That has let him and his team start correcting the omission.

Using a statistical analysis of people’s reactions to different sorts of urban sound, the team drew up four broad categories: chaotic, calm, monotonous and vibrant. Mechanical sounds tended to be chaotic. Human ones tended to be vibrant. The sounds of nature, though, could be either calm or monotonous. Birds chirping were calming. Crickets chirping were monotonous. Rain pattering down from the sky was monotonous, but

dripping from trees it was calming. Drawing on social media to show which sounds people report hearing around them in particular places, the team then mapped the centres of the two cities accordingly.

Not surprisingly, parks, such as Hyde Park, sound calm. More surprisingly beaches (at least, those in Barcelona) are monotonous. But, main roads aside (they are usually chaotic), a stranger to either city would have difficulty predicting from a map which streets would have good vibes and which would seem chaotic. That would bear further investigation, and perhaps even the attention of forward-thinking planning departments. ■



城市规划

竖耳倾听

如何利用社交媒体绘制城市声音地图

“充满活力”一词经常出现在旅行手册中，用于描述城市的某个区，比如伦敦的苏荷区（Soho）。但是这个词到底什么意思？对于英国剑桥大学贝尔实验室（Bell Labs）的达尼埃尔·凯西亚（Daniele Quercia）和他的同事来说，“充满活力”一词的字面意思充分说明了问题。苏荷区的空气中都荡漾着满满的活力——换言之，就是好的声音。在声音方面，巴塞罗那的哥特区（Gothic quarter，即巴塞罗那老城的中心）与其有着相似之处，但在临近苏荷区的高尚住宅区梅费尔区（Mayfair）和贝尔格莱维亚区（Belgravia），情况就大不相同，凯西亚博士认为这些地方在声音上属于“喧嚣嘈杂”。

凯西亚博士和他的同事三月在《皇家学会开放科学》（Royal Society Open Science）发表了研究报告，他们一直在为伦敦和巴塞罗那绘制声音地图。凯西亚博士发现，城市规划者在工作中也会考虑声音的因素，在他们的考虑范围内，最受关注的是噪音。噪音同其字面意思一样令人烦躁，噪音滋扰问题还会影响政绩，因此城市规划者会竭力消除。但是声音也有抚慰人心、振奋精神、让人黯然伤神、出乎意料等其他功效，而城市声音景观的这些方面又鲜有研究，凯西亚博士认为这很可惜。信息技术的传播，尤其是社交媒体的广泛应用，已经为城市声音创建了巨大的数据池，可以精准到具体区域。这为凯西亚博士和他的同事弥补空白打下了基础。

凯西亚博士的研究团队就人们对不同城市声音的不同反应进行统计分析，在此基础上将城市声音划分为四大类别：喧嚣嘈杂、定心凝神、单调乏味和充满活力。机械的声音一般都属于喧嚣嘈杂类，人声则是充满活力，大自然的声音既可能定心凝神，也有可能单调乏味。鸟鸣可以定心，蟋蟀叫声则显单调乏味。雨点从天而降的声音单调，树上滴落的雨滴声则能凝神。凯西亚博士的研究团队从社交媒体收集人们对在不同地方听到的声音的描述，并据此绘制出两座城市市中心的声音地图。

公园——例如伦敦的海德公园——在声音地图上会显示为令人定心凝神，这倒是在意料之内。令人出乎意料的则是海滩（至少是巴塞罗那的海滩），在声音上表现为单调乏味。然而除了主干道（一般都喧嚣嘈杂）之外，初到伦敦和巴塞罗那的人很难从地图上判断哪条街充满活力，哪条街喧嚣嘈杂。这还需要进一步的调查研究，也许还会引起某些高瞻远瞩的规划部门的注意。■



Pulp producers in Brazil

Money that grows on trees

Brazil's economy is crumbling but its giant pulp firms are booming

LOOK north from atop the 120-metre (390-foot) bleaching tower at the Horizonte 1 pulp mill, and all you see is plantations of tall, slender eucalyptus trees. They stretch from the factory gate, across the gentle undulations of Mato Grosso do Sul, a state in Brazil's centre-west, all the way to the horizon. "That's our competitive advantage," explains Alexandre Figueiredo, who is in charge of production at the plant. Its owner, Fibria, is the world's biggest producer of "short-fibre" cellulose pulp, which is used to make such things as newsprint, nappies and banknotes. ("Long-fibre" is used for high-grade paper and packaging.)

As its name suggests, Mato Grosso do Sul (roughly, "southern thick bush" in Portuguese) has vast expanses of *cerrado*, or tropical savannah, a chunk of which was long ago turned into farmland, some of which has more recently been planted with eucalyptus. Most of Fibria's 568,000 hectares of plantations lie within 200km of its mills. Eldorado, a rival with a mill on the other side of Três Lagoas (a city of 115,000 that is fast becoming Brazil's cellulose cluster), needs its lorries to drive only a bit farther. No other firm in the world has such ready access to its raw material. Add the balmy climate and rich soils of Brazil's south and centre-west—where, as Joe Bormann of Fitch, a credit-rating agency, puts it, eucalyptus "grows like a weed"—and it is easy to see how Brazil has conquered 40% of the global short-fibre market.

Investment in technology is paying off, too. In the late 1990s Brazilians introduced a fast-growing eucalyptus variety that can be harvested after just seven years, compared with the two decades or more it takes to grow pine, the main source of cellulose pulp in the northern hemisphere. Next

door to Horizonte 1, Fibria is building a high-tech nursery with technology devised by Dutch flower growers. Eldorado pioneered the use of drones to map the topography of its woods and optimise planting and harvesting.

Pulp producers are also thriving thanks to the storm that is sucking life out of much of the rest of Brazil's economy. From his vantage-point, Mr Figueiredo waves towards the only clearing in the arboreal landscape: an unfinished Petrobras fertiliser plant a few kilometres away. Construction stopped in 2014, when the state-controlled oil giant emerged as the locus of a multibillion-dollar bribery scandal that may yet topple Brazil's government. That is in stark contrast to the frenetic activity directly below him, where a second, 8.7 billion reais (\$2.4 billion) production line is taking shape that will more than double Horizonte 1's current annual capacity of 1.3m tonnes, once it is completed in late 2017.

Recession and political upheaval have brought Brazil's currency, the real, down by three-fifths against the dollar since 2011. That is a boon to pulp producers, who export nearly all their output. Standard & Poor's, another rating agency, reckons that production costs in dollars dropped by \$50 per tonne in 2015; another \$40 per tonne was saved on maintaining mills. UBS, a bank, calculates that for every 10-centavo decline against the greenback, Brazilian producers' earnings rise by \$15 per tonne.

As the real has tumbled, global pulp prices have held steady, whereas some of the other commodities Brazil produces have slumped (see chart). As it rebalances from investment to consumption, China may build fewer bridges, hurting Brazilian iron-ore exports. But the Chinese are buying more bog roll; and over 40% of Brazilian pulp producers' output is turned into tissue for the Chinese market. Between 2013 and 2023 annual toilet-paper sales will grow by 7.4m tonnes, with China accounting for nearly half of the rise, according to RISI, a consulting firm.

The combination of a cheap currency and healthy demand has pushed Brazilian producers' margins to mouth-watering levels. Fibria's rose to 53%, on record revenues of 10.1 billion reais, last year. With earnings equal to 75% of revenues in the fourth quarter of 2015, Eldorado's margins set an all-time industry high. This helped ease its debt burden, which remains large compared with rivals'. Klabin and Suzano, two other big Brazilian firms, also had a good year, even if, as integrated producers of both pulp and its products, their mostly domestic papermaking businesses suffered in line with Brazil's economy.

Can it last? Overcapacity is one worry. Last May CMPC, a Chilean concern, fired up a plant in Rio Grande do Sul state in southern Brazil that will churn out 1.3m tonnes of pulp a year. This month Klabin produced the first bales at a 1.5m-tonne plant in nearby Paraná state. Eldorado is breaking ground on its own expansion project in Três Lagoas, which could add another 2.3m tonnes to annual output. And that is just Brazil. Global capacity is poised to grow by 2.7m tonnes this year alone, estimates UBS; demand by just 1.5m tonnes. That will surely weigh on prices eventually. And the real has recently begun to pick up, as markets bet on a change of government and thus an end to Brazil's political and economic paralysis.

Brazilian pulp bosses nevertheless seem chipper. If pulp prices fall, older, high-cost producers, mainly in the northern hemisphere, may go out of business, reducing any excess capacity. In the long run, demand for tissue can only grow. As Marcelo Castelli, Fibria's boss, observes, the average Chinese still uses just over 5kg of it a year; in developed countries the figure is 10-20kg.

As for the currency, Eldorado's boss, José Carlos Grubisich, notes that the industry survived a rate of 1.6 reais to the dollar five years ago. With the exchange rate now around 3.6, there is a long way to go before it begins to hurt. Even the rich world's falling demand for printing and writing paper is

not such a worry: it means there is less used paper for recycling, which should in turn shore up demand for “primary” pulp.

Though Brazil’s pulp industry is booming, it is on the lookout for new uses for its eucalyptus timber, from biofuels to green substitutes for plastics. In the past few years Fibria has bought stakes in several startups with promising technology, including one in Canada. It is sizing up two more. “Money can grow on trees,” Mr Castelli promises. “It just takes time.” ■



巴西纸浆生产商

摇钱树

巴西经济岌岌可危，其大型纸浆企业却欣欣向荣

从奥里藏特一号纸浆厂（Horizonte 1）那120米高的漂白塔顶往北看去，目力所及全是林场，种满了高大修长的桉树，从工厂门口，跨越南马托格罗索州（Mato Grosso do Sul，位于巴西中西部）连绵起伏的地势，直至天际。“那是我们的竞争优势。”工厂的生产主管亚历山大·菲格雷多（Alexandre Figueiredo）解释道。拥有该工厂的Fibria公司是“短纤维”纤维素纸浆的全球最大生产商，这类纸浆用于制造新闻纸、纸尿裤及钞票等。（“长纤维”纸浆则用于制造高档纸张及包装纸品。）

南马托格罗索州（在葡语中大致意为“南部茂林”）地如其名，拥有辽阔的热带稀树草原，其中一大片在很早以前已开垦为农田，另一些则在近年来种上了桉树。Fibria坐拥56.8万公顷的林场，大多在其工厂200公里范围内。其对手埃尔多拉多集团（Eldorado）的一家纸浆厂位于特雷斯拉瓜斯（Três Lagoas，人口11.5万，正快速成为巴西的纤维素纸浆制造中心）的另一头，但其货车也只需跑远一点点。能如此近距离获取原材料，世界各地的其他公司难出其右。加上巴西南部及中西部气候和煦，土壤肥沃，如信用评级机构惠誉的乔·鲍曼（Joe Bormann）所说，桉树“像野草般疯生”，就不难明白巴西如何征服了全球短纤维纸浆市场40%的份额。

技术上的投资也有回报。上世纪90年代末巴西人引进了一种只需种植七年便可采伐的速生桉树品种，相比之下，在北半球，纤维素纸浆的主要来源是松树，至少需要生长二十年才能成材。在奥里藏特一号纸浆厂旁，Fibria正在兴建一座高科技苗圃，应用荷兰花农发明的技术。埃尔多拉多集团则率先利用无人机测绘林场地形，优化栽种及采伐。

纸浆生产商的蓬勃发展也得益于大范围重创巴西经济的那场风暴。菲格雷多居高临下，挥手指向林中唯一一块空地：几公里外，那是巴西石油公司（Petrobras）一座未完工的化肥厂所在地。工程在2014年中断，当时这一

国营石油巨头卷入数十亿美元的贿赂丑闻，事件可能导致巴西政府倒台。那与菲格雷多脚下热火朝天之势形成了鲜明对比，在这里，价值87亿雷亚尔（24亿美元）的第二条生产线已见雏形，到2017年底完工后，奥里藏特一号纸浆厂的产能将在目前130万吨的基础上翻一倍还多。

由于经济衰退和政局动荡，自2011年来巴西雷亚尔兑美元汇率下降了五分之三。对于产出几乎全部用于出口的纸浆制造商来说，这是件好事。另一评级机构标准普尔估计，2015年，按美元计算，每吨纸浆的生产成本下降了50美元；而纸浆厂的维护成本则每吨节省了40美元。据瑞银计算，雷亚尔兑美元每下跌10分（Centavo，100分等于1雷亚尔），巴西生产商每吨盈利就上升15美元。

雷亚尔下跌之际，全球纸浆价格却走势平稳，而巴西生产的其他大宗商品则部分出现了价格下滑（见图表）。随着中国经济从投资驱动向消费主导转型，桥梁建设可能减少，巴西铁矿石的出口因而受损。但中国人购买卫生纸的数量却在上升；巴西纸浆厂商的产出有超过40%最终被制成了中国市场上的卫生纸品。据咨询公司RISI估计，2013年至2023年，卫生纸年销量将增加740万吨，增幅的近一半来自中国。

廉价的货币加上良好的需求将巴西生产商的利润推高至令人垂涎的水平。Fibria公司去年营收创纪录，达101亿雷亚尔，利润率升至53%。埃尔多拉多集团2015年第四季度盈利达营收的75%，利润率创下行业新高。这有助缓解其债务负担，但集团的负债水平仍高于对手企业。巴西另外两家大企业克拉宾（Klabin）和苏扎诺（Suzano）也年景不错，但作为纸浆及纸浆制品的综合制造商，它们主要依赖国内市场的纸制品业务随着巴西经济下滑蒙受了一定损失。

好景是否能持续？产能过剩是一大忧虑。去年五月，智利企业集团CMPC投资在巴西南部的南里奥格兰德州（Rio Grande do Sul）兴建纸浆厂，年产量预计达130万吨。本月，克拉宾集团在附近巴拉那州（Paraná）兴建的年产量150万吨的纸浆厂正式投产。埃尔多拉多公司在特雷斯拉瓜斯对现有厂房的扩建计划也破土动工，年产量将增加230万吨。而这只是巴西

的情况。据瑞银估计，单单今年，纸浆业的全球产能就将增加270万吨；需求增幅则仅为150万吨。这最终必然会打压价格。而且由于最近市场估计巴西政府将更迭，并为国内政治及经济困境划上句号，雷亚尔已开始回升。

巴西纸浆业的老板们却似乎仍旧乐观。假如纸浆价格下跌，主要位于北半球的那些相对老旧及高成本的生产商可能会破产，过剩的产能因而会减少。而长远来看，对卫生纸的需求只会有增无减。据Fibria总裁马塞洛·卡斯泰利（Marcelo Castelli）观察，中国人均年卫生纸用量仅刚过5公斤；而在发达国家该数字为10至20公斤。

至于货币，埃尔多拉多公司的老板何塞·卡洛斯·古比西克（José Carlos Grubisich）指出，五年前雷亚尔兑美元汇率为1.6时，纸浆业也挺了过来。如今的汇率约为3.6，距离造成伤害还很远。即使富裕国家对打印及书写纸张的需求下降，也无须担心：这意味着供回收利用的废纸减少，按道理将推高对“原生”纸浆的需求。

尽管巴西纸浆业一片繁荣，但业界已在为桉树开拓新用途，从生物燃料到塑料的绿色替代品等。过去几年，Fibria已投资多家技术前景看好的创业公司，包括一家加拿大公司，而且正在评估另外两家。“树上可以长钱，”卡斯泰利夸口说道，“只是要花点时间。”■



Free exchange

Dumping and tub-thumping

Throwing up tariffs is a counterproductive response to economic weakness

IT WAS a flood of cheap steel from an intimidating new economic power that prompted the passage of the world's first anti-dumping law. In 1904 Canada's parliament, angered by soaring imports of cut-price steel from America, imposed punitive tariffs. America is now on the other side of a similar trade dispute. Last year China exported over 100m tonnes of steel—more than the entire output of all America's mills. Only 3% of that went to America, but American steelmakers squealed all the same and in March the government announced plans to impose an anti-dumping tariff on steel imports from China (and a handful of other countries) of up to 266%. The instinct behind such measures is understandable, but no good will come of them.

Dumping is the practice of selling goods in foreign markets at an unfairly low price—typically, one lower than the going rate in the exporter's home market. Anti-dumping measures are intended to prevent a company from selling goods below cost in order to drive competitors out of business, before using the resulting market power to gouge customers.

The threat was all too real when Canada adopted its pioneering law. The American corporate monopolies of the day were more than willing to manipulate markets in order to put rivals out of business. American lawmakers eventually took aim at their “predatory pricing”, creating the first modern competition laws. Such laws usually bar firms from selling their wares below the cost of production. Anti-dumping rules, in contrast, tend to set a lower bar: they can be invoked if the price in one market is lower than in others. That makes it easy for firms seeking to shelter themselves from foreign competition to abuse them.

Competition is not the only concern of those who argue for anti-dumping measures. In Britain, where rock-bottom global steel prices now threaten Tata Steel, the owner of the country's biggest surviving mill, proponents of tariffs argue that it is important to preserve domestic steelmaking to ensure supplies for the defence industry, among others. But it is hard to see how the use of French steel in British submarines harms Britain's security (its pride is another matter). For manufacturers of all sorts, most notably carmakers, cheap steel is a boon.

Weighing against these shaky benefits are a heap of costs. Economic analyses suggest that temporary anti-dumping tariffs are actually more damaging than run-of-the-mill protectionism. Anti-dumping rules, like other trade barriers, cause economic harm by shrinking markets and excluding efficient producers, thereby raising prices for consumers. But anti-dumping measures do additional harm, because big global firms know how to game them. Should their rivals attempt to cut prices to gain market share, they file anti-dumping petitions against them. That encourages everyone to keep margins plump, in effect creating an unspoken cartel. Such tacit collusion inhibits innovation and creative destruction, and holds back growth. One recent analysis suggests that America's anti-dumping policy reduces American consumption by 3%—an effect equivalent to a uniform tariff of 7%.

Nonetheless, anti-dumping rules have been enshrined in global trade treaties, which outline when and how such duties can be applied and provide a forum in which they can be challenged. Some economists suggest that they could actually provide a boost to globalisation, by making trade liberalisation seem more palatable to those whose livelihoods it threatens. Broad reductions in trade barriers may look less alarming if governments retain the right to impede the most disruptive imports.

Greg Mankiw, an economist at Harvard University, recently used a similar

argument to defend the anti-dumping tariffs that America placed on steel imports in 2002, when he was advising George W. Bush, the president at the time. Mr Mankiw claims the tariffs were part of a calculated political strategy to push for trade liberalisation. By imposing them, he says, Mr Bush helped persuade Congress to grant him “trade promotion authority”—the right to negotiate trade deals which Congress cannot amend, but only approve or reject. Later, Mr Mankiw writes, that authority was used to secure the approval of a free-trade agreement with the countries of Central America.

At the moment, however, it is hard to justify anti-dumping tariffs as a calculated sop to the opponents of liberalisation. Progress on multilateral trade deals has stalled; the fate of regional agreements also hangs in the balance thanks to the protectionist mood seizing Western voters.

| *A movable glut*

Cheap exports from China reflect overcapacity that has developed as the Chinese economy has slowed. The resulting “dumping” is not proof that China is on the verge of vanquishing all rivals, but rather a reflection of its manufacturers’ weakness.

That weakness is now being exported. Cheap exports depress prices in foreign markets, most of which are already experiencing worryingly low inflation. Central banks have little room to respond using conventional tools: interest rates are already at historic lows. In the 1930s economies that were unable to respond vigorously enough to headwinds blowing in from abroad (in that case, because of the gold standard, which constrained monetary policy) were the most likely to resort to protectionist tariffs.

Yet the impulse to raise tariffs, if understandable, should be avoided. Once one country gives in to it, the imports that prompted the move are diverted to another country, which naturally follows suit, setting off a chain

reaction. As Tata Steel teeters, Britons are rethinking their opposition to anti-dumping tariffs. Yet Tata itself was a target of the American tariffs imposed in March. Politicians are keen to get their economies growing again; tariffs are a poor way to manage it. ■



自由贸易

倾销与激愤

提高关税应对经济疲软会适得其反

从令人生畏的新经济强国涌入的廉价钢材促使了世界上第一部反倾销法律的通过。1904年，加拿大的议会被美国削价钢材的进口飙升激怒了，于是开始征收惩罚性关税。如今在一场类似的贸易争端中，美国却站在了另一边。去年，中国出口钢材超过1亿吨，比所有美国工厂的总产量还高。这里面只有3%出口到了美国，但美国的钢铁生产商还是尖叫起来。3月，政府宣布向来自中国（和其他少数几个国家）的进口钢材征收高达266%反倾销关税的计划。这些措施背后的直觉是可以理解的，但它不会带来什么好结果。

倾销指的是在国外市场以不公平的低价销售商品的做法——通常比出口商所在国市场的通行价格还要低。反倾销措施旨在防止一家公司通过以低于成本的价格销售商品将竞争对手逼出局，然后再利用由此获得的市场能量压榨客户。

在加拿大通过了这一开创性的法律时，威胁再真实不过了。当时的美国垄断公司迫不及待地想操纵市场来迫使竞争对手歇业。美国的立法者最终盯上了“掠夺性定价”，创造了第一部现代竞争法。这些法律通常禁止公司以低于生产成本的价格销售商品。相反，反倾销规则倾向设置更低的门槛：如果一个市场中的价格比其他市场低就可以触发。这就很容易被试图免受外国竞争的企业滥用。

主张反倾销措施者关注的还不只是竞争。在英国，如今处于谷底的全球钢铁价格威胁到了塔塔钢铁公司——该国仍然存活的最大钢铁厂的所有者。关税的支持者说保持国内钢铁生产来确保国防工业供应非常重要，云云。但其实我们看不出用法国钢材造英国潜艇会对英国的安全有何危害（自尊心是另一回事了）。对于所有厂家，特别是汽车制造商来说，钢价便宜是一个福音。

权衡这些似是而非的好处有很大的成本。经济分析表明，临时的反倾销税实际上比普遍性的保护主义破坏力更大。和其他贸易壁垒一样，反倾销规则也会伤害经济——引发市场萎缩并排除高效的生产者，消费者就要付出更高的价格。但反倾销措施的危害还不止于此，因为庞大的全球性公司知道如何利用它们。如果竞争对手试图通过降价来获得市场份额，它们就会对其提出反倾销申诉。这就促使大家保持丰厚的利润率，从而形成一个心照不宣的卡特尔。这种默契扼杀了创新和创造性破坏，阻碍了增长。最近的一项分析表明，美国的反倾销政策导致美国的消费降低了3%——相当于征收7%统一关税的效果。

然而，反倾销规则已被供奉在全球贸易条约中，其中规定了允许何时及如何征税，并提供了一个可以质疑它的论坛。一些经济学家认为，这实际上促进了全球化，因为它让那些生计受到贸易自由化威胁的人更容易接受它。如果政府仍然能够阻止危害最大的商品进口，贸易壁垒的普遍降低可能看起来就不那么吓人了。

哈佛大学的经济学家格里格·曼昆（Greg Mankiw）最近使用了类似的观点来为美国2002年对钢材进口征收的反倾销税辩护，当时他是小布什总统的顾问。曼昆先生声称关税是精心设计推动贸易自由化的政治战略的一部分。他说，通过实施关税，小布什说服国会授予他“贸易促进权”，即有权进行贸易谈判来达成协议，国会可以批准或拒绝，却不能修改它。后来，曼昆先生写道，总统使用了这一权力，确保了与中美洲国家自由贸易协定的批准。

然而，如今再用反倾销关税来讨好自由化的反对者就不大说得过去了。多边贸易协议踟蹰不前；由于西方选民充满保护主义情绪，区域协定也风雨飘摇。

| 过剩会跑

来自中国的廉价出口反映了中国经济放缓所造成的产能过剩。由此产生的“倾销”并不证明中国打败了所有的对手，而是反映了其制造商的疲弱。

这种疲弱如今被出口了。廉价的出口压低了国外市场价格，其中大部分市场的低通胀率已经让人忧心。央行几乎没有使用常规工具来应对的空间了——利率已经处于历史低点。20世纪30年代，无法强力响应外国冲击（当时的金本位制约了货币政策）的经济体最有可能诉诸保护主义关税。

然而，提高关税的冲动，即使可以理解，也应当避免。一旦有一个国家坚持不住，造成此举的那种进口就会转移到另一个国家，而这个国家也会自然跟进，引发连锁反应。塔塔钢铁摇摇欲坠，英国人正在重新考虑是否还要反对反倾销关税。然而，塔塔钢铁本身便是三月份美国惩罚性关税的目标。政客们渴望经济恢复增长，而关税是一个糟糕的手段。■



After the Panama papers

Who next?

Mossack Fonseca and its homeland are not alone in facing closer scrutiny

THE travails of Mossack Fonseca, the Panamanian law firm from which a trove of documents about offshore firms it had helped create was recently leaked, intensified on April 12th, when prosecutors raided its head office. But as the firm defends itself, campaigners for financial transparency are already looking for other Mossacks and other Panamas.

Mossack was an outlier, rivals claim. “Everyone knew that if you wanted that bit more secrecy, you’d go to them,” says a lawyer who investigates offshore fraud. “We were lucky to get beneficial-ownership data from them 30% of the time.” Nevertheless, other incorporation mills face more scrutiny too, among them Panama’s other big law firms, such as Morgan & Morgan, and OIL, part of Hong-Kong-based Vistra, which caters primarily to Chinese customers. Like Mossack, these are wholesalers. They sell shell companies in blocks to law firms and banks, which sell them on to the end client, sometimes via other retailers. Mossack has dealt with 14,000 such intermediaries.

In many of the cases highlighted in the Panama papers, there was a clear breakdown of due diligence along this chain. Retailers who were supposed to check clients’ identities and store the information were not doing so. Mossack was doing little—and may not have been obliged to—to know its customers’ customers.

Also likely to come under the spotlight are the giants of corporate services, such as TMF and Intertrust, both based in the Netherlands, although forming companies is just a small part of their business. The global market for offshore company formation and ancillary services is not huge: annual

revenues are perhaps \$6 billion. But it is very profitable (pre-tax margins are often 30-40%) and growing by 7% a year. The typical offshore company has an average life of 8-10 years, meaning that clients offer “a nice, annuity-like earnings stream”, says one operator. This has attracted some savvy investors: Blackstone has a stake in Intertrust; Doughty Hanson owns TMF.

Other jurisdictions are also coming under scrutiny, although Panama is genuinely different. Among sizeable offshore financial centres, it alone has firmly resisted the move to greater tax transparency—a stance which it may now abandon. Apart from Panama itself, the most heat is on Britain and its offshore territories—particularly the British Virgin Islands (BVI), home to roughly half of the 214,000 companies mentioned in the Panama papers.

A dozen of the world’s 50-60 active offshore financial centres are current or former British possessions. Perennially derided as dens of financial iniquity, these islands have in fact cleaned up a lot since the first sustained attacks on them in the 1990s. They now do as well as many bigger places in reviews by the OECD (see chart) and the Financial Action Task Force (FATF), which set tax-transparency and anti-money-laundering standards.

But David Cameron, Britain’s prime minister, is under pressure to extract another pound of flesh from them. He is likely to renew a push for them to adopt public registers of company ownership, as Britain has. Those territories that have no central registers readily available to the taxman and law enforcers, as Bermuda and Jersey already do, have agreed to set them up. This will put them ahead of FATF standards, which do not require centralised data collection. In April, they pledged to speed up response times to requests from British authorities, from weeks or months to a day or less—though they will still resist the idea of making their registers public.

The BVI, which is home to 450,000 companies in all, hopes to deflect

criticism with its new requirements on corporate agents. One of these, which kicks in this year, will force them to collect and verify beneficial-ownership information on clients. Until now this has often been left to “introducers” in the client’s home country, who often fail to do it.

Some worry that if the British outposts are squeezed too hard, business will flow to less tightly regulated places with shell-company-friendly laws, such as the Seychelles and Samoa. Hong Kong, already a giant peddler of offshore firms, could also benefit, as could the numerous American states with lax regulation of registration agents and ironclad corporate anonymity, like Delaware and Nevada (see next article).

And then there is Britain itself. Oversight of its company-formation industry is poor. Many embarrassing links have been established between British shell companies and criminals, such as those behind a \$1 billion swindle in Moldova involving Scottish limited partnerships. Fraudsters use Britain and America because they are “cheap, anonymous and good names”, says Martin Kenney, an offshore investigator. “Since compliance departments don’t count them as high-risk, they are often subjected to less due diligence.” That gives the transparency-loving Mr Cameron lots to ponder as he prepares to host a global anti-corruption summit, set for May 12th. ■



巴拿马文件之后 接下来是谁？

莫萨克·冯赛卡律师事务所及其所在地不是唯一面临更严格审查的地方

检察官在4月12日突击搜查了巴拿马律师事务所莫萨克·冯赛卡（Mossack Fonseca）的总部，这家律所面临的难题进一步加剧。由它帮助创建的离岸公司的大量文件最近被泄露。但随着该律所进行自我辩护，支持财务透明的活动家已经在寻找其他类似莫萨克的机构和像巴拿马那样的避税天堂。

竞争对手声称莫萨克是个特例。“每个人都知道，如果你想要多那么一点保密性的话，就应该去找它们。”一位调查海外欺诈的律师说，“只有30%的时候我们能从它们那里获得受益所有权的数据，这已经算是幸运的了。”不过，其他“公司作坊”也将面临更加严格的审查，其中包括巴拿马的其他大型律所，例如Morgan & Morgan以及香港瑞致达（Vistra）旗下主要迎合中国客户的OIL。和莫萨克一样，这些企业是批发商。它们向律所和银行出售大批空壳公司，后者再把空壳公司出售给最终客户，有时候还会通过其他零售商来出售。莫萨克与1.4万家这样的中介有生意往来。

在巴拿马文件揭露出的许多案子中，这一链条上的尽职调查有明显的断裂。零售商本应检查客户的身份并保存信息，但它们没有这样做。在了解自己客户的客户这一方面，莫萨克所做甚少，而且或许没有被要求这样做。

还可能备受关注的是同样位于荷兰的达盟（TMF）和富信（Intertrust）等企业服务巨头，尽管注册公司只是它们业务的一小部分。建立离岸公司及其辅助服务的全球市场并不大：年收入大概为60亿美元。但它很赚钱（税前利润常达30%到40%），每年增长7%。一位经营者表示，典型的离岸公司平均寿命为8到10年，这意味着客户提供“类似年金的优厚收入流”。这已经吸引了一些精明的投资者：黑石集团持有富信股份；道蒂·汉森公司（Doughty Hanson）持有达盟。

其他司法辖区也受到审查，尽管巴拿马确实与众不同。在大型离岸金融中心里，只有它坚决抵制住了加强税收透明度的行动，它现在或许会放弃这一立场。除了巴拿马，最受关注的是英国及其离岸领土，尤其是英属维京群岛，巴拿马文件里提到的21.4万家公司里有大约一半在这里注册成立。

世界上50到60个活跃的离岸金融中心里，有10多个现在或以前是英国属地。这些岛屿常年被嘲笑为金融黑窝，在上世纪90年代首次遭受持续攻击之后，它们实际上已经大有改观。在经合组织（见图表）和“反洗钱金融行动特别工作组”（Financial Action Task Force on Money Laundering，简称FATF，该机构设定税务透明和反洗钱标准）的评审中，它们现在的表现不亚于很多较大的离岸中心。

但英国首相卡梅伦正承受压力，要对它们提出进一步监管要求。他有可能重新推动它们和英国一样采取公司所有权公开登记制度。百慕大和泽西（Jersey）等没有现成的集中注册信息供税务部门 and 执法机构查核的地区已经同意设立这一制度。这将让它们超前于FATF标准的监管要求，因为该标准并不要求集中收集数据。四月，它们承诺要缩短对英国当局调查要求的回应时间，从几个星期或几个月缩短到一天或更短，尽管它们仍然会抵制公开注册信息的想法。

英属维京群岛共有45万家公司注册，它希望用对代理公司的新监管来转移批评。其中今年开始生效的一项新监管将强制代理公司收集并核实客户的受益所有权信息。迄今，这项工作往往留给客户所在国的“介绍人”来做，而这些介绍人往往做不到。

一些人担心，如果英国的这些属地被逼得太紧，业务将流失到塞舌尔群岛和萨摩亚等监管不那么严格的地方，那里的法律对空壳公司比较友好。香港这个离岸企业的大聚集地也将受益，而美国很多像特拉华和内华达这样对注册代理人监管不严、公司匿名制坚不可摧的州也会得利。

然后是英国自身。它对公司注册业的监管很差。英国的空壳公司和罪犯之间已经建立了许多令人尴尬的关联，比如说，摩尔多瓦的10亿美元诈骗案

就涉及苏格兰注册的有限合伙公司。离岸调查员马丁·肯尼（Martin Kenney）表示，骗子利用英国和美国注册公司是因为它们“便宜、匿名、听起来好听”。“既然合规部门不把它们算在高风险之列，它们往往会经受较少的尽职调查。”这就让热衷透明度的卡梅伦在准备主办5月12日的全球反腐峰会时平添了许多思虑。 ■



Alibaba

Crocodile of the Yangzi

How Jack Ma conquered China's internet

NOT since John Rockefeller has a businessman defined a country's transformation as well as Jack Ma does. Rockefeller's Standard Oil capitalised on the rise of petroleum and the internal-combustion engine, a combination that powered a century of American greatness. He became America's first billionaire and its richest man by far. Through both ruthless dealing and visionary philanthropy, he came to personify American capitalism.

Alibaba, which Mr Ma and a handful of collaborators started in a cramped apartment in Hangzhou in 1999, is now one of the world's biggest internet companies. It utterly dominates e-commerce in China, and has also made inroads into internet finance, cloud computing and logistics. Its flotation in New York in 2014 was the biggest public offering ever, and with a fortune worth perhaps \$23 billion, Mr Ma is one of China's richest men.

How did a poor boy who barely scraped into a teacher's college manage this? Like Rockefeller, Mr Ma spotted a confluence of technologies and market opportunities. The rise of the internet came just as China was gearing up to join the World Trade Organisation in 2001. Duncan Clark, an expert on China's technology sector, explains the result in a fascinating new book: Mr Ma "stands at the intersection of China's newfound cults of consumerism and entrepreneurship".

It began with Mr Ma's homesick search for a pint of Chinese lager. As an English translator, he got the chance to travel to Seattle in the mid-1990s and to use the internet for the first time. Told that one could find anything in the world online, he searched for "beer". He found American beer,

German beer and so on, but no Chinese beer. His country was, it seemed, living in the dark ages. That gave him the inspiration he needed.

With liberalisation would come rising incomes and global travel, reasoned Mr Ma, and soon hundreds of millions of Chinese would clamour for the goods and services enjoyed by the comfortable classes elsewhere. Unlike those in America, the land of Sears and Walmart, China's retail chains were fragmented and stodgy. This, Mr Ma calculated, meant that e-commerce could quickly become a potent force.

He was right. China's online consumers are now the world's most voracious, buying over \$14 billion-worth of goods on Alibaba's platforms on just one day last year (a promotion known as Singles' Day). That is far more than Americans purchase on Cyber Monday, when online retailers heavily discount goods for Christmas shoppers. Alibaba now sees some 3 trillion yuan (\$464 billion) in e-commerce transactions flow yearly through its portals, triple the figure seen in 2012.

The cult of the entrepreneur is strong in China too. Though state-owned enterprises and national champions national lumber on, it is private enterprise that has created nearly all net new urban jobs in China over the past two decades, and private firms account for perhaps two-thirds of all economic output. China is producing millions of new entrepreneurs each year, and (unlike Rockefeller, who was widely reviled as a monopolist) Mr Ma is idolised by them.

| *eBay for lunch*

How did he come from nowhere to overcome such American rivals as Yahoo (which later became a big investor in Alibaba) and eBay? The answer lies in the most powerful cult of all: a team of martial-arts heroes with Jack Ma as its leader. Alibaba's campus in Hangzhou features numerous artistic references to Jin Yong, a celebrated writer of martial-arts novels. Employees

take nicknames from his novels and other pulp fiction, and use these names for internal communication. Team-building exercises regularly have employees doing handstands, and office romances are often made official at mass weddings (pictured), witnessed by Mr Ma. The company's philosophy is a "six-vein spirit sword", and during an interview conducted last year at his headquarters, Mr Ma several times got up to punctuate his answers with an actual sword from his wall.

Mr Ma does not believe in religion or communism, saving his faith for a kind of inclusive capitalism. Unlike the founders of other big Chinese internet firms, Mr Ma distributed shares to employees from the beginning, and continued to find ways for them to cash in during Alibaba's spectacular rise. As a result, his share is smaller than that held by comparable tycoons. Western technology founders like Google's Larry Page and Sergey Brin and Facebook's Mark Zuckerberg structured share offerings so that they retained a tight grip on their creations. Mr Ma formed a partnership before Alibaba's flotation, and shares control with several dozen colleagues.

Mr Ma rejects Milton Friedman's nostrum that "the business of business is business", namely that companies exist only to make a profit and that philanthropy should be strictly personal. He has set up a philanthropic fund, but uses Alibaba itself as a vehicle for social change, helping people book doctors' visits, for example, or selling cheap water-testing devices and encouraging his customers to upload results for big-data analysis. Given his ambitions, perhaps it is a good thing that Mr Ma plans for Alibaba to flourish "at least 102 years": begun in the last year of the 20th century, it may yet leave a mark on the 22nd. ■



阿里巴巴

扬子鳄

马云如何征服中国互联网

继约翰·洛克菲勒之后，没有哪一位商人能像马云那样定义了一个国家的转型。洛克菲勒的标准石油公司（Standard Oil）利用的是石油和内燃机的崛起，这两者的组合为美国的一个伟大世纪提供了动力。他成为美国第一位亿万富翁，迄今仍是美国史上最富有的人。凭借坚决的手段和有远见的慈善事业，他成了美国资本主义的象征。

马云和十几位合作伙伴于1999年在杭州一个逼仄的公寓里创办了阿里巴巴，该公司是目前世界上最大的互联网公司之一。它完全主导了中国的电子商务，还进军互联网金融、云计算和物流业。阿里巴巴2014年在纽约上市，是史上最大的公开募股，而马云坐拥大约230亿美元的身家，是中国最富有的人之一。

一个勉强才考进师范学院的可怜小男生如何能成就如此非凡？和洛克菲勒一样，马云发现了技术和市场机会的汇合点。正当中国2001年加紧加入WTO之时，互联网开始兴起。中国科技产业专家邓肯·克拉克（Duncan Clark）在一本引人入胜的新书中解释了结果：马云“站在中国新兴消费主义崇拜与企业家精神的十字路口”。

事情起源于马云因为乡愁而到处搜寻中国啤酒。作为一名英语翻译，他有机会在20世纪90年代中期到西雅图旅行，并第一次上了网。有人告诉他网上能找到任何东西，于是他搜索“啤酒”。他找到了美国啤酒、德国啤酒等等，可是没找到中国啤酒。他的国家似乎还生活在黑暗时代。这给了他所需的灵感。

马云认为，自由化会带来收入增加和全球旅行，数以亿计的中国人很快就会强烈地需要其他地方的有闲阶级所享用的商品和服务。不同于遍布西尔斯百货和沃尔玛的美国，中国的零售连锁店分散而且商品有限。马云估

计，这意味着电子商务可能迅速成为一股强大的力量。

他是对的。中国的在线消费者是当今世界上最贪婪的，在去年“光棍节”那一天的促销活动中，他们就在阿里巴巴的平台上购买了价值超过140亿美元的商品。这个数字远远超过了美国人在“网络星期一”（Cyber Monday）的购买额，美国网上零售商在这一天向圣诞节购物者大幅打折促销。如今，每年通过阿里巴巴门户网站进行的电子商务交易额约为3万亿元（4640亿美元），相当于2012年的三倍。

在中国，对企业家的崇拜也很狂热。尽管国有企业和全国领军企业步伐缓慢，过去二十多年里，还是由私营企业创造了中国城市几乎所有的净新增职位，私营企业大概占有所有经济产出的三分之二。中国每年产生数百万新创业者，而（不像被众人斥为垄断者的洛克菲勒）马云在他们中间备受推崇。

| 把eBay当午餐

他是如何横空出世、一举战胜像雅虎（后来成了阿里巴巴的大股东）和eBay这样的美国竞争对手的？答案在于最具有影响力的偶像：马云领导下的武林高手团队。阿里巴巴在杭州的园区很有特色，借鉴了著名武侠小说家金庸的众多艺术元素。员工从金庸小说以及其他通俗小说中取花名用于内部沟通。团队建设活动通常会让员工做倒立，办公室恋情经常会在马云的见证下以集体婚礼的形式修成正果（见图）。企业的价值观是“六脉神剑”，去年在阿里巴巴总部的一次采访中，马云多次站起身拿起挂在墙上的一把剑来强调自己的回答。

马云不信仰宗教或者共产主义，而是信仰一种包容性的资本主义。不同于中国其他大型互联网企业的创始人，马云从一开始就给员工分配股份，并不断地想方设法让他们在阿里巴巴惊人崛起的过程中兑现。结果是，他自己的持股份额要小于同类大亨。谷歌的拉里·佩奇和谢尔盖·布林以及Facebook的马克·扎克伯格等西方科技公司创始人都精心组织股票发行，以便能保持对自己所创办企业的严密掌控。马云在阿里巴巴上市前就建立了合伙关系，与几十位同僚分享企业的控制权。

马云摒弃了米尔顿·弗里德曼（Milton Friedman）那条“企业的职责就是经营”（the business of business is business）的妙方，即公司存在只是为了赚钱，而慈善应该完全是个人行为。他已经建立了一个慈善基金，但使用阿里巴巴本身作为推动社会变革的载体。比如说，帮助人们预约就诊或者销售便宜的水测试设备，并鼓励他的客户为大数据分析上传结果。考虑到马云的抱负，他要阿里巴巴蓬勃发展“至少102年”的计划或许是一件好事：始创于20世纪的最后一年，该公司还可能会在22世纪留下深远的影响。 ■



Clearing-houses

Double-crossed

Bigger may not be better when it comes to clearing-houses

THE bookmaker on Aldgate High Street, on the fringes of London's financial district, attracts its fair share of risk-takers. But across the road, at the offices of LCH.Clearnet, part of the London Stock Exchange Group (LSE), the really big bets are handled. It and other clearing-houses now occupy a central position in high finance. They ensure that trillions of dollars are paid out on derivatives contracts each day. A decade of dealmaking has created five big beasts of clearing: LSE, Deutsche Börse, CME Group, ICE and HKEX. A planned merger between LSE and the Germans would reduce that to four.

LSE and Deutsche Börse take their names from their respective bourses. But they now make more money from their clearing-houses, LCH.Clearnet and Eurex Clearing. That is because the clearing of derivatives has become central to the modern financial system.

Imagine two banks want to hedge against interest-rate movements, but in opposite directions. They sign a contract that will lead to a payment from one to the other if rates rise, and the reverse if they fall. The potential loss or gain is theoretically unlimited, since there is no ceiling (or floor, as the world is fast learning) to rates. To make sure the other party is able to pay up, the two will often work through a middleman—the clearing-house. For a fee, the clearing-house signs two offsetting but technically separate derivatives contracts with the two parties. As long as both know that it is good for the money, they know their bets are solid.

But the clearing-house is now left with the risk that the losing party fails to stump up. So it asks the two parties to post collateral, or margin, which it

can keep if one of them defaults. That way the clearing-house only suffers if the defaulting party owes more than the margin it has posted.

In theory, this system makes bank failures less contagious and the financial system more resilient. In 2009 the G20, a club of big economies, decided that simple derivatives contracts should all be put through clearing-houses, rather than settled directly between the two parties. As a result, clearing-houses, also known as central counterparties, now handle trades with a notional worth of hundreds of trillions of dollars.

The more margin the clearing-houses take, the safer they are. The required margin is calculated using sophisticated actuarial models, and is heavily regulated. The riskier a trade, naturally, the more margin is needed. LCH.Clearnet and Eurex Clearing hold some €150 billion (\$170 billion) in collateral between them (see chart). Deutsche Börse notes that its large margin pool helps to ensure the “safety, resiliency and transparency of global financial markets”. But having to put up more collateral is expensive for customers. Clearing-houses, which compete for customers, therefore have an incentive not to take too much.

Banks don't just bet on interest rates, of course. They may also buy derivatives tied to bond yields or currency movements, say. Some of those prices move in relation to one another in predictable ways. Gains on an interest-rate future may offset losses on a bond-price future, for example. Clearing-houses take such correlations into account when setting the overall amount of collateral they demand from their customers, a technique called “cross-margining” or “portfolio margining”. CME Group boasts that its portfolio-margining service can cut margin requirements by 54-80%. LCH.Clearnet's “Spider” and Eurex's “Prisma” services do something similar.

All of which gives clearing-houses an incentive to merge. Some clients use

LCH, Clearnet and Eurex Clearing to make correlated wagers. If the two entities combined, they could use cross-margining to reduce the amount of collateral such customers needed, gaining an advantage over the competition. (The pair say that initially, at least, they would limit such offsetting to perfectly matching derivatives.)

There is a downside, though. The exchange industry is already highly concentrated. Regardless of who gobbles up LSE (ICE may yet enter the fray), the five big groups will soon become four. As they consolidate, the amount of collateral in the system is likely to be reduced.

That could prove risky. Correlations between different asset classes sometimes break down during crises. Such unpredictable movements caused the clearing-house of the Hong Kong Futures Exchange to blow up after the stockmarket crash of 1987, forcing the city's capital markets to close. Such events suggest that models that rely on correlations to trim margin requirements must be ultraconservative.

There is no evidence that any big clearing-house holds too little collateral. Their models are designed to withstand the simultaneous failure of their two biggest customers. They can also tap big default funds if things go wrong. Regulators are untroubled. But it is a worry, nonetheless, that the logic of competition seems to be ever-bigger clearing-houses with ever less collateral. ■



清算所

豪赌翻番

对清算所来说，大未必好

位于伦敦金融区边缘的阿尔德门大街（Aldgate High Street）上的博彩公司吸引了自己的一批冒险者。但马路对面，属于伦敦证券交易所集团（LSE）的伦敦清算所集团（LCH.Clearnet）才是真正玩大赌注的地方。它和其他清算所目前占据了高级金融的核心地位。它们确保每天数万亿美元的衍生品合约得以兑付。并购交易的十年创造了清算所的五大巨兽：伦敦证券交易所（LSE）、德国证券交易所（Deutsche Börse）、芝加哥商品交易所（CME）集团、洲际交易所（ICE）和香港交易及结算所（HKEX）。LSE和德国证券交易所之间的合并计划将会把巨兽的数目减少到四个。

伦敦证券交易所和德国证券交易所的名字是来自于各自的交易所。然而如今各自的清算所——伦敦清算所集团和欧洲期交所清算公司（Eurex Clearing）挣的钱却更多，因为衍生品清算已经成为现代金融体系的中心。

想象一下，比如有两家银行要对冲利率波动，但方向相反。它们签了一份合同，如果利率上升则由一家向另外一家付款，下降则相反。理论上，可能的损失或收益是无限的，因为利率没有上限（也没有下限，大家很快就发现了）。为了确保对方能够支付，双方常常需要一个中间人，即清算所。在收取一定费用之后，清算所会和双方签订两份相互抵消但理论上独立的衍生品合约。只要双方都觉得合算，它们就知道自己的赌注是成立的。

但是这样一来，清算所就要面临输钱一方不掏腰包的风险。因此，它要求双方提供担保品或保证金，如果有一方违约就可以扣下。这样，只有在违约方欠款超过已付保证金时它才会蒙受损失。

从理论上讲，这个体系会降低银行倒闭的传染性，让金融体系更坚挺。

2009年，20国集团（G20）这个大型经济体的俱乐部决定简单衍生品合约都应该经过清算所，而不是在双方之间直接结算。这样一来，清算所（也称为中央交易对手）就要处理名义价值高达百万亿美元的交易。

清算所拿到的保证金越多就越安全。需要多少保证金是由先进的精算模型计算出来的，并受到严格的监管。自然，交易风险越高，需要的保证金就越多。伦敦清算所集团和欧洲期交所清算公司之间持有的担保品约有1500亿欧元（1700亿美元）（见图）。德国证券交易所指出，其庞大的保证金池有助于确保“全球金融市场的安全性、灵活性和透明度”。但提供更多的担保品对于客户来说十分昂贵。因此，清算所在争抢客户时，会倾向于不去要求太多。

银行要赌的当然不只是利率。比如，它们还可以购买和债券收益率或货币的走势挂钩的衍生品。其中一些价格之间的相对移动是可以预见的，比如利率期货的收益可能会抵消债券价格期货的损失。清算所在计算客户总共要多少担保额时，也会考虑这些相关性，这种技术称为“交叉保证金”或“投资组合保证金”。CME集团宣称其投资组合保证金服务可以将保证金要求下调54-80%。伦敦清算所的“Spider”和欧洲期交所“Prisma”服务也与此类似。

所有这一切都在鼓励清算所合并。一些客户使用伦敦清算所集团和欧洲期交所清算公司来做有相关性的赌注。如果这两家合并，他们就可以利用交叉保证金来降低这些客户的总担保额，从而获得竞争优势（至少这两家当初说过，它们会将这种抵消限于完美匹配的衍生品。）

不过凡事都有缺点。交易所业务已经高度集中了。不管谁吃掉LSE（ICE还可能半路杀出），五大集团很快就会变成四大。整合后，整个体系中的担保额就很可能降低。

这可能会有风险。如果发生危机，不同资产类别之间的相关性有时会被打破。这种不可预知的变化导致香港期货交易所的清算所在1987年的股市崩盘后瘫痪，迫使香港资本市场关闭。这些事件表明，靠相关性削减保证金

时必须极度保守。

没有证据表明哪一家大型清算所担保品不足。它们的模型设计能够承受两个最大的客户同时崩溃。如果出了问题，它们还可以利用庞大的违约基金。监管者并无担忧。但我们仍然有顾虑，因为竞争的逻辑似乎就是，清算所越来越大，担保品却越来越少。■



Share trading

Complicate, then prevaricate

Discontent is rife at the very heart of capitalism: the trading of shares

THE brokers who traded shares in the Tontine coffee house in 18th-century New York often resorted to stronger drink, leaving them “a little addled”, according to one contemporary account. The technology involved in share-trading has changed a bit since then, and at least some of the participants have sobered up. But more than 200 years later, investors in American equities still wonder whether they are really receiving decent service.

On the face of things, they have little to complain about. The cost of trading has declined sharply over the years (see chart). Explicit commissions, which were once levied in percentage points (0.25% in 1792), have largely disappeared. This is thanks mainly to competition. Whereas the New York Stock Exchange (NYSE) dominated the trading of shares listed on it for most of the 20th century, there are now lots of places where they can be bought and sold.

The impetus for the fragmentation was “Regulation NMS”, adopted in 2005 by the Securities and Exchange Commission (SEC), Wall Street’s main regulator. This required share-trading orders to be funnelled to the exchange offering the best price. The intention was to boost competition to NYSE and NASDAQ, which had a near-duopoly in share-trading at the time. It succeeded in that: both now have less than a fifth of the market.

American shares are traded on a dozen exchanges; at least six other exchanges cater to investors in derivatives linked to shares. Shares also change hands on another 40 or so “alternative trading systems”, as well as a number of “single-dealer platforms”. Finally, many trades are now “internalised” by big banks and asset-managers, meaning that they pair up

buyers and sellers within their sprawling empires rather than use an outside trading venue.

Yet investors worry that, in many cases, competition has brought down the visible price of trading by adding hidden costs. Two anxieties stand out. One is the worry that the current set-up of the markets allows high-speed traders to anticipate big orders and “front-run” them, moving prices in an unfavourable direction before an order can be executed. The other is the question of how robust the system is, with regulators still unable fully to explain events like the “flash crash” of 2010, when the Dow Jones Industrial Average plunged by 9% in minutes before rebounding.

Start with fears of front-running. Many institutional investors complain that ultra-fast traders spot big orders entering the market, and race ahead of them to adjust their prices accordingly. Attempts to hide from the speedsters can go awry. In January Credit Suisse and Barclays, two big banks, agreed to pay \$154m in fines for misleading clients about the workings of their “dark pools”, where offers to sell and bids to buy are not published. In theory, that protects investors from front-running; in practice, several of the firms running such venues had concealed the central role that high-frequency traders played on them. (Credit Suisse didn’t admit or deny wrongdoing in the settlement.)

There is another, less-often-told side to the story. Speed is necessary to knit together a dispersed set of exchanges, so that investors are immediately routed towards the best price available and so that their orders are the first to get filled. And plenty of high-frequency traders are market-makers; it is their job to adjust prices in response to new information. Nonetheless, the idea that markets are rigged is widespread, not least thanks to the publication of “Flash Boys”, a book by Michael Lewis on the evils of high-speed trading.

One preferred solution is to level the field by slowing things down deliberately. IEX, whose founder is the hero of Mr Lewis's book, is a trading platform that has applied to the SEC to become an exchange. It uses miles of coiled cable to create a "speed bump" that delays trades to the advantage of institutional investors. The SEC has received more than 400 letters in support of its application, but there is a vigorous debate about whether IEX's system complies with the requirements of Regulation NMS. Some think that the better solution would be to get rid of Rule 611, which in effect requires orders to be sent to the exchange showing the best price, even though such quotes can sometimes be unobtainable in practice. The SEC will vote on IEX's application by March 21st.

Front-running is not the only concern about America's market structure. The other is the risk of sudden spasms like the flash crash. Glitches are common. In 2012 two public offerings, for Facebook and BATS ("Better Alternative Trading System", a firm that runs exchanges and other trading venues, ironically enough), suffered disruption. Later that year faulty software toppled Knight Capital Group, a big trading firm, by vomiting orders to exchanges without tracking those that were filled. In 2013 the primary electronic market and the back-up system both failed at NASDAQ thanks to a software bug, and so on.

Andrew Lo, a professor of finance at the Massachusetts Institute of Technology (MIT), argues that investigations into such events tend to focus on the venue most affected. How they reverberate through the broader system is very little studied or understood. Sometimes, the existence of other venues may help: in July the NYSE briefly went offline and traders barely noticed as other exchanges filled the gap. On other occasions, they may amplify volatility. In August lurches in the future and equities markets caused the value of exchange-traded funds to deviate from the value of the underlying shares they owned.

Mr Lo proposes a simple reform: the creation of a commission that can subpoena witnesses and evidence to look into the causes of crashes, just as the National Transportation Safety Board investigates air disasters. The commission would look as widely as it liked at what went wrong and then publish its findings.

The SEC acknowledges that the rules governing share-trading need amending. Mary Jo White, the chair of the SEC, has mused, for example, about monitoring the controls firms use to prevent their algorithms running amok. Another idea is to provide the SEC with the power to curtail otherwise legal trading when the market is convulsing.

The risk is that in addressing market complexity, the regulators only add to it. A single SEC proposal, on a facet of a facet of the overall system, is now up for public comment. It runs to 581 pages. ■



股票交易

先搞复杂，再行敷衍

对股票交易这一资本主义核心的不满甚为普遍

根据一段当代的叙述，十八世纪在纽约的汤丁咖啡馆（Tontine coffee house）里交易股票的经纪人往往求助于比较烈性的酒来让自己“微醺”。自那以后，股票交易的相关技术已略有变化，而且至少有一些参与者已经清醒过来。但是在200多年之后，美国股票投资者依旧对股票经纪的服务质量心存怀疑。

从表面上看，他们没什么可抱怨的。这些年来，交易成本已大幅下降（见图表）。一度按百分比（1792年为0.25%）收取的表面佣金在很大程度上已经消失。这主要归功于竞争。在二十世纪的大部分时间里，纽约证券交易所主导了在该所上市的股票的交易，而如今股票买卖的场所有很多。

推动多元化的是华尔街的主要监管机构美国证券交易委员会（SEC）于2005年采取的“全国市场系统规则”（Regulation NMS）。这一规则要求股票交易指令汇集到提供最好报价的交易所，其目的是增加对纽交所和纳斯达克的竞争，而当时它们几乎垄断了股票交易。就此而言，这项规则是成功的——现在这两家各自的市场份额不到五分之一。

目前美国的股票在十几家交易所上交易，另外至少有六家交易所向投资者提供股票衍生品的交易服务。此外，大约40个“另类交易系统”以及几个“单一经纪平台”上也有股票交易。最后，许多交易正在被大银行和资产管理公司“内部吸收”，也就是说它们在自己庞大帝国内部就已将买家和卖家配对，而无需使用外部交易场所。

然而在很多情况下，投资者们担心竞争虽然降低了交易的表面价格，但增加了隐性成本。突出的忧虑有两点：第一是担心目前的市场机制让高频交易者能够预测到大订单并“超前交易”，导致大订单指令被执行之前市场价格已经向不利于它的方向移动。第二是这个系统是否足够强大，毕竟监管

机构仍然无法充分解释2010年道琼斯工业平均指数在几分钟内暴跌9%而后反弹的“闪电崩盘”（flash crash）等类似事件。

先来看市场对超前交易的恐惧。许多机构投资者抱怨说，当超高频交易员发现有大订单要进入市场，就抢在他们之前相应地调整自己的价格。躲避高速交易者的尝试可能会出错。今年1月，瑞士信贷（Credit Suisse）和巴克莱银行（Barclays）两家大银行同意支付1.54亿美元罚款，原因是它们在“暗池”运作方式上误导客户，暗池的意思是不公布买卖报价。理论上说，这样做能保护投资者免受超前交易的影响；在实践中，一些经营此类交易场所的公司掩盖了高频交易员在其中所起的核心作用。（瑞士信贷在庭外和解协议中既不承认也不否认相关指控。）

关于这个故事还有不常被提起的另一面。速度对于把各个分散的交易所联系在一起是必要的，这样的话就可以把投资者的交易直接引导到可获得的最好报价上，保证其指令最先得到执行。许多高频交易员是做市商，根据新信息调整价格是他们的工作。不过，认为市场被操纵的观点普遍存在，很大程度归功于迈克尔·刘易斯（Michael Lewis）的著作《高频交易员》（Flash Boys），书中讲述了高频交易的罪恶。

一个首选的解决方案是通过有意放慢速度来提供公平的竞争环境。交易平台IEX已向SEC申请成为一家交易所，其创始人正是刘易斯书中的主人公。该平台利用数十英里盘绕卷曲的电缆制造出一个“减速带”来延迟交易从而有利于机构投资者。SEC已收到超过400封支持其申请的信件，但对于IEX系统是否符合“全国市场系统规则”的要求，争论颇为激烈。有人认为，更好的办法是废除第611号规则，这条规则实际上要求交易指令被发送到显示最好报价的交易所，即使这种报价有时在实际情况下可能拿不到。SEC将在3月21日对IEX的申请进行表决。

超前交易并不是对美国市场结构的唯一担忧。另一担忧是像闪电崩盘这类突发大事件的风险。小事件很常见。2012年，Facebook和BATS（Better Alternative Trading System）的上市遭到破坏，说来讽刺，后者经营的正是交易所和其他交易平台。那一年晚些时候，软件故障让骑士资本集团

（Knight Capital Group）栽了跟头，这家大型交易公司向交易所发送大量交易指令，却无法跟踪哪些指令已经被执行。2013年，由于一个软件漏洞，纳斯达克的主要电子市场和后备系统双双失灵，诸如此类。

麻省理工学院（MIT）的金融学教授罗闻全（Andrew Lo）认为，对这类事件的调查往往专注于受影响最严重的交易场所。而对于它们如何波及更广泛的系统，研究和理解都很少。有时，其他交易场所的存在可能会有所帮助：去年7月，纽交所发生短暂交易停顿，交易员们却几乎没有注意到，因为别的交易所填补了这一空白。在其他情况下，它们可能会放大波动。8月，期货和股票市场的突然下跌导致交易所交易基金（Exchange Traded Funds，简称“ETF”）的价值偏离了它们挂钩的股票价值。

罗闻全提议了一项简单的改革：成立一个委员会，传唤证人和证据以调查崩盘的原因，就如美国国家运输安全委员会（National Transportation Safety Board）调查空难那样。委员会将尽可能广泛地调查出了什么问题，然后公布结果。

SEC承认股票交易的管理规则需要修改。例如，SEC主席玛丽·乔·怀特（Mary Jo White）曾想过监控公司用来防止其算法失控的控制手段。另一个想法是在市场动荡时给予SEC权力，限制原本合法的交易。

这样做的风险在于，面对市场的复杂性，监管机构只会使其雪上加霜。这个SEC提案仅关系到整体系统中小之又小的一部分，现在正准备提交公开评论，长达581页。■



Artificial intelligence

Million-dollar babies

As Silicon Valley fights for talent, universities struggle to hold on to their stars

THAT a computer program can repeatedly beat the world champion at Go, a complex board game, is a coup for the fast-moving field of artificial intelligence (AI). Another high-stakes game, however, is taking place behind the scenes, as firms compete to hire the smartest AI experts. Technology giants, including Google, Facebook, Microsoft and Baidu, are racing to expand their AI activities. Last year they spent some \$8.5 billion on research, deals and hiring, says Quid, a data firm. That was four times more than in 2010.

In the past universities employed the world's best AI experts. Now tech firms are plundering departments of robotics and machine learning (where computers learn from data themselves) for the highest-flying faculty and students, luring them with big salaries similar to those fetched by professional athletes.

Last year Uber, a taxi-hailing firm, recruited 40 of the 140 staff of the National Robotics Engineering Centre at Carnegie Mellon University, and set up a unit to work on self-driving cars. That drew headlines because Uber had earlier promised to fund research at the centre before deciding instead to peel off its staff. Other firms seek talent more quietly but just as doggedly. The migration to the private sector startles many academics. "I cannot even hold onto my grad students," says Pedro Domingos, a professor at the University of Washington who specialises in machine learning and has himself had job offers from tech firms. "Companies are trying to hire them away before they graduate."

Experts in machine learning are most in demand. Big tech firms use it in

many activities, from basic tasks such as spam-filtering and better targeting of online advertisements, to futuristic endeavours such as self-driving cars or scanning images to identify disease. As tech giants work on features such as virtual personal-assistant technology, to help users organise their lives, or tools to make it easier to search through photographs, they rely on advances in machine learning.

Tech firms' investment in this area helps to explain how a once-arcane academic gathering, the Conference on Neural Information Processing Systems, held each December in Canada, has become the Davos of AI. Participants go to learn, be seen and get courted by bosses looking for talent. Attendance has tripled since 2010, reaching 3,800 last year.

No reliable statistics exist to show how many academics are joining tech companies. But indications exist. In the field of “deep learning”, where computers draw insights from large data sets using methods similar to a human brain's neural networks, the share of papers written by authors with some corporate affiliation is up sharply (see chart).

Tech firms have not always lavished such attention and resources on AI experts. The field was largely ignored and underfunded during the “AI winter” of the 1980s and 1990s, when fashionable approaches to AI failed to match their early promise. The present machine-learning boom began in earnest when Google started doing deals focused on AI. In 2014, for example, it bought DeepMind, the startup behind the computer's victory in Go, from researchers in London. The price was rumoured to be around \$600m. Around then Facebook, which also reportedly hoped to buy DeepMind, started a lab focused on artificial intelligence and hired an academic from New York University, Yann LeCun, to run it.

The firms offer academics the chance to see their ideas reach markets quickly, which many like. Private-sector jobs can also free academics from

the uncertainty of securing research grants. Andrew Ng, who leads AI research for the Chinese internet giant Baidu and used to teach full-time at Stanford, says tech firms offer two especially appealing things: lots of computing power and large data sets. Both are essential for modern machine learning.

All that is to the good, but the hiring spree could also impose costs. One is that universities, unable to offer competitive salaries, will be damaged if too many bright minds are either lured away permanently or distracted from the lecture hall by commitments to tech firms. Whole countries could suffer, too. Most big tech firms have their headquarters in America; places like Canada, whose universities have been at the forefront of AI development, could see little benefit if their brightest staff disappear to firms over the border, says Ajay Agrawal, a professor at the University of Toronto.

Another risk is if expertise in AI is concentrated disproportionately in a few firms. Tech companies make public some of their research through open sourcing. They also promise employees that they can write papers. In practice, however, many profitable findings are not shared. Some worry that Google, the leading firm in the field, could establish something close to an intellectual monopoly. Anthony Goldbloom of Kaggle, which runs data-science competitions that have resulted in promising academics being hired by firms, compares Google's pre-eminence in AI to the concentration of talented scientists who laboured on the Manhattan Project, which produced America's atom bomb.

| *Ready for the harvest?*

The threat of any single firm having too much influence over the future of AI prompted several technology bosses, including Elon Musk of Tesla, to pledge in December to spend over \$1 billion on a not-for-profit initiative, OpenAI, which will make its research public. It is supposed to combine the

research focus of a university with a company's real-world aspirations. It hopes to attract researchers to produce original findings and papers.

Whether tech firms, rather than universities, are best placed to deliver general progress in AI is up for debate. Andrew Moore, the dean of Carnegie Mellon University's computer-science department, worries about the potential for a "seed corn" problem: that universities could one day lack sufficient staff to produce future crops of researchers. As bad, with fewer people doing pure academic research, sharing ideas openly or working on projects with decades-long time horizons, future breakthroughs could also be stunted.

But such risks will not necessarily materialise. The extra money on offer in AI has excited new students to enter the field. And tech firms could help to do even more to develop and replace talent, for example by endowing more professorships and offering more grants to researchers. Tech firms have the cash to do so, and the motivation. In Silicon Valley it is talent, not money, that is the scarcest resource. ■



人工智能

百万美元宝贝

硅谷抢夺人才，大学难留明星学者

计算机程序可以反复战胜围棋世界冠军，这是人工智能（AI）这一快速发展的领域中一项极为难得的成就。然而，随着各家公司竞相把顶尖的人工智能专家招致麾下，另一场高风险游戏正在幕后展开。包括谷歌、Facebook、微软、百度在内的科技巨头争相扩展其人工智能项目。数据公司Quid表示，去年，这些科技公司花费了约85亿美元用于研究、收购及网罗人才，比2010年多四倍。

过去，大学拥有世界一流的人工智能专家。如今，科技企业正从大学的“机器人及机器学习（计算机通过数据自动学习）”系里抢夺优秀师生，以堪比职业运动员的高薪做诱饵。

美国卡耐基梅隆大学（Carnegie Mellon University）的国家机器人工程中心（National Robotics Engineering Centre）原本有140名教师，去年，打车公司优步从中招聘了40人，设立部门研究自动驾驶汽车。此举惹来关注，因为优步之前承诺资助该中心的研究工作，后来却转而挖角。其他公司寻觅人才的举动则相对低调，但也同样执着。人才向私营公司的流动让不少学者感到震惊。“我连自己的研究生也留不住，”华盛顿大学的佩德罗·多明戈斯（Pedro Domingos）教授说道，他是机器学习方面的专家，连他自己也收到了科技公司伸出的橄榄枝，“学生还没毕业，那些公司就想把他们聘走。”

机器学习领域的专家最为抢手。大型科技公司的许多任务都要运用这一技术，从一些基本任务，如过滤垃圾邮件和令网络广告更有针对性，到无人驾驶汽车或扫描图像来发现疾病等具有未来色彩的尝试，无一例外。科技巨头在研发一些产品时要依赖机器学习技术的进步，比如帮助用户安排生活的虚拟个人助理或是方便人们搜寻图片的工具。

科技公司对这一领域的投资有助解释为何“神经信息处理系统大会”（Conference on Neural Information Processing Systems，每年12月在加拿大举行）这一曾被视为高深莫测的学术会议如今摇身成为人工智能界的达沃斯盛会。与会者一方面为了学习，另一方面也为了被求贤若渴的老板们发现并追捧。2010年以来，其与会人数增加了两倍，去年达到3800人。

学术界有多少人转投科技公司的怀抱目前仍无可靠统计数据，但有迹可循。“深度学习”是指计算机利用近似人类大脑神经网络的运作方式从大型数据集中析取知识，这一范畴的学术论文中，在企业任职的作者比例大幅上升（见图表）。

科技公司并非一开始就对人工智能专家倾注如此多的心思和资源。在上世纪八九十年代的“人工智能寒冬”，新潮的人工智能技术未如预期，该领域被广为忽视，资金投入也不足。目前这股“机器学习”热潮是在谷歌开始收购专注人工智能技术的公司后才真正开启的。比如，2014年，谷歌从伦敦的研究人员手中收购了DeepMind，这家创业公司正是人机围棋大战中计算机取胜的幕后关键。据传当时的收购价约为六亿美元。据报道也曾有意收购DeepMind的Facebook也在差不多同一时间建起实验室，专注研发人工智能技术，并从纽约大学请来学者燕乐存（Yann LeCun）来做负责人。

这些公司为学者们提供机会，让其创意迅速推向市场，往往大受欢迎。私营公司的职位也令学者们不用担心研究经费不足的问题。之前在斯坦福大学全职任教的吴恩达目前效力于中国互联网巨头百度，主管人工智能研究。他表示，科技公司能提供两个特别诱人的条件：强大的计算能力和庞大的数据集。这两者为现代机器学习研究必不可少。

这些都是好的方面，但挖角热潮也有代价。一方面，大学由于无法提供具有竞争力的薪酬，假如过多优秀人才被诱走，一去不返，或是忙于服务科技公司而无法专心讲学，大学将蒙受损失。同时，一些国家也可能遭罪。大型科技公司总部多在美国；像加拿大这样的国家，其大学一直处于人工

智能研发的前沿，如果他们最聪明的人才都被境外公司吸引走，对本国实在毫无益处，多伦多大学的阿杰伊·阿格拉沃尔（Ajay Agrawal）教授说道。

另一风险是人工智能技术过度集中于少数企业手中。科技公司通过开源方式公开其部分研究成果。它们也答应员工可以撰写论文。然而，实际上，许多有利可图的研究成果并未共享。有人担心，作为人工智能界领头羊的谷歌可能形成近乎知识垄断的地位。Kaggle是组织数据学竞赛的平台，不少公司通过这些比赛搜罗学术新星，该平台的安东尼·古德鲁姆（Anthony Goldbloom）将谷歌在人工智能上的卓越表现与当年集结众多科学英才在曼哈顿计划中努力工作相提并论。该计划最终为美国造出原子弹。

| 准备收获？

由于担心某一家企业在未来对人工智能的发展拥有过大影响力，多家科技公司的老板，包括特斯拉的伊隆·马斯克（Elon Musk）在去年12月承诺向非营利研究机构OpenAI提供10亿美元资助。这一机构将公开其研究成果。该机构应该能结合大学的研究热点和企业的现实抱负，希望能吸引研究人员做出原创成果及论文。

最有优势推动人工智能研究总体进展的是科技企业而非高等院校么？众说纷纭。卡耐基梅隆大学计算机系系主任安德鲁·摩尔（Andrew Moore）担心“希望种子”成忧：大学终有一天会缺乏教师培养未来的研究人员。同样糟糕的是，越来越少人会从事纯学术研究、公开分享想法或者参与跨度达几十年的研究项目，未来的突破也可能受到制约。

但忧虑未必会成真。投入人工智能研发的额外资金激励新生步入这一领域。而且科技公司可以进一步推动人才发展及更新换代，比如授予更多教授职位，向研究人员提供更多资助。科技公司有财力也有动力这么做。在硅谷，最稀缺的资源是人才，而非金钱。■



Mobile services

Bots, the next frontier

The market for apps is maturing. Now one for text-based services, or chatbots, looks poised to take off

“YOU are a developer and you’ve just spent two weeks writing this amazing app. What is your dream? Your dream is to get it in front of every iPhone user.” That was how Steve Jobs, then Apple’s boss, introduced an online shop for smartphone apps eight years ago. At first few paid it much heed, but it launched one of the fastest-growing software markets ever. Since then over 100 billion apps have been downloaded, generating \$40 billion in revenues for developers and billions more in subscriptions and other fees.

At a conference on April 12th in San Francisco, Mark Zuckerberg, Facebook’s boss, is expected to make a similar announcement. He will probably unveil an online shop and coding tools for “chatbots”. These are text-based services which let users complete tasks such as checking news, organising meetings, ordering food or booking a flight by sending short messages. Bots are usually powered by artificial intelligence (hence the name, as in “robot”), but may also rely on humans. Many in the technology industry hope that Facebook’s event will mark the beginning of another fast-growing, multi-billion-dollar software economy. Are bots the new apps?

The timing looks right, because smartphone software is in flux. Download numbers are still growing, but the app economy is clearly maturing. “The dream of the independent developer building a business in the app store is over,” suggests Activate, a consultancy. The 20 most successful developers grab nearly half of all revenues on Apple’s app store. Building apps and promoting them is getting more costly. Meanwhile, users’ enthusiasm is waning, as they find downloading apps and navigating between them a hassle. A quarter of all downloaded apps are abandoned after a single use.

Only instant messaging bucks the trend. Over 2.5 billion people have at least one messaging app installed, with Facebook Messenger and WhatsApp, which is also owned by Facebook, leading the pack (see chart). Within a couple of years, says Activate, that will reach 3.6 billion, about half of humanity. Many teenagers now spend more time on smartphones sending instant messages than perusing social networks. WhatsApp users average nearly 200 minutes each week using the service.

| *Talking out of your bot*

As services based on artificial intelligence improve, they need a way to talk to real people. Chatbots are one option. At a conference on March 30th Microsoft showed off several prototypes. It will be a while before anyone trusts such services, however. A few days earlier one of Microsoft's bots, "Tay", designed to impersonate a millennial, started parroting racist language it had learned from users on Twitter. "Tay" had to be sent to her digital room.

As a result of these various developments, a new software ecosystem has started to emerge. Text-based services have been around since the dawn of internet time, but the birth of the bot economy can be dated to June last year, when Telegram, a messaging app with Russian origins and more than 100m users, launched a bot platform and a "bot store". It now counts thousands of bots, such as news alerts from media organisations, or feeds that link to football videos or porn.

A few dozens startups exist. Some provide tools: Chatfuel is a web-based offering that lets users build bots for Telegram. Others offer specialised services: Digit allows users to interact with their bank accounts and find ways to save money; Pana is an online travel agency that takes text messages and turns them into bookings. MeeKan sets up meetings for users of Slack, a popular corporate-messaging service (now valued at nearly \$4 billion).

Then there are firms which want to be the foundation for other services. Assist aims to be the equivalent of Google's search box—to find bots. Another firm, Operator, hopes to become the Amazon of bot-commerce: when a shopper requests, for example, certain sports shoes, its system can contact a salesperson in a nearby shop or get one of its own “experts” to handle the order. Robin Chan, Operator's boss, talks of creating a virtuous cycle of more buyers attracting more businesses, which will in turn draw in more buyers.

The app economy grew quickly only after Apple and then Google became enthusiastic champions. The bot economy will also need industry leaders, and Microsoft and Facebook look eager to play the role. Most smartphones are powered by operating systems controlled either by Apple or Google. The bot market, by contrast, is unconquered territory. At its conference, Microsoft also introduced tools to create clever new services. Facebook is expected to open its messaging platform to all sorts of bots (users can already chat with a selected few, including one impersonating Miss Piggy of the Muppets) and launch an online shop which will list the services.

Given the drawbacks of apps, there should be plenty of demand for bots, says Michael Vakulenko of VisionMobile, a market-research firm. Much like web pages, they live on servers, not a user's device, meaning they are easier to create and update. This is likely to make them attractive to businesses which have shied away from developing their own apps, such as restaurants and shops.

Users should find bots smoother to use, which explains another of their monikers: “invisible apps”. Installation takes seconds; switching between bots does not involve tapping on another app icon; and talking to bots may be more appealing than dealing with a customer-support agent of a bank or airline, for example.

No guarantee exists, however, that the bot economy will be as successful as the app one, which has created 3.3m jobs just in America and Europe, according to the Progressive Policy Institute, a think-tank. The economics for developers are not obviously attractive: if bots are easier to develop, that means more competition. Consumers could, again, be overwhelmed by the cornucopia of services and ways of interacting with them. And designing good text-based interfaces can be tricky. After launching the first version for Slack, Matty Mariansky, a co-founder of MeeKan, was surprised by the many different ways users tried to communicate with his bot. He has since hired dedicated script writers, who have come up with more than 2,000 sentences to handle a meeting request.

The popularity of messaging apps suggests people will happily talk to bots. But much will depend on “killer bots”—hugely popular services that work best in the form of bots. Toby Coppel of Mosaic Ventures, a venture-capital firm, sees health care as a promising market. Bots could deal with routine ailments and send difficult ones to a doctor. Ted Livingston, the founder of Kik, another messaging app, which launched a “bot shop” on April 5th, expects “instant interaction” to dominate. He predicts businesses won’t just have phone numbers and web pages, but bots too. Restaurants could take orders via instant message—as some do already in China.

As with apps, bots will need much experimentation to find their place. That will, in turn, depend on how well providers manage their platforms. Telegram lets developers do pretty much what they want (although it has shut down chat channels related to Islamic State). Microsoft has promised to be as open as possible. Developers and investors have their doubts about Facebook, given its chequered history: it made life difficult for developers of applications for its website.

| *There will still be an app for that*

Microsoft, Facebook and others will also have to deal with Apple and

Google, both of which are laggards in messaging and bots. They could try to get ahead, for instance by attracting developers with their widely used payment systems. Or they might try something entirely new, says Benedict Evans of Andreessen Horowitz, another venture-capital firm. One possibility would be to allow bots to show up on a smartphone's notification panel.

Still, there will soon be "a bot for that", to paraphrase Apple's iconic slogan which suggests that an app exists for everything. Yet bots, unlike the Daleks of Dr Who fame (pictured), won't try to take over the world. They will be happy to co-exist on people's smartphones with websites, apps and other things yet to be invented. The mobile world will keep changing, but will always be a mixed affair. ■



移动服务

聊天机器人，下一前沿

应用市场日趋饱和，基于文本的聊天机器人市场蓄势待发

“作为开发人员，你花了两周时间编写了一个美妙的应用。你的梦想是什么？是让这个应用呈现在每一个iPhone用户面前。”那是八年前苹果公司当时的老板乔布斯在推出智能手机应用商店时的一席话。起初并没有多少人留意，但史上增长速度数一数二的软件市场自此开启。从那时起，超过一千亿个应用被用户下载，为开发者带来400亿美元收入，还有数十亿美元的订阅费及其他费用。

4月12日在旧金山召开的发布会上，预计Facebook的老板扎克伯格将会发表类似的宣言。他可能会推出一个“聊天机器人”的网上商店及相关编程工具。这些基于文本的服务能让用户通过发送短讯来查看新闻、安排会议、订餐或是订购机票。聊天机器人通常由人工智能支持（因而名为“机器人”），但也可能依赖人类操作。许多科技业人士希望Facebook的发布会能开启又一个价值数十亿美元且高速增长的软件经济。聊天机器人会取代应用，成为人们的新宠吗？

时机似乎是对的，因为智能手机软件在不断变化。下载数量仍在增长，但应用经济显然已趋于成熟。“独立开发者希望在应用商店开创一番事业的梦想已经终结。”咨询公司Activate表示。最成功的二十家软件开发公司在苹果应用商店抢占了近一半的收入。开发及推广应用的成本越来越高。同时，用户的热情也在消减，他们觉得应用的下载和切换使用都是麻烦事。在所有下载的应用中，有四分之一在使用一次后就被扔在一边。

只有即时通讯应用逆势上扬。超过25亿人安装了至少一款通讯应用，其中Facebook Messenger和同属Facebook旗下的WhatsApp领先群雄（见图表）。Activate表示，在几年内，即时通讯的用户将达到36亿，约为全球人口的一半。许多青少年如今更多是利用智能手机发送即时消息，而非浏览社交网络。WhatsApp用户每周使用该服务的时间平均接近200分钟。

| 聊天机器人“代言”

随着基于人工智能的服务不断发展，开发技术与真人对话成为必要。聊天机器人是选择之一。在3月30日举行的一场发布会上，微软展示了几个产品原型。但人们要能信赖此类服务，尚需一段时间。几天前，微软一款模拟千禧一代的聊天机器人“Tay”从推特用户那里学来种族歧视言论，开始口出狂言，不得不回炉再造。

随着各个方面的发展，一个新的软件生态系统开始显现。自互联网时代之初，各种基于文本的服务便一直存在，但聊天机器人经济的诞生则是在去年六月，拥有超过一亿用户的俄罗斯通讯应用“Telegram”推出了一个聊天机器人平台及一家“聊天机器人商店”。如今店内有数以千计的软件机器人可供选择，比如可以提醒媒体新闻、推送足球视频或色情影片。

现在已经有数十家相关创业公司。有一些提供工具：Chatfuel是基于网页的产品，供用户为Telegram开发聊天机器人。另一些则提供专业化服务：Digit帮助用户处理银行账户，寻找省钱办法；Pana是一家网络旅行社，接收文字信息后转为订单。MeeKan则为流行的企业通信软件Slack（现时估值接近40亿美元）的用户安排会议。

再就是希望成为其他服务基础的公司。Assist的目标是成为相当于谷歌搜索框的聊天机器人搜索工具。另一家公司Operator则希望成为聊天机器人商务领域的亚马逊：例如购物者要买某一款运动鞋时，其系统可以联系附近商店的销售人员或让系统自己的“专家”来处理订单。Operator的老板罗宾·陈（Robin Chan）提到，更多买家能吸引更多商家，进而又吸引更多买家，形成良性循环。

应用经济在苹果及谷歌相继大力推动后才迅速成长起来。聊天机器人经济也需要行业先锋，微软和Facebook看来热衷于担当这一角色。大部分智能手机运行的不是苹果便是谷歌的操作系统。相比之下，聊天机器人市场则是一块处女地。微软在其发布会上也推出了用以创建智能新服务的工具。据估计，Facebook将向各类聊天机器人开放其通讯平台（用户已经可以与一些聊天机器人对话，包括模仿《布偶家族》中的猪小姐的一款虚拟机器

人），并推出网上商店，展示这些聊天机器人。

市场调查公司VisionMobile的迈克尔·瓦库连科（Michael Vakulenko）认为，鉴于应用的弊端，聊天机器人的市场需求应该很大。跟网页很像的是，这些机器人位于服务器中，而非用户设备上，从而更容易创建和更新。对于餐馆及商店这类不愿自行开发应用的商家而言，这可能极具吸引力。

用户会发现，聊天机器人使用起来更顺畅，因此又得名“隐形应用”。只需几秒就能安装完毕；在机器人之间的切换无须点击另一应用图标；而且相比和银行或航空公司的客服人员打交道，跟机器人对话或许更有意思。

然而，谁也不能保证聊天机器人经济会像应用经济那样大获成功，据智囊机构“进步政策研究所”（Progressive Policy Institute）的数据，应用经济单单在欧美就创造了330万个职位。在开发者的眼中，聊天机器人经济不具备明显吸引力：假如聊天机器人变得更易开发，竞争便会加剧。而且，服务选择及互动方式之多，可能会让消费者再次感到无所适从。另外，基于文本的界面很难设计得好。MeeKan公司推出为Slack打造的第一版聊天机器人后，其联合创始人马蒂·马里安斯基（Matty Mariansky）惊讶地发现用户会以众多不同的方式与其机器人沟通。之后，他请来专人撰写脚本，针对一个会议请求就构思出2000多句话来应对。

通讯应用大行其道表明人们将乐于和机器人对话。但未来发展主要寄望于“杀手级聊天机器人”的出现，即以聊天机器人的形式发挥出最佳效用的超级流行服务。“马赛克风投”（Mosaic Ventures）的托比·科贝尔（Toby Coppel）认为医疗市场潜力巨大。聊天机器人可以诊断日常疾病，将棘手病症转交医生处理。另一家通讯应用Kik的“聊天机器人商店”在4月5日上线，其创始人特德·利文斯顿（Ted Livingston）估计“即时互动”将成为主流。他认为企业将不但拥有电话号码及网页，还必备聊天机器人。餐馆可以通过即时信息接收订单，中国的一些餐厅已经在这么做了。

和应用一样，聊天机器人需要通过大量实验来确立地位。而这又取决于提

供应商能否很好地管理平台。Telegram给予开发者充分的自由，几乎是随心所欲（虽然已经关闭了与伊斯兰国组织相关的聊天频道）。微软已承诺尽量开放。而Facebook则因劣迹斑斑而不获开发人员和投资者的信任：过去，Facebook对其网站应用的开发者设下诸多限制。

| 还是总有一款应用能搞定

微软和Facebook等公司也须与在即时通讯和机器人技术上落后的苹果和谷歌交锋。这两家公司可以努力赶超，比如以其广泛使用的支付系统吸引开发者。它们也可以做全新的尝试，另一家风投公司安德森霍洛维茨（Andreessen Horowitz）的本尼迪克特·埃文斯（Benedict Evans）说道。一种可能是让聊天机器人出现在智能手机的通知栏上。

不过，套用苹果公司的标志性口号（“There's an app for that”，即“总有一款应用能搞定”，表示一切任务总有应用能完成），“总有一个机器人能搞定”的情况将很快出现。但聊天机器人不像科幻电视剧《神秘博士》（Dr Who）里的戴立克机器人（如图），它们不会试图占领地球。它们将乐于与网站、应用和其他未来发明共存于人们的智能手机上。移动世界将变化不休，但永远是百花齐放。■



Road haulage

The appy trucker

Digital help is at hand for a fragmented and often inefficient industry

MENTION “logistics” and it may bring to mind shiny FedEx or UPS vans with their neatly uniformed drivers. However, the business of shifting cargo by road, especially larger loads, is far more fragmented and inefficient than the image of its best-known brands would suggest.

Even the world-famous names in parcel delivery compete with many lesser firms. Likewise, “third-party logistics”—the outsourcing of a business’s transport needs, including running fleets of lorries and vans on its behalf—also has some big firms but lots of smaller ones. There is even more fragmentation in what Americans call the “truckload” part of the industry—one-off deliveries of entire lorry trailers—and in the “less-than-truckload” business—the carriage of a pallet or two of goods. Whereas America’s top five airlines earn around 90% of their industry’s domestic revenues, the equivalent figure for the top five logistics firms is just 20%, reckons Armstrong & Associates, a consulting firm. Official figures show that one in nine American truckers is an independent owner-operator rather than an employee.

The entire industry is a juicy target, ripe for disruption. Together, road haulage of all kinds is worth around \$700 billion a year in America and more than €310 billion (\$335 billion) in Europe. The rise of internet shopping and other factors will help the industry to keep growing, by around 3% a year worldwide for the next decade, according to Deloitte, another consulting firm. But it is a wasteful business. Every year American lorries travel empty for 50 billion miles (80 billion km)—28% of their total mileage. In Europe, a quarter of the containers on the road are empty, reckons InlandLinks, a container-tracking service.

Some moves have been made towards consolidation. Low fuel prices, cheap finance and recovering rich-world economies have given larger companies the means and the motive to buy rivals. Last year FedEx bought TNT, a European parcel-delivery counterpart, for \$4.8 billion. XPO Logistics of America, a broker in the truckload and less-than-truckload businesses, bought a French firm, Norbert Dentressangle, for \$3.5 billion; and then a domestic rival, Con-way, for \$3 billion. European firms have joined in too: SNCF Geodis, a French state-owned logistics outfit, recently bought OHL for \$800m, to establish a foothold in America.

However, there seems little prospect so far of consolidating the multitude of freelance truckers into employees of a handful of big firms. This is because of the comparatively low barriers to entry in their business, says Jack Semple of the Road Haulage Association, a British trade body. The average cost of a lorry-driving course in Britain is less than £1,000 (\$1,400). In California it can be as little as \$1,100. Lorries can be leased, or bought on cheap credit provided by their makers. Britain nationalised and merged its biggest hauliers in the 1940s, but a state behemoth was outrun by one-man outfits and the business was privatised again in the 1980s.

The best prospects for efficiency and rationalisation, then, are in improving the creaky system by which large numbers of freight-brokers haggle with even larger numbers of truckers. Deals can take days of telephone calls to organise. And for their efforts, brokers charge hefty commissions—of as much as 45% of the delivery cost per load for short-haul trips. Brokers have an incentive to choose the priciest options for their clients to extract as high a fee as possible.

Inevitably, a bunch of startups are now seeking to make the business cheaper, quicker and more transparent by replacing the brokers with mobile-app platforms that match shippers' loads with available trucks and truckers. Cargomatic, based in Los Angeles, lets shippers list local jobs on

its app, which are pinged to the smartphones of nearby drivers. When one of them takes on a job, the shipper can track his journey in real time. Trucker Path, already a popular social app that helps around 450,000 registered American drivers find rest-stops and poker partners, is currently testing its Truckloads app, which does something similar to Cargomatic for the long-haul market.

Other systems automatically match drivers to loads, much as Uber does for taxis and passengers. Transfix, developed by a New York startup, not only scans for nearby lorries, but also rates each driver based on how many miles he would have to drive his lorry empty, how soon he will be available and his past performance. The best match is offered the job first. The whole process takes minutes, says Drew McElroy, a founder of Transfix. And the commission is just 10%, a fraction of what some brokers charge.

Other apps are attempting to do the same for containers whose journeys do not just involve the roads. Kontainers, based in Britain, aims to be a one-stop-shop for businesses that want their goods moved across the oceans. Now, to shift a load from a shipper in Britain to a customer in Australia typically requires two days, 20 phone calls and 40 e-mails to reach an agreement, says Graham Parker, one of Kontainers' founders. He wants to make booking a container shipment as easy as buying a plane ticket. Its website does this by dealing directly with truckers and shipping lines, which provide real-time tracking throughout the journey. Mr Parker says one of his clients discovered through Kontainers that shipping from Britain to Australia could be done in 38 days rather than the 55 his broker had always told him.

Previously Nam Nguyen, of Skyline Steel in Seattle, would call five or six haulage companies whenever he needed to move a load from the company's yard to a customer. For local jobs he says he now uses the Convoy app, created by another firm in Seattle, which went live in

September. The main gains, he says, have been the “huge time savings” and reliability of delivery. Although it was at first assumed that only small businesses would be interested in such apps, big companies have also started to use them too. Barnes & Noble, an American bookshop chain, was one of Transfix’s first clients; Bosch, a German industrial giant, is now one of Kontainers’ best.

| *Road to riches*

Drivers’ hours are restricted by law, so anything that helps them cut the time spent behind the wheel with no load (and thus no pay) is a bonus. Apps can help with this, and in generally helping them find more jobs. Mr McElroy says some of his drivers now average five weekly one-way trips between Indianapolis, where several publishers are based, and Barnes & Noble’s warehouse in New Jersey, instead of four. So they earn 25% more, with less waiting around. The apps also arrange payments much more quickly than brokers typically do, another important benefit for drivers. Some platforms, such as Transfix, guarantee payment within 24 hours of a delivery. Others, such as Truckloads, allow drivers to filter for shippers’ credit ratings and thus the likelihood of getting paid.

Investors have concluded that such platforms have proved their worth, and are ready to take off. Last year \$63m was raised for seven of these companies, including \$12m for Transfix and \$20m for Truckloads. Such sums are small change compared with the huge sums that taxi-app firms like Uber and Didi Kuaidi are raising, but it is in the haulage apps’ favour that they can achieve scale with such relatively modest sums. And they do not need to attract millions of users to turn profitable. Kontainers says it already has more than 100 businesses as customers in Britain, a number which many offline brokers would be more than happy with.

So far, the big names of road logistics have largely stood back and left the business of “Uberising” the haulage business to the startups. Dan Lewis of

Convoy argues that newcomers such as his have an edge, because incumbents would need to integrate new technology into their legacy systems, and “retrofit solutions rarely outperform something built from the ground up.” As for the established brokers, they have an incentive to maintain the status quo and keep the market offline, argues Mr Parker of Kontainers. This will change if the apps begin to eat into brokers’ business and divert a significant share of work from the big parcels and haulage firms towards freelance drivers.

Brett Parker, a founder of Cargomatic, sees large, asset-heavy logistics firms like UPS and FedEx not as competitors but as future partners, and says many such incumbents are seeking alliances with on-demand-economy firms like his. Others think the incumbents will eventually buy the most successful haulage-broker apps.

Two other, deep-pocketed names are also casting an eye over the delivery business. Uber itself is testing a service in some cities in which its freelance taxi drivers also collect and drop off parcels; and Amazon is developing an app, “On My Way”, which allows any member of the public to get paid for delivering packages. If these two giants eventually adapted their services to cover larger loads—not much of a technological challenge—then the scale of their resources and expertise would be hard to compete with.

By then, another wave of upheaval may be in prospect—including for today’s app-based disrupters—as driverless lorries begin taking to the roads. It seems likely that they will be phased in over a number of years, starting perhaps with bigger, longer-distance loads. An industry that has less need for drivers ought to tip the scales away from freelancers and towards large fleet owners. But the advantages of being able to book a shipment quickly and cheaply by app will remain. ■



陆路货运

玩应用的卡车司机

数字化正在帮助改进一个分散且通常效率低下的行业

提到“物流”这个词，你可能就会想到联邦快递（FedEx）或UPS公司那光鲜的货车和统一着装的司机。然而，和这些业内最知名品牌留给人们的印象相比，陆路货运业的实际情形要分散也低效得多，尤其是大型货运。

在包裹递送这一块，即使世界闻名的品牌也在和众多较小的公司竞争。同样的，在“第三方物流”（一家企业将其运输需求外包，让对方替它运作卡车和货车车队）这一领域，也是一些大公司和许多较小的公司并存。而在货运业的“一卡车”（美国人口中的“truckload”，即装满一整辆拖挂式卡车的一次性运输）以及“一卡车不到”（运载一两个托盘的货）业务里，则更是四分五裂。据咨询公司Armstrong & Associates估算，美国最大的五家航空公司赚取了航空业国内收入的约90%，而五大物流公司的这一比例仅为20%。官方数据显示，美国九分之一的卡车司机是独立运营的车主兼司机而非雇员。

整个行业已成为酝酿颠覆的沃土。在美国，所有类型的陆路货运总共年价值达约7000亿美元，在欧洲为3100多亿欧元（3350亿美元）。据另一家咨询公司德勤预测，网络购物的兴起等因素将推动该行业继续增长，在未来十年里全球每年约增长3%。但该产业浪费严重。集装箱追踪公司InlandLinks估算，美国的货车每年空驶500亿英里（800亿公里），占其全部行驶里程的28%。在欧洲，“在路上”的集装箱有四分之一是空的。

已经有一些向整合发展的动态。低燃料价格、廉价金融和富裕国家经济复苏让较大的公司拥有了买下对手的条件和动力。联邦快递去年以48亿美元收购了在欧洲旗鼓相当的TNT快递公司。美国的XPO物流公司（XPO Logistics）是“一卡车”及“一卡车不到”业务的代理，以35亿美元收购了法国公司Norbert Dentressangle，而后又以30亿美元收购了当时的国内对手康威物流（Con-way）。欧洲的企业也加入了收购战：法国国有物流公司

乔达国际集团（SNCF Geodis）最近以八亿美元收购了OHL以求在美国立足。

不过，目前看来还不大可能把大批自雇卡车司机整合进几家大企业的人马中。英国行业机构陆路货运协会（Road Haulage Association）的杰克·森普尔（Jack Semple）说，这是因为在他们所从事的业务领域，进入门槛相对较低。在英国，货车驾驶课程平均价格不到1000英镑（1400美元），加州最便宜的课程只要1100美元。司机可以租赁货车，或通过货车制造商提供的廉价贷款购买货车。英国在上世纪40年代将该国最大的几家货运公司国有化并合并，但在80年代，国有巨头被一人公司超越，该业务再度私有化。

由此，提高效率及行业重组的最佳前景是改善一个糟糕的体系：大批货运代理和数量更为庞大的卡车司机讨价还价。交易可能需要打上几天的电话来安排，而代理商还要收取高昂的服务佣金，在短途货运中占到每次货运费用的45%之多。为了尽可能多地从中牟利，代理商有理由为客户选择最贵的交易方。

无可避免地，一批创业公司正在寻求让这类业务变得更廉价、迅捷也更为透明，方法是用移动平台取代代理商来匹配发货方和卡车及司机。总部位于洛杉矶的Cargomatic让发货方在其应用上发布本地的工作机会，并发送到附近司机的智能手机上。一名司机接下一个单子后，发货方可以实时追踪其行程。Trucker Path这款流行的社交应用已帮助约45万名美国注册司机找到休息站和扑克牌友，目前在测试另一款应用Truckloads，类似于长途货运市场里的Cargomatic。

其他一些系统自动匹配司机和货物，很像优步匹配出租车和乘客。纽约一家创业公司研发的Transfix不仅搜罗附近的货车，还根据司机将必须空驶的里程数、多久能抵达，以及过去的表现来给他们打分。最佳匹配对象会最先拿到单子。Transfix的创始人之一德鲁·麦克尔罗伊（Drew McElroy）说，整个过程只耗时几分钟，而佣金仅为10%，是一些代理公司要价的零头。

其他应用正在为那些不止在陆路上运输的集装箱做同样的事。总部位于英国的Kontainers力求为那些想要跨洋移送货物的企业提供一站式服务。Kontainers的创始人之一格拉汉姆·帕克（Graham Parker）说，目前，从英国的发货商那里发一批货运至澳大利亚的一名顾客，安排货运通常耗时两天，需要打20个电话和来回40封电子邮件才能达成协议。他想将预约一次货运变得和买机票一样简单。为此，他的网站直接和货车司机及航运公司协调，并在整个运输途中提供实时跟踪。帕克说，他的一个客户使用Kontainers后发现，从英国送货到澳大利亚可以在38天里完成，而以前他的代理商一直说需要55天。

以前，西雅图Skyline钢铁公司（Skyline Steel）的阮南（Nam Nguyen，音译）每次需要从公司的院子运货给一名客户时，都要给五六家搬运公司打电话。他说，现在他使用西雅图另一家公司创建的Convoy应用（去年九月上线）来处理同城送货。主要的收获是“节省了大量时间”，且运输很可靠。虽然一开始人们以为只有小公司会对这类应用感兴趣，但大企业也已经开始使用它们了。美国连锁书店Barnes & Noble是Transfix的首批客户之一。德国工业巨头博世（Bosch）目前是Kontainers的最佳客户之一。

| 致富之路

司机的工作时长受法律限制，因此如果有任何方法能够帮助他们减少无报酬的空驶时段，都等同于发奖金。应用可以提供帮助，而且通常也帮他们接到了更多工作。麦克尔罗伊说，他手下的一些司机现在每周在几家出版商所在的印第安纳波利斯和位于新泽西州的Barnes & Noble仓库间平均行驶五趟单向旅程而非四趟。空等的时间减少了，司机的收入增加了25%。应用在支付报酬时的速度也比代理商通常的速度快很多，这是司机的另一项重要收获。有些平台比如Transfix保证在送达后24小时内完成支付。其他应用如Truckloads让司机可以筛选发货商的信用评分，以了解自己拿到报酬的可能性。

投资商总结认为，这类平台已经证明了自己的价值，将会很快流行起来。去年，七家公司获得了6300万美元的融资，其中Transfix融资1200万美元，Truckloads获投2000万美元。和优步及滴滴快的这类出租车应用公司

巨大的融资规模比起来，这些数字只是小菜一碟，但货运类应用能凭借相对微薄的数额取得规模效应，这对它们有利。而它们并不需要吸引数百万计的用户来盈利。Kontainers称它在英国已拥有100多家企业客户，这个数字是许多线下代理商可望而不可即的。

目前为止，陆路物流的巨头们很大程度上仍在观望，将货运业“优步化”的工作留给了创业公司。Convoy的丹·刘易斯（Dan Lewis）说，像自己的公司这类新进者有其优势，因为既有业者需要将新技术整合到自己的传统系统中，而“整改的解决方案极少会超越那些从头做起的”。Kontainers的帕克认为，对于成熟的代理商而言，它们有动机维持现状，让市场保持在线下。而如果各种应用开始蚕食代理商的业务，并将一大块生意从大型快递和货运公司转到自雇司机那里，那么局面将发生变化。

在Cargomatic的创始人之一布雷特·帕克（Brett Parker）看来，UPS和联邦快递这类重资产的大型物流企业并非自己的竞争对手，而是未来的合作伙伴。他说许多这类既有业者正在寻求和像他这类按需经济公司结成联盟。其他一些人认为既有业者最终会买下最成功的货运代理应用。

另两家实力雄厚的企业也在下注货运业。优步本身正在一些城市里测试一项服务，让它的兼职司机同时也收发包裹。亚马逊正在研发一款应用“顺路”（On My Way），任何人都可以递送包裹并获得报酬。如果这两大巨头最终调整自己的服务来覆盖更大的货运量——这在技术上不算什么挑战——那么它们的资源规模和技能将难以匹敌。

届时，另一轮巨变可能逐渐显现，给目前基于应用的颠覆者也带来冲击：无人驾驶货车开始上路。看起来，它们很可能在几年里逐步进入市场，一开始可能介入大型的长途货运。当这个产业变得不那么需要司机时，天平应该会从自由职业者向大型车队的拥有者倾斜。不过，应用仍会保留它快速又廉价地预定货运的优势。■



Health care

Things are looking app

Mobile health apps are becoming more capable and potentially rather useful

SAVILE ROW in London is best known for producing some of the world's finest bespoke suits. But tucked away in a quiet corner of the same street is a firm that gives tailored health advice through a smartphone app. Your.MD uses artificial intelligence to understand natural-language statements such as "I have a headache" and ask pertinent follow-up questions. The app typifies a new approach to mobile health (also known as m-health): it is intelligent, personalised and gets cleverer as it gleans data from its users.

There are now around 165,000 health-related apps which run on one or other of the two main smartphone operating systems, Apple's iOS and Google's Android. PwC, a consulting firm, forecasts that by 2017 such apps will have been downloaded 1.7 billion times. However, the app economy is highly fragmented. Many providers are still small, and most apps are rarely, if ever, used.

That said, the successful ones are highly popular. As apps and wearables become increasingly capable and useful, and smartphones continue their march of dominance, m-health has a promising future. BCC Research, which studies technology-based markets, forecasts that global revenues for m-health will reach \$21.5 billion in 2018 (see chart 1), with Europe the largest m-health market.

So far, most smartphone health apps fall squarely into the category of "wellness". Along with portable sensors such as the Fitbit wristband, such apps help people to manage and monitor their exercise, diet and stress levels (see chart 2). Other types of app, such as WebMD and iTriage, repackaged medical information already found online, and offer

information about symptoms and treatments. Some, such as ZocDoc, let users book consultations with doctors.

However, m-health increasingly promises to do more of the heavy lifting in medicine. First, there is a growing range of apps through which users can talk directly to doctors and therapists. These include Teladoc, DoctorOnDemand, HealthTap and Pingmd. Since late 2014 Walgreens, an American pharmacy chain, has been offering an app called MDLive, which provides 24-hour access to a doctor for \$49 a consultation. Patients will soon be able to chat with artificial-intelligence health advisers rather like Your.MD, but through messaging apps. Second, and with potentially more far-reaching effects on the quality of care, there is an emerging breed of apps that monitor and diagnose patients with a variety of ailments, in some cases predicting and thus helping to avert health crises.

Cerora, a firm from Bethlehem, Pennsylvania, has created a headset, with an associated smartphone app, which monitors brain health. The headset measures brainwaves and tracks eye movement; the app uses the smartphone's internal sensors to test patients' balance and reaction times. Cerora plans to launch the product this year, subject to review by America's Food and Drug Administration (FDA); it could help diagnose concussion and other neurodegenerative diseases. Cellscope, of San Francisco, offers a smartphone attachment that lets parents see inside a child's ear, take photos or video, and send them to a doctor.

A small number of patients, mostly the chronically sick, are disproportionately costly in any health-care system. M-health offers a continuous, long-term means of monitoring them, with the potential to improve the way conditions such as cardiovascular disease, epilepsy, asthma and diabetes are managed.

Patients with diabetes constantly have to make decisions on medication,

food and activity, says Hooman Hakami of Medtronic Diabetes, a maker of medical devices; and most will go for months between doctor's appointments. Medtronic, allied with IBM's Watson, an artificial-intelligence system, is creating an app to predict, three hours in advance, when a patient will experience high or low blood-sugar levels. It will gather data from Medtronic's insulin pumps and glucose monitors, worn by the patient, and combine these with information on the user's diet, and data from activity trackers. Among other providers of diabetes-related m-health services is Diabetes+Me, whose app is already showing that it can improve patient outcomes while reducing costs. Novartis, a Swiss drugs giant, is set to test a glucose-monitoring contact lens, developed by Google.

| *Apps on prescription*

Constant, wireless-linked monitoring may spare patients much suffering, by spotting incipient signs of their condition deteriorating. It may also spare health providers and insurers many expensive hospital admissions. When Britain's National Health Service tested the cost-effectiveness of remote support for patients with chronic obstructive pulmonary disease, it found that an electronic tablet paired with sensors measuring vital signs could result in better care and enormous savings, by enabling early intervention. Some m-health products may prove so effective that doctors begin to provide them on prescription.

So far, big drugmakers have been slow to join the m-health revolution, though there are some exceptions. HemMobile by Pfizer, and Beat Bleeds by Baxter, help patients to manage haemophilia. Bayer, the maker of Clarityn, an antihistamine drug, has a popular pollen-forecasting app. GSK, a drug firm with various asthma treatments, offers sufferers the MyAsthma app, to help them manage their condition.

GSK, along with Propeller Health, is developing custom sensors for GSK's Ellipta asthma inhaler, so that the pharma company can gather information

on how patients use it. GSK wants to know how well patients comply with instructions on when to take it, and to see how compliance relates to the safety, efficacy and economic benefits of the drug.

All pharmaceutical companies are under pressure from regulators and health insurers to do more to demonstrate the value of their medications, and m-health may be a big help with this. Clinical trials of a proposed new drug will be able to use apps to measure disease progression more accurately, and thus demonstrate the efficacy of the treatment. After a drug is approved and perhaps many thousands of patients are taking it, the use of apps to monitor their condition will constitute a huge trial of the product's long-term benefits. However, it could spell disaster for drug firms if such post-approval testing shows that their medicines do not in practice deliver the expected benefits, or shows up undesirable side-effects.

As m-health apps take on more serious work, they will require more serious regulation. Inaccuracy is fairly harmless in a pedometer but less so in a heart-rate monitor. In August a popular product, Instant Blood Pressure, was removed from the Apple app store after serious concerns were raised over its accuracy. In 2011 a developer who claimed his AcneApp could treat pimples with light from an iPhone screen was fined.

Last year the FDA finished drawing up its regulatory regime for m-health, indicating that it will calibrate its approach, paying little attention to low-risk apps, such as ones that just promote a healthy lifestyle; and scrutinising those in areas where any misinformation could be dangerous. This sensible approach may be followed by regulators in other countries.

But other regulatory questions are harder to answer. As health apps become more popular, concerns about how patients' data are stored, used and shared will become more pointed. A new study in the *Journal of the American Medical Association* finds that many health apps may be sharing

patients' health data without their knowledge. Four-fifths of 211 diabetes apps it examined did not have privacy policies.

America's rules on the storage and transmission of personal-health data have not been changed since the advent of the iPhone. So doctors and hospitals may be reluctant to embrace health apps until the rules are updated to make it clear they can do so without breaching the stringent standards on data security. And conscientious providers and prescribers of m-health apps risk being tarred by association with any data-misusing rogues that emerge.

The fragmented, nascent m-health market seems likely to consolidate in time, with its most promising startups perhaps being bought by, or entering alliances with, trusted health brands. That would help it to realise its substantial potential to help patients, doctors, health insurers and researchers alike. ■



医疗保健

应用越来越有用

移动健康应用功能日渐强大，而且可能相当有用

伦敦萨维尔街（Savile Row）最出名的便是制作世界上最好的定制西服。但就在这同一条街道的一处安静街角，隐匿着一家通过智能手机应用为用户提供有针对性健康建议的公司。这款应用就是Your.MD，它利用人工智能来理解诸如“我头疼”等自然语句，并询问相关的后续问题。该应用代表了移动健康（又称为m-health）的新方式：它智能化、个性化，并在收集用户数据过程中变得越来越聪明。

如今在苹果的iOS和谷歌的安卓这两个主要的智能手机操作系统上运行的健康相关应用约有16.5万个。咨询公司普华永道（PwC）预测，到2017年，这类应用的下载次数将达到17亿次。当然，应用经济高度分散。许多供应商依然很小，而且，大多数应用只有很少人使用，甚至没有人使用。

尽管如此，成功的应用还是受到热捧。随着应用和可穿戴设备的功能越来越强、用处越来越大，以及智能手机继续雄霸天下，移动健康的发展前景一片光明。BCC研究（BCC Research）专注于基于技术的市场的分析，它预测，全球移动健康的收入将在2018年达到215亿美元（见图表1），而欧洲将成为最大市场。

到目前为止，大多数智能手机的健康应用都属于“健康”范畴。与Fitbit手环等便携式传感器一道，这些应用帮助人们管理和监控自己的锻炼、饮食与压力水平（见图表2）。诸如WebMD和iTriage等其他类型的应用把已经找到的在线医疗信息重新打包，并提供有关症状和治疗的信息。一些应用，如ZocDoc，让用户预约医生就诊。

然而，移动健康越来越有望担负更多的医学重任。首先，用户用以同医生和治疗师直接沟通的应用不断增多。这些应用包括Teladoc、DoctorOnDemand、HealthTap和Pingmd。自2014年底以来，美国连锁药

店沃尔格林（Walgreens）提供了一款名为MDLive的应用，花费49美元即可在任何时间找医生诊断一次。很快，患者便可通过即时通讯应用与人工智能健康顾问聊天，就像Your.MD一样。其次，目前有一类新兴的应用，可以对有多种疾病的患者进行监测和诊断，在一些情况下，还能预测病情从而帮助避免突发急症。这些发展对护理质量有更深远的潜在影响。

美国宾夕法尼亚州伯利恒市（Bethlehem）的Cerora公司发明了一款用来监控大脑健康的耳机以及相关的智能手机应用。这款耳机测量脑电波并跟踪眼球运动；其应用则利用智能手机内部的传感器来测试患者的平衡和反应时间。Cerora公司计划今年推出这款产品，前提是通过美国食品药品监督管理局（FDA）的审查。它可以帮助诊断脑震荡和其他神经退行性疾病。旧金山的CellScope公司提供了一款智能手机配件，让父母能够看到孩子的耳朵内部，拍摄照片或视频，并把它们发给医生。

在每一个医疗保健系统中，总有一小部分患者，大多是慢性病患者，其治疗费用远高于其他病患。移动健康为他们提供了一种连续而长期的监控手段，并有可能改善心血管疾病、癫痫、哮喘和糖尿病等病症的治疗。

医疗器械制造商美敦力糖尿病部门（Medtronic Diabetes）的胡曼·哈卡米（Hooman Hakami）表示，糖尿病患者经常要决定如何使用药物、选择饮食和进行活动；而且，大多数患者要好几个月才找医生诊断一次。美敦力联合IBM的人工智能系统沃森（Watson），正在设计一款应用，在病人出现高血糖或低血糖水平之前3小时做出预测。这款应用通过穿戴在患者身上的美敦力胰岛素泵和血糖监测仪收集数据，并把这些数据与用户的饮食信息及活动跟踪器的数据相结合。其他与糖尿病相关的移动健康服务提供者还有Diabetes+Me，其应用已经证实能够改善患者的治疗效果并降低成本。瑞士制药巨头诺华（Novartis）正准备测试一种由谷歌开发的监测葡萄糖的隐形眼镜。

| 处方上的应用

通过发现患者病情恶化的初期迹象，经由无线连接的持续监测也许会为患者避免许多痛苦。它也可能为医疗机构和保险公司免除多项高昂的住院费

用。在考核对慢性阻塞性肺疾病患者远程支持的成本效益时，英国国民健康服务体系（National Health Service）发现，通过早期干预，一种与测量生命体征的传感器配对的电子片剂可能会带来更好的护理并极大地节省费用。一些移动健康产品可能证明非常有效，因而医生们开始把它们写进处方。

到目前为止，大型制药公司加入移动健康革命的步调缓慢，但也有一些例外。辉瑞（Pfizer）的HemMobile和百特（Baxter）的Beat Bleeds帮助患者应对血友病。生产抗组胺药氯羟他定（Clarityn）的拜耳（Bayer）有一款花粉预报应用颇受欢迎。有多种哮喘药物的制药企业葛兰素史克（GSK）向患者提供一款名为MyAsthma的应用，帮助他们控制自己的病情。

葛兰素史克正与Propeller Health公司联手，为前者的Ellipta哮喘吸入器研发定制的传感器，以便收集患者如何使用该产品的信息。葛兰素史克想知道患者是否遵照说明书规定的时间用药，以及这样做与药物的安全性、疗效和经济效益之间存在何种关联。

所有的制药企业都受到来自监管机构和健康保险公司的压力，需要更加努力地证明其药物的价值，移动健康可能对此有很大帮助。在对提交审批的新药进行临床试验时，这些应用将派上用场，更准确地测量病情的发展，从而证明治疗的功效。在药物获批并且有或许成千上万的患者服用后，使用应用来监控他们的情况，这将对产品的长期功效构成重大检验。当然，如果这种审批后的测试表明其药物实际上没有达到预期效果或表现出不良的副作用，就可能为制药企业招致灾难。

随着移动健康应用担任更重要的工作，它们将需要更加严格的监管。不准确对于计步器而言无伤大雅，但对于心率监测仪来说则是另一回事。去年8月，一款流行产品“即时血压”（Instant Blood Pressure）的准确性受到严重关切，它随之被苹果应用商店下架。2011年，一位开发者声称其AcneApp应用能借iPhone屏幕的光线来治疗青春痘，结果被罚款。

去年，FDA完成了移动健康方面监管体系的制定工作，这表明它将调整方

法，较少关注低风险的应用，例如那些仅仅提倡健康生活方式的应用；而仔细审查那些任何错误信息都可能造成危险的应用。这种明智的做法可能会被其他国家的监管机构所效仿。

但是，其它的监管问题则更难回答。随着健康应用日益流行，对如何存储、使用和分享患者数据的担忧将变得愈加尖锐。《美国医学会杂志》（Journal of the American Medical Association）的一项新研究发现，许多健康应用可能在患者不知情的情况下就分享了他们的健康数据。在它调查的211个糖尿病应用中，五分之四没有隐私政策。

自从iPhone问世以来，美国对于个人健康数据存储和传输的规则就一直没有改变过。因此，医生和医院可能不愿意接受健康应用，除非更新规则以明确他们可以这样做而不违反数据安全方面的严格准则。认真负责的移动健康应用供应商和治疗方（开处方者）可能会因为与滥用数据的流氓有关联而遭受污名。

分散的而方兴未艾的移动健康市场似乎迟早会被整合，最有前途的创业公司或许会被值得信赖的健康品牌所收购，或者与这些品牌组成联盟。这将有助于它发挥巨大的潜力来帮助患者、医生、医疗保险公司以及研究人员。 ■



The gig economy

Smooth operators

A new report reveals the scale and purpose of app-based earnings

HOW important is America's ondemand economy? Some worry that the likes of Uber, a car-hailing app, and Etsy, which helps workers to sell arts-and-crafts, are destroying traditional employment and with it pensions and health-care benefits. Others hail the flexible hours, low prices and convenience such apps facilitate. Until now not many data have informed this debate. Official statistics track things like part-time working, self-employment and working from home, but the app economy is too small to move those needles. In fact, most indicators suggest it is boring traditional work, rather than app-enabled odd-jobbing, that is on the rise.

A new report plugs the gap. Researchers from the JPMorgan Chase Institute, a think-tank attached to the bank, studied the incomes of 1m of their customers with active current accounts of three years. They found that, in September 2015, 1% of them earned income through an (identifiable) on-demand platform. Of these, just over half used "capital" platforms, such as Airbnb, to lease stuff they own. The rest—about 0.4%—used labour platforms like Uber. Though small, the supply of ondemand labour and capital has grown rapidly: as recently as the end of 2012 barely 0.1% of the bank's customers earned through online platforms. Since then, 4.2% have participated at one point or another.

Is the on-demand economy replacing traditional jobs? Uber drivers are "independent contractors" who must pay their own payroll taxes, buy their own health insurance and save for their own pensions. Some drivers think this is wrong (and have taken their battle to the courts). In December 2015 two economists, Seth Harris and Alan Krueger (who has consulted for Uber in the past), penned a plan for a third category of worker, somewhere

between a contractor and an employee, designed for the on-demand economy. The “independent worker” would get some benefits, like contributions towards health-care costs and payroll taxes, but would not be entitled to the minimum wage or unemployment insurance. Messrs Harris and Krueger say that equalising benefits makes it easier to compare earnings between jobs and apps, and that firms can use their bargaining clout to obtain health insurance more cheaply than individuals can.

Such reforms, though, would be relevant to only a tiny fraction of the workforce. JPM’s data suggest that most ondemand workers use apps to supplement their income, rather than as a replacement for a full-time job. On average, labour platforms provided only one-third of ondemand workers’ incomes. And their participation was often sporadic; almost half of those who start working on a labour platform stop within a month.

Earnings from Uber and the like are strongly correlated with negative shocks to incomes from other sources (capital platforms are used much more consistently). That suggests people use apps to smooth bumps in their earnings, which are frequent: more than half of JPM’s customers have seen their incomes swing by at least 30% in a month. Volatility in pay is largely responsible. Perhaps conventional jobs are not so great after all. ■



零工经济

收入稳定器

一份新报告揭示出应用经济的规模和目标

美国的按需经济有多重要？有些人担心像打车应用优步（Uber）和帮从业者卖掉工艺美术品的Etsy这类应用正在摧毁传统职业及其相伴的退休金和医保福利。其他人则为这类应用带来的灵活工作时间、低价格和便利性而欢呼。迄今为止关于这场争论并无多少数据支持。官方统计追踪的是兼职、自由雇佣、在家工作等等，而应用经济规模太小，无法影响这些指标。实际上，大部分指数显示处于上升状态的是无聊的传统职业，而非基于应用的零工。

一份新报告填补了这一空白。摩根大通银行旗下的智库摩根大通研究院（the JPMorgan Chase Institute）研究了该银行三年间活期账户活跃的一百万客户。他们发现，2015年9月，有1%的人通过（可确认的）按需平台获得收入。其中，有一半多一点使用了Airbnb之类的“资本”平台，把自己的东西租赁出去。剩余的约0.4%使用的是如优步之类的劳动力平台。尽管量小，但按需劳动力和资本的供应已迅猛发展：近至2012年底，该银行仅有0.1%的客户通过在线平台获利。那之后有4.2%的客户在不同时期加入了这一行列。

按需经济是否正在替代传统职业？优步司机是“独立承包人”，他们要自己支付工资税，自己买医疗保险，自己存养老金。有些司机认为这不对（并且已经将他们的抗争闹上了法庭）。2015年12月，塞斯·哈里斯（Seth Harris）和艾伦·克鲁格（Alan Krueger）（后者曾为优步做咨询）这两位经济学家为第三类就业者制定了计划，这类就业者介于承包商和雇员之间，为按需经济而生。“独立就业者”会获得一些福利，例如公司承担部分医保费用和工资税，但不会享受最低工资或失业保险。哈里斯和克鲁格认为将福利均等化能更容易地比较全职工作和应用经济的收入，而公司可以施展它们的议价能力，获得比个人更便宜的医疗保险。

不过这样的改革仅与极小部分就业者相关。摩根大通的数据表明大多数按需就业者是以应用补贴收入，而非代替全职工作。平均而言，劳动力平台只提供了按需就业者收入的三分之一。而且他们的参与通常是零散的；在劳动力平台上开始工作的人中，几乎一半在一个月后就停工了。

来自优步之类应用的收入和对其他来源收入的负面冲击紧密相关（资本平台的使用要稳定得多）。这表明人们使用应用抹平收入上的起伏，而这很常见：超过一半摩根大通客户的收入曾在一个月至少波动30%。工资的波动是主要原因。或许传统职业毕竟并不那么好。 ■



Buttonwood

Living off the people

A history of investment shows how managers have prospered

FOR as long as there have been organised economies, people have been employed to look after the wealth of others. More than 4,000 years ago landowners in Akkad, an early Mesopotamian civilisation, hired local managers to look after their farms.

In their new book, “Investment: A History”, Norton Reamer and Jesse Downing explain how the industry has changed over time. Their fundamental idea is that investment has become “democratised”, available to a wider range of individuals.

Early investment was conducted on behalf of the wealthy, often by individuals with low status—current or former slaves in the Roman Republic, for example. In the Biblical parable of the talents, a master entrusts his wealth to a range of servants. Two of the servants doubled the master’s money but the third buried it in the ground, rather than “investing it with the bankers”. For this failure, the poor performer was “cast into the outer darkness” where “there will be weeping and gnashing of teeth”. Today’s clients might welcome the ability to add this penalty clause to their contracts.

Looking after the assets of the rich—or high-net-worth individuals, as they are known in the jargon—is still big business. But the fund-management industry’s growth has been turbocharged by the evolution of a much wider client base. In the rich world, most people have some money available for savings after they have paid for the necessities of food, clothing and shelter. With a retirement age of, in effect, around 65, they have two decades or so of old age to provide for. In America, retirement savings grew from \$368

billion in 1974 to more than \$22 trillion by 2014—a fivefold increase in assets relative to income.

This has transformed the industry. Investment management was once a dull business, consisting mainly of helping trust funds stock up on government bonds. The standard joke was: “Why don’t fund managers look out of the window in the mornings? Because then they’d have nothing to do in the afternoons.” Nowadays fund management is a much more glamorous profession—more masters of the universe than keepers of the paper clips.

Another key to the change in the industry’s fortunes is its reward system. Fees are linked to the value of the assets, even though the cost of managing \$10 billion is little more than the cost of looking after a measly \$1 billion. So fund managers have benefited twice over: first, from the expansion of pension and other savings and, second, from the huge rise in asset prices since the 1980s. The latter has been driven by falls in inflation and interest rates which have reduced the yield (and thus increased the price) of financial assets. When markets faltered in the financial crisis, central banks stepped in to buy assets through quantitative easing (QE)—in effect, an indirect subsidy of fund managers’ profits.

As Messrs Reamer and Downing point out, some fund managers have become very wealthy by looking after other people’s money. A quarter of all American billionaires work in finance and investments, an industry that employs less than 1% of all workers. In ancient times, the poor looked after the assets of the rich; in modern times, it is the other way round.

Successful managers deserve decent rewards, but a lot of mediocre managers have prospered too. Just because they are rich does not mean they are clever. Their position is slowly being eroded by the emergence of index-trackers and exchange-traded funds, which charge much lower fees. But the transformation is not occurring fast enough.

A world of low inflation and low nominal returns should prompt clients to pay a lot more attention to fees. Instead, many pension funds and endowments are moving into higher-charging “alternative asset” categories like hedge funds and private equity, a “Hail Mary” strategy that cannot work in aggregate. There may be market inefficiencies that are profitable to exploit, but none large enough to give a big, across-the-board boost to the returns of a \$22 trillion industry. ■



梧桐

以人为生

投资史也是理财经理的发家史

只要还存在组织有序的经济体，便会有人被雇来帮别人管理财富。四千多年前，在早期美索不达米亚文明的阿卡德，已有地主雇佣当地管理人员照看他们的农场。

诺顿·雷默（Norton Reamer）和杰西·唐宁（Jesse Downing）在他们的新书《投资：史鉴》（Investment: A History）中解释了这一行业如何与时俱进。他们的基本思想是投资已经变得“大众化”，让更多广泛的人群可以参与进来。

早期的投资是受富人之托进行，通常由地位低下的人从事，例如在罗马共和国，这些人是奴隶或曾经是奴隶的人。在关于天资的圣经寓言中，主人把他的财富托付给几个仆人。其中两个仆人将主人的钱翻了一倍，但第三个人把钱埋了起来，而不是“将之投资于银行家”。因为这一失败，那个收益不佳的仆人被“丢在外面的黑暗里”，在那里“必要哀哭切齿了”。要是能将这一处罚条款加入合同，今天的客户也许会欢欣鼓舞了。

为富人（或者套用理财术语来说：高净值人士）照管资产仍然是一门庞大的生意，但是客户群的扩大更推动了基金管理行业的强劲增长。在富裕国家，大多数人在衣食住行的必要开支之外都有些钱可以储蓄。到了退休年龄，即65岁左右，他们还有20年左右的老年生活要开销。在美国，退休储蓄从1974年的3680亿美元增至2014年的22万亿美元。与收入相比，储蓄资产增长了五倍。

这改变了整个行业。投资管理曾经是一门沉闷的生意，主要内容是帮信托基金囤积政府债券。常听到的笑话是：“为什么基金经理早上不去看窗外的风景？因为这样一来下午他们就无事可做了。”如今基金管理这一职业要光鲜得多，不再是纸夹保管员，而更像是宇宙的主宰。

这一行业命运转变的另一个关键是其报酬体系。管理费与资产价值挂钩，尽管管理100亿美元的成本不比管理区区10亿美元多多少。因此基金经理会双重受益：第一，得益于养老金和其他储蓄的扩大；第二，得益于自20世纪80年代起资产价格的猛增。后者的动力源自通胀和利率的降低，它导致金融资产收益降低，从而推高了其价格。当市场在金融危机中摇摇欲坠时，中央银行介入，通过量化宽松（QE）购买资产。实际上，这是对基金经理利润的一种间接补贴。

雷默和唐宁指出，有些基金经理已经通过管理别人的钱而腰缠万贯。美国的亿万富翁有四分之一从事金融和投资，而这一行业雇佣的员工占总劳动人口的比例不到1%。在古代，穷人帮富人照管资产；在现代则恰恰相反。

成功的经理理应得到体面的报酬，但是很多平庸的经理也发达起来。他们富裕并不意味着他们聪明。随着指数跟踪基金和交易型开放式指数基金的出现，他们的地位正在被慢慢侵蚀，因为这些基金的管理费低得多。但是这一转变发生得还不够快。

低通胀和低名义收益的世界本应敦促客户更关注管理费用。但是相反，很多养老基金和捐赠基金正开始投资诸如对冲基金和私募股权等更高收费的“另类资产”。这一“孤注一掷”的策略并不能在整体上扭转乾坤。可能会有机会利用市场缺乏效率而牟利，但没有任何机会能大到足以全面强力提振这一22万亿美元行业的收益。 ■



BBVA

Digital addition

A big Spanish bank's tech drive prompts some scepticism

BANKS love to talk up their tech credentials, but few go as far as BBVA, Spain's second-biggest. In a surprise move last year, it promoted its head of digital banking, Carlos Torres, to second-in-command despite his lack of experience in retail banking. Digital transformation, the bank said, was its top strategic priority. To that end, it has spent around \$200m over the past three years investing in fintech startups such as Atom, a British digital bank, and Simple, an American one. It has also invested in a data-crunching firm, a Bitcoin-trading outfit and a digital-design company, among others.

The shopping spree is not over yet. In mid-February BBVA injected an extra \$150m into its \$100m venture-capital arm and transferred it to a new subsidiary called Propel Venture Partners. This outfit, based in San Francisco and London, will operate independently of the rest of the bank, in an attempt to appeal to startups wary of working with a dinosaur.

BBVA is also trying to turn its existing operations into something resembling a tech firm. Some 600 employees at its headquarters near Madrid now work in small "scrums" incorporating people from IT, marketing, design and other divisions. They take on small projects with short deadlines, gathering daily in front of whiteboards dotted with fluorescent Post-It notes to chart their progress. The aim is to improve apps constantly, based on feedback from customers, including the direct telephone conversations with a personal account manager enabled by the app. BBVA calls it "the revolution of small things" and points to higher customer-satisfaction ratings as evidence of its success.

Investors are not quite as satisfied. BBVA's emphasis on technology has not yet translated into any big benefit to the business, says Rohith Chandra, an analyst at Barclays, a British bank. Two years after the purchase of Simple, for example, it remains independently managed and in the red. Its most appealing features, such as clever budgeting software for customers, have not yet been adopted by other units.

Moreover, most big banks are investing heavily in technology and offering more services via fancy apps as custom at branches dwindles. BBVA's digital offerings do not seem dramatically different from those of Santander or CaixaBank, say, its biggest Spanish rivals. CaixaBank recently launched ImaginBank, accessible only through mobile apps and social networks. Many big banks, including Barclays, Citigroup, HSBC, Santander and UBS, have invested in fintech startups. BBVA's investments are so disparate that they seem driven chiefly by FOMO, as millennials might say, or fear of missing out.

Teppo Paavola, head of BBVA's New Digital Business unit and a former executive at PayPal, makes no apologies for that. "Being paranoid is the way to go," he says. BBVA can afford a digital flutter or two: it earned €2.6 billion (\$2.9 billion) last year. Many of its 66m customers are in emerging markets, where few people have ingrained banking habits; that might allow more rapid technological change. Just under 30% of consumer loans at BBVA's Mexican unit are issued digitally, up from 2% a year ago. If mobile banking can be made appealing enough that it allows BBVA to attract customers in such countries without building lots of expensive branches, then it could make a difference to the bottom line, Mr Chandra speculates.

For now, however, bricks and mortar are still an integral part of BBVA's business model. It has no plans to close a big chunk of its 3,800 branches in Spain anytime soon. Transforming the bank is a gradual process which will take a very long time, the bank's chairman recently said. That, at least, is

not the sort of talk you would hear at a tech firm. ■



BBVA

数字加

西班牙一家大型银行的技术驱动力引发了一些怀疑

银行都喜欢大肆宣扬自家的技术资质，但鲜有几家能像西班牙第二大银行西班牙对外银行（BBVA）这么夸张。去年一项惊人的举措中，它将数字银行主管卡洛斯·托雷斯（Carlos Torres）提拔为二把手，尽管他缺乏零售银行业务的经验。该银行称，数字化转型是银行首要的战略重点。为此，过去三年它已经向金融科技创业公司投资约2亿美元，如英国数字银行Atom和美国数字银行Simple。它还投资了一家数据分析公司、一家比特币交易公司、一家数字设计公司等等。

收购狂潮尚未结束。2月中BBVA向其价值1亿美元的风险资本部门再注资1.5亿美元，并将其转给新的子公司Propel Venture Partners。这家位于旧金山和伦敦的公司将独立于银行其他部分运营，试图吸引那些对跟恐龙一起工作有所忌惮的创业公司。

BBVA还在努力把现有的运作方式变得更像科技公司。位于马德里附近的银行总部约600名员工现在以“小团队”的形式工作，将来自IT、市场、设计和其他部门的人员整合在一起。他们承担期限紧迫的小项目，每天集合在白板前，白板上星星点点贴着显示进度的荧光便利贴。其目的是在用户反馈的基础上不断改进应用，包括通过应用直接与个人客户经理电话交流。BBVA称之为“小玩意的革命”，并以客户满意度提升作为其成功的佐证。

投资人却没这么满意。英国银行巴克莱（Barclays）的分析师罗伊斯·钱德拉（Rohith Chandra）认为，BBVA对科技的注重还没有转变成对业务的任何重大利好。例如，被收购两年后，Simple依旧独立管理，且仍在亏损。它最具吸引力的特色，如供客户使用的智能预算软件，还没有被其他部门采用。

而且，鉴于客户光顾网点日渐减少，大多数大型银行不惜重金投资技术，通过精巧的应用提供更多服务。BBVA的数字服务看似与它在西班牙的最大竞争对手如桑坦德银行（Santander）或Caixabank并无太大差别。Caixabank最近推出了ImaginBank，只能通过移动应用和社交网络登录。很多大银行，包括巴克莱、花旗、汇丰、桑坦德和瑞银（UBS）已投资了金融科技创业公司。BBVA的投资如此多元，要按千禧一代的说法，似乎主要是出于错失恐惧症（FOMO，即fear of missing out）。

BBVA的新数字业务部门主管、PayPa前高管泰伯·帕沃拉（Teppo Paavola）并未对此感到愧疚。“就是要走偏执这条路。”他说。BBVA能负担一两次数字震颤：去年它获利26亿欧元（29亿美元）。它的6600万客户有很多在新兴市场，那里极少人有根深蒂固的银行习惯，这让技术的变革可以更为迅猛。BBVA的墨西哥分行通过数字化发放的消费贷款略低于30%，一年前还仅为2%。钱德拉推断，如果移动银行可以做到足够吸引人，让BBVA在这些国家无需设立大量昂贵的网点就可吸引客户，那么足可以改善利润。

然而迄今为止，实体网点仍然是BBVA业务模式的主要部分。它并无近期内大量关闭西班牙3800家网点的计划。该行董事长称银行转型是循序渐进的过程，要耗费很长的时间。至少，这并不像你从一家技术公司那儿能听到的言论。■



Antibiotics

When the drugs don't work

How to combat the dangerous rise of antibiotic resistance

SOME people describe Darwinian evolution as “only a theory”. Try explaining that to the friends and relatives of the 700,000 people killed each year by drug-resistant infections. Resistance to antimicrobial medicines, such as antibiotics and antimalarials, is caused by the survival of the fittest. Unfortunately, fit microbes mean unfit human beings. Drug-resistance is not only one of the clearest examples of evolution in action, it is also the one with the biggest immediate human cost. And it is getting worse. Stretching today's trends out to 2050, the 700,000 deaths could reach 10m.

Cynics might be forgiven for thinking that they have heard this argument before. People have fretted about resistance since antibiotics began being used in large quantities during the late 1940s. Their conclusion that bacterial diseases might again become epidemic as a result has proved false and will remain so. That is because the decline of common 19th-century infections such as tuberculosis and cholera was thanks to better housing, drains and clean water, not penicillin.

The real danger is more subtle—but grave nonetheless. The fact that improvements in public health like those the Victorians pioneered should eventually drive down tuberculosis rates in India hardly makes up for the loss of 60,000 newborn children every year to drug-resistant infections. Wherever there is endemic infection, there is resistance to its treatment. This is true in the rich world, too. Drug-resistant versions of organisms such as *Staphylococcus aureus* are increasing the risk of post-operative infection. The day could come when elective surgery is unwise and organ transplants, which stop rejection with immunosuppression, are downright

dangerous. Imagine that everyone in the tropics was vulnerable once again to malaria and that every pin prick could lead to a fatal infection. It is old diseases, not new ones, that need to be feared.

| *Common failings*

The spread of resistance is an example of the tragedy of the commons; the costs of what is being lost are not seen by the people who are responsible. You keep cattle? Add antibiotics to their feed to enhance growth. The cost in terms of increased resistance is borne by society as a whole. You have a sore throat? Take antibiotics in case it is bacterial. If it is viral, and hence untreatable by drugs, no harm done—except to someone else who later catches a resistant infection.

The lack of an incentive to do the right thing is hard to correct. In some health-care systems, doctors are rewarded for writing prescriptions. Patients suffer no immediate harm when they neglect to complete drug courses after their symptoms have cleared up, leaving the most drug-resistant bugs alive. Because many people mistakenly believe that human beings, not bacteria, develop resistance, they do not realise that they are doing anything wrong.

If you cannot easily change behaviour, can you create new drugs instead? Perversely, the market fails here, too. Doctors want to save the best drugs for the hardest cases that are resistant to everything else. It makes no sense to prescribe an expensive patented medicine for the sniffles when something that costs cents will do the job.

Reserving new drugs for emergencies is sensible public policy. But it keeps sales low, and therefore discourages drug firms from research and development. Artemisinin, a malaria treatment which has replaced earlier therapies to which the parasite became resistant—and which now faces resistance problems itself—was brought to the world not by a Western

pharmaceutical company, but by Chinese academics.

| *Sugar the pill*

Because antimicrobial resistance has no single solution, it must be fought on many fronts. Start with consumption. The use of antibiotics to accelerate growth in farm animals can be banned by agriculture ministries, as it has in the European Union. All the better if governments jointly agree to enforce such rules widely. In both people and animals, policy should be to vaccinate more so as to stop infections before they start. That should appeal to cash-strapped health systems, because prophylaxis is cheaper than treatment. By the same logic, hospitals and other breeding grounds for resistant bugs should prevent infections by practising better hygiene. Governments should educate the public about how antibiotics work and how they can help halt the spread of resistance. Such policies cannot reverse the tragedy of the commons, but they can make it a lot less tragic.

Policy can also sharpen the incentives to innovate. In a declaration in January, 85 pharmaceutical and diagnostic companies pledged to act against drug resistance. The small print reveals that the declaration is, in part, a plea for money. But it also recognises the need for “new commercial models” to encourage innovation by decoupling payments from sales.

That thought is taken up this week in the last of a series of reports commissioned by the British government and the Wellcome Trust, a medical charity. Among the many recommendations from its author, Jim O’Neill, an economist, is the payment of what he calls “market-entry rewards” to firms that shepherd new antibiotics to the point of usability. This would guarantee prizes of \$800m-1.3 billion for new drugs, on top of revenues from sales.

Another of Lord O’Neill’s suggestions is to expand a basic-research fund set up by the British and Chinese governments in order to sponsor the

development of cheap diagnostic techniques. If doctors could tell instantaneously whether an infection was viral or bacterial, they would no longer be tempted to administer antibiotics just in case. If they knew which antibiotics would eradicate an infection, they could avoid prescribing a drug that suffers from partial resistance, and thereby limit the further selection of resistant strains.

Combining policies to accomplish many things at once demands political leadership, but recent global campaigns against HIV/AIDS and malaria show that it is possible. Enough time has been wasted issuing warnings about antibiotic resistance. The moment has come to do something about it. ■



抗生素

当药物不管用

如何应对抗生素耐药性的可怕增长

有些人认为达尔文的进化论“仅仅是个理论”，那让他们把这个说给每年因耐药性感染而死亡的70万人的亲朋好友听吧。对抗菌素和抗疟药等抗微生物药物的耐受，就是适者生存的表现。不幸的是，适应微生物就意味着不适应人类。药物耐受不仅是最鲜活地体现进化真实发生的例证之一，也是给人类带来最大直接损失的一个案例。而且情况还在不断恶化。按照目前的趋势发展下去，到2050年，此类死亡人数可能从70万增加到一千万。

有些愤世嫉俗的人认为他们以前就听过这样的论调，那也情有可原。自从上世纪40年代末抗生素开始大量使用时起，人们就始终为耐药性而烦恼。他们认为这可能会导致细菌性疾病再度流行，这一结论已被证实是错误的，以后也不会正确。因为19世纪常见的感染性疾病如肺结核和霍乱等的减少是由于住房条件的改善、排水设施的建设以及清洁的供水，而不是青霉素的功劳。

真正的威胁更不易察觉，却非常严重。公共卫生方面的进步（如维多利亚时代的人们发起的那些）最终将会降低印度的肺结核发病率，但这很难弥补每年六万名新生儿因耐药性感染而致死的损失。哪里有地方性传染病，哪里就有对其疗法的耐受。这即便在富裕世界也不例外。具有耐药性的微生物，如耐药的金黄色葡萄球菌等增加了术后感染的风险。或许在未来的某一天，去做那些可做可不做的手术将是不明智的选择；而用免疫抑制来阻止排异反应的器官移植则危险到了极点。想象一下，热带地区的每个人都再次易患疟疾，每一次针刺都可能引发致命感染。我们要担忧的是旧病而非新疾。

| 常见失误

耐药性的蔓延是“公地悲剧”的例子之一；负责的人看不到造成的损失。你养牛吗？给它们的饲料里加点抗生素促进生长，不断增强的耐药性造成的

损失却由全社会承担。你嗓子痛吗？吃点抗生素吧，以防是细菌性的。就算是病毒性的，吃药治不了，那也没坏处——除了会害了以后染上耐药性传染病的人。

对做正确的事缺乏激励，这一点很难纠正。在有的医疗保健体系中，医生开处方会有奖励。症状消除后，病人如果疏忽了而没有吃完整个疗程的药，也不会有直接的损害，但是最耐药的细菌会存活下来。因为很多人错误地相信是人类而非细菌产生了耐药性，他们并未意识到自己做错了。

如果行为不容易改变，那么能造出新药来吗？事与愿违的是，市场在这里也失灵了。医生们想要把最好的药留到最后，用来对付耐受其他所有药物的最顽固病例。给流鼻涕的患者开昂贵的专利药毫无意义，因为几块钱的药也能奏效。

把新药留给紧急情况的公共政策是合情合理的。但是这样一来销量很低，降低了制药公司的研发积极性。青蒿素是一种治疗疟疾的药物，替代了寄生虫已能耐受的早期疗法，但现在自身也面临着耐药性的问题。青蒿素并不是由西方医药公司带给世人的，而是中国学术界的成果。

| 给药裹上糖衣

因为没有一种办法能够独立解决耐药性的问题，我们必须多管齐下。首先是减少用量。农业部门可以禁止对农场动物使用抗生素促进生长的做法，欧盟已经这样做了。如果各国政府都同意携手推进这类法规就再好不过。无论对人还是对动物，政策都应当是多接种疫苗，在感染发生之前加以预防。这对资金紧张的医疗系统应该有吸引力，因为预防比治疗便宜。按照同样的逻辑，医院和其他耐药细菌的孳生地应当改善卫生条件以防止感染。政府要教育民众，告知抗生素的工作原理，以及怎样做有助于阻止耐药性的蔓延。这类政策无法逆转“公地悲剧”，但可以让悲剧的程度大大降低。

政策也可以加强对创新的激励。在一月发布的一项宣言中，85家医药公司和诊断公司宣誓抵御耐药性。附属细则表明这一宣言在某种程度上也是在

呼吁资助。但它也承认需要“新的商业模式”，将报酬和销售分隔开来以鼓励创新。

本周，这一想法在英国政府和医疗慈善组织惠康基金会（the Wellcome Trust）委托撰写的一系列报告的最后一篇中有所提及。报告作者——经济学家吉姆·奥尼尔（Jim O'Neill）提出了很多建议，其中之一是，公司若能将新抗生素培育到实际可用，则向其支付他称之为“市场进入奖励”的报酬。此举可保证在销售收入之外，新药还会获得8亿美元至13亿美元的奖金。

奥尼尔的另一条建议是扩充一项由英国和中国政府共同设立的基础研究基金，旨在资助低价诊断技术的研发。如果医生能够迅速辨别感染是病毒性的还是细菌性的，他们就不会为了以防万一而开出抗生素。如果他们知道哪些抗生素能根除某种感染，他们就可以避免开出有部分耐受性的药物，从而限制耐药菌株的进一步选择。

要将多种政策综合起来毕其功于一役需要政治领导力，但近来全球抗击HIV病毒/艾滋病和疟疾的战斗表明这是可能的。在发布抗生素耐药性的警告上人们已经浪费了太多时间，现在是时候有所行动了。■



Additive manufacturing

A printed smile

3D printing is coming of age as a manufacturing technique

A SET of straight and gleaming teeth makes for a beautiful smile. But how many people who have undergone a little dental maintenance know that they may have inside their mouths some of the first products of a new industrial revolution? Tens of millions of dental crowns, bridges and orthodontic braces have now been produced with the help of additive manufacturing, popularly known as 3D printing. Forget the idea of hobbyists printing off small plastic trinkets at home. Industrial 3D printers, which can cost up to \$1m, are changing manufacturing.

The business of dentures shows how. For the metal bits in false teeth, dentists have long relied upon a process called “investment casting”. This involves creating an individual model of a person’s tooth, often in wax, enclosing it in a ceramic casing, melting out the wax and then pouring molten metal into the cavity left behind. When the cast is split open, the new metal tooth is removed. It is fiddly, labour-intensive and not always accurate; then again the casting method is some 5,000 years old.

Things are done differently at an industrial unit in Miskin, near Cardiff, set up by Renishaw, a British engineering company. The plant is equipped with three of the firm’s 3D printers; more will be added soon. Each machine produces a batch of more than 200 dental crowns and bridges from digital scans of patients’ teeth. The machines use a laser to steadily melt successive layers of a cobalt-chrome alloy powder into the required shapes. The process is a bit like watching paint dry—it can take eight to ten hours—but the printers run unattended and make each individual tooth to a design that is unique to every patient. Once complete, the parts are shipped to dental laboratories all over Europe where craftsmen add a layer

of porcelain. Some researchers are now working on 3D printing the porcelain, too.

| *Say “ah”*

The mouth is not the only bodily testing-ground for 3D-printed products. Figures gleaned by Tim Caffrey of Wohlers Associates, an American consultancy that tracks additive manufacturing, show that more than 60m custom-shaped hearing-aid shells and earmoulds have been made with 3D printers since 2000. Hundreds of thousands of people have been fitted with 3D-printed orthopaedic implants, from hip-replacement joints to titanium jawbones, as well as various prosthetics. An untold number have benefited from more accurate surgery carried out using 3D-printed surgical guides; around 100,000 knee replacements are now performed this way every year.

That the health-care industry has so swiftly adopted additive manufacturing should be no surprise. People come in all shapes and sizes, so the ability of a 3D printer to offer customised production is a boon. The machines run on computer-aided design (CAD) software, which instructs a printer to build up objects from successive layers of material; a medical scan in effect functions as your CAD file. And software is faster and cheaper to change than tools used in a traditional factory, which is designed to churn out identical products.

Compared with the \$70 billion machine-tool market, additive manufacturing is still tiny. But it is expanding rapidly, and not just in health care. Overall, Wohlers estimates that 3D-printed products and services grew by 26% last year, to be worth nearly \$5.2 billion. That is just the tip of a bigger mountain in the making. McKinsey, a management consultancy, reckons that in terms of things like better products, lower prices and improved health, 3D printing could have an economic impact of up to \$550 billion a year by 2025.

One reason why 3D printers are becoming more mainstream is that the “inks” they use are getting better thanks to advances in materials science, says Andy Middleton, the European head of Stratasys, an Israeli-American company that makes 3D printers. One method Stratasys uses, called PolyJet, is similar to inkjet printing: cartridges deposit layers of a liquid polymer which are cured with ultraviolet light. The company has just unveiled a new PolyJet model called the J750. It uses multiple cartridges to print items in 360,000 different colours and any combination of six different materials, which can be rigid or flexible, opaque or transparent.

The machine is intended to make prototypes as the polymers are not yet robust enough for a final product. Nevertheless, that allows a manufacturer of trainers, for instance, to print a complete shoe in one go, with a rubbery sole and a leather-like upper. The ability to make realistic prototypes greatly speeds up product approval and the time it takes to get to market.

Increasingly, however, 3D-printed objects are being produced as finished items, rather than as models or prototypes. This leads consultants at PWC to conclude in a new report that additive manufacturing “is crossing from a period of hype and experimentation into one of rapid maturation”. Their research found more than two-thirds of American manufacturers are now using 3D printing in some form or the other.

Another 3D-printing process used by Stratasys builds parts layer by layer, by heating and extruding thermoplastic filaments. Airbus now uses these machines to print internal cabin fittings for its new A350 XWB airliner. The printers use a resin that meets the safety standards on aircraft. As airlines often specify custom fittings, 3D printing saves on re-tooling. It also allows multiple components to be consolidated into a single part, which reduces assembly costs. It will not be long, some in the industry reckon, before carmakers will offer interior customisation using 3D printers, too.

Although further development is needed to speed up additive-manufacturing systems and improve the surface finish, the technology is already trusted enough to be used in products that have to withstand high stresses and strains. GE has spent \$50m installing a 3D-printing facility at a plant in Auburn, Alabama, to print up to 40,000 fuel nozzles a year for the new LEAP jet engine it is making in partnership with Snecma, a French company. The nozzles will be printed in one go, instead of being assembled from 20 different parts. They are made from a powdered “super alloy” of cobalt, chrome and molybdenum. The finished item will be 25% lighter and five times more durable than a fuel nozzle made with conventional processes.

Materials companies are coming up with more and more specialised ingredients for additive manufacturing. Alcoa, a leading producer of aluminium, recently said it would supply Airbus with 3D-printed titanium fuselage parts and the pylons used to attach engines to wings. Alcoa is spending \$60m expanding its R&D centre in Pennsylvania to accelerate the development of advanced 3D-printing materials and processes.

Large 3D printers are also emerging to make big things. Oak Ridge National Laboratory in Tennessee is working with a company called Local Motors to print cars, or at least much of their structure, using a blend of plastic and carbon fibre. The lab has also teamed up with Skidmore, Owings and Merrill, a firm of architects, to print substantial sections of buildings. The idea is to develop an additive-building process that results in no waste.

Some factory bosses have said that 3D printing will never replace mass manufacturing. Perhaps, but it does not have to in order to transform production processes. Additive-manufacturing systems are being mashed together with traditional production methods, which themselves are improving with digital technologies. Even old-fashioned metal bashing and welding is going high-tech.

Perhaps the surest evidence comes from China. LITE-ON, a leading contract manufacturer, has just installed a set of 3D printers in a Guangzhou factory that makes millions of smartphones and other portable consumer electronics. The printers, made by Optomec, an Albuquerque-based firm, use a process called Aerosol Jet to focus a mist of microdroplets into a tightly controlled beam, which can print features as small as 10 microns (millionths of a metre). LITE-ON is using the machines to print electronic circuits, such as antennae and sensors, directly into products instead of making those components separately and assembling them into the devices either by robot or by hand. When a manufacturing technology arrives in the workshop of the world, it really is coming of age. ■



增材制造

打印的笑容

3D打印制造技术已渐成熟

一口整齐而闪亮的牙齿会让您的笑容更加美丽。但又有多少做过牙科治疗的人知道，新工业革命带来的第一批产品就在自己口中呢？如今，数以千万计的牙冠、牙桥和牙箍都是依靠增材制造，也就是俗称的3D打印生产出来的。别再觉得它只是爱好者在家里打印几个小塑料玩意了。价格可高达百万美金的工业3D打印机正在改变着制造业。

牙科行业就是一个明证。对于假牙中的金属件，牙医们长期以来都依靠一种名为“熔模铸造”的工艺。它要先做出患者的牙齿模型（一般是蜡制），封上陶瓷，再把蜡熔化后倒出，在其留下的空腔中注入熔融的金属。最后打开铸模，拿出新的金属牙齿。整个过程十分繁琐，相当辛苦而且并不总是很准确。再说，铸造法已经有5000年的历史了。

位于英国卡迪夫附近米斯金村（Miskin）的一家工厂则采取完全不同的做法。该工厂由英国工程公司雷尼绍（Renishaw）设立，配备了三台公司自产的3D打印机，很快还会再添数台。根据患者牙齿的数字扫描，每台机器一批可以生产200多个牙冠和牙桥。机器用激光将一层层钴铬合金粉末稳定地熔融成所需的形状。整个过程有点像坐等油漆干燥，可能需要8到10个小时——但打印机可以无人值守运行，按照每位患者独一无二的设计来制作牙齿。制作完成后，产品会被送往遍布欧洲的牙科实验室，手工加上瓷层。还有一些研究人员已经在研究3D打印陶瓷了。

| 说“啊”

口腔并不是3D打印产品在身体上唯一的试验场。关注增材制造的美国咨询公司Wholers Associates收集的数据显示，2000年以来，利用3D打印机定制生产的助听器壳体和耳模已逾6000万件。从人工髋关节到钛颞骨再加上各种假肢，数十万患者已经安装了3D打印的骨科植入体。3D打印的手术导板让手术更为精确，造福无数患者。如今每年约有10万例膝关节置换手

术是以这种方式进行的。

医疗保健行业如此迅速地接受增材制造并不奇怪。人的身材尺寸各异，因而3D打印机定制化生产的能力是一个福音。计算机辅助设计（CAD）软件控制这些打印机，引导它们一层层地堆积材料来构建物体，医学扫描实际上就是你的CAD文件。传统工厂中的工具更适合批量生产一模一样的产品，而软件改动起来则更快速、更经济。

和700亿美元的机床市场相比，增材制造仍然微小。但它扩张迅速，而且并不限于医疗保健行业。Wohlers估计，3D打印产品和服务在去年整体增长了26%，总价值近52亿美元。而这只是日渐庞大的冰山初露的一角。管理咨询公司麦肯锡估计，如果考虑到更好的产品、更低的价格和健康的改善，到2025年，3D打印的经济影响将达到每年5500亿美元。

3D打印机日益跻身主流的一大原因是，随着材料科学的进步，它们使用的“油墨”越来越好了，生产3D打印机的以色列-美国公司Stratasys的欧洲负责人安迪·米德尔顿（Andy Middleton）表示。Stratasys公司使用的一种名为PolyJet的方法和喷墨打印类似：墨盒会逐层累积液体聚合物，并用紫外线灯使之硬化。该公司刚刚推出了一种新的PolyJet型号，称为J750。它使用多个墨盒，打印的色彩达36万种，并可将任意六种刚性或柔性，不透明或透明的材料组合起来。

这台机器本来只是用来制作原型的，因为聚合物的强度还不足以制作最终产品。然而，这让运动鞋的制造商可以一口气打印出一只完整的具有橡胶鞋底和皮革般鞋面的鞋。做出逼真原型的能力大大减少了产品审批和推向市场所需的时间。

然而，越来越多的3D打印物体被作为成品生产出来，而不只是用作模型或原型。这让普华永道的顾问在一份新的报告中得出了增材制造“正在从炒作和实验期进入快速成熟期”的结论。他们的研究发现，美国超过三分之二的制造商在使用某种形式的3D打印。

Stratasys公司使用的另一种3D打印工艺则是通过加热和挤压的热塑性塑料

丝来逐层构建零件。空中客车公司现在使用这些机器来为其新的A350 XWB客机打印内部座舱配件，打印机使用的树脂也符合飞机安全标准。由于航空公司往往自己定制机舱内部装饰，3D打印可节省更换工具的费用。它还可以把多个组件合并为一个部件，从而降低了组装成本。一些业内人士估计，在不久的将来，汽车制造商就会使用3D打印机来制作定制内饰了。

虽然对于增材制造系统而言，要提高速度并改善表面光洁度还需要进一步的开发，但技术已经足够可靠，可以用于需承受高应力和应变的产品。GE花费了5000万美元，在阿拉巴马州奥本市的一家工厂中安装了一台3D打印设备，每年为其与法国斯奈克玛（Snecma）公司合作生产的新型LEAP喷气式引擎打印至多4万个燃料喷嘴。喷嘴不再需要把20个零件组装起来，而是用钴、铬和钼制成的“超级合金”一次打印成型。成品将比用传统方法制造的燃料喷嘴轻25%，寿命更可延长五倍。

材料公司为增材制造推出了越来越多的专用原料。领先的铝生产商美国铝业公司（Alcoa）近日表示，将为空中客车公司提供3D打印的钛机身部件以及把发动机连接到机翼上的挂架。美铝投资6000万美元扩建其位于宾夕法尼亚州的研发中心，为先进的3D打印材料和工艺的研发助力。

生产大家伙的大型3D打印机也不断涌现。位于田纳西州的橡树岭国家实验室正在与一家名为Local Motors的公司合作，采用塑料和碳纤维的混合物打印汽车，至少是打印汽车的主体构造。该实验室还联手SOM建筑设计事务所（Skidmore, Owings & Merrill）来打印出庞大的建筑部件，其想法是开发没有浪费的增材建筑工艺。

一些工厂老板表示，3D打印将永远无法取代大规模生产。或许此言不虚，但它不必做到这一点就可以改造生产工艺。增材制造系统正在与传统生产方法融合，而后者本身也在利用数字技术进行改进，连古老的打铁和焊接也将迎来高科技。

也许最可靠的证据来自中国。领先的合同制造商LITE-ON刚刚在广州一家

工厂中安装了一组3D打印机，生产数以百万计的智能手机和其他便携式消费类电子产品。这些打印机由总部位于新墨西哥州阿尔伯克基市的Optomec制造，使用名为“气溶胶喷射”（Aerosol Jet）的工艺将微滴雾聚焦成一个精密控制的集束，打印的细部可小至10微米（百万分之一米）。LITE-ON使用这些机器来直接在产品中打印天线和传感器等电子电路，而无需另行生产这些部件，再用机器人或手工组装起来。一种制造技术来到了世界工厂，就意味着它真的成熟起来了。■



High-definition maps

The autonomous car's reality check

Building highly detailed maps for robotic vehicles

A CAR sprouting a dome containing a spinning laser sensor and festooned with cameras barely draws a second glance as it edges through the crowded streets of Berkeley. Self-driving cars are no longer a rare sight on Californian roads. Over 100 autonomous vehicles from a dozen manufacturers are now being tested in public, covering hundreds of thousands of kilometres each year.

But this car is different: its human driver keeps his hands firmly on the wheel. The vehicle, nicknamed “George” by HERE, a Berlin-based mapping company owned by BMW, Audi and Daimler, is not driving itself but collecting data that enable other cars to do so.

| *By George*

For every second of its journey, a high-precision GPS receiver on George's roof collects the car's latitude, longitude and elevation ten times over; a motion-tracking inertial system records its yaw, pitch and roll 100 times; and the laser scanner calculates its distance from some 600,000 different points, such as trees, kerbs and buildings. At the same time, four cameras also shoot a 96-megapixel, 360-degree panoramic image for every 6 metres the vehicle moves along the road.

A day's driving can accumulate 100 gigabytes or more of data. Together, these allow HERE to build up an extremely detailed three-dimensional image of George's route—what digital cartographers call a high definition (HD) map.

A few years ago, some carmakers hoped that autonomous vehicles might be

able to position themselves using the low-definition maps found in today's turn-by-turn navigation devices and apps. Sensors would do the rest. With clear road markings, for instance, visual sensors can already keep cars safely within their lanes, and even spot the solid or dotted lines that indicate stop signs and exits.

The trouble is, a fully driverless car needs to operate safely in all environments. "You don't really need a map to do simple lane-keeping," says John Ristevski, HERE's grandiosely named vice-president of reality capture. "But if you're on a five-lane freeway, you need to know which of those five lanes you're in, which are safe to traverse, and at what exact point that exit ramp is coming up."

The trouble is road markings can wear away or disappear under snow. And modern laser-surveying sensor systems (called LIDARS, after light detection and ranging) may not be accurate in those conditions. LIDARS calculate distances by illuminating a target with laser light and measuring the time it takes for the light to bounce back to the source. Radar does much the same thing with radio waves. In cars, LIDARS and radars have an effective range of around 50 metres, but that can shrink significantly in rain or when objects are obscured by vehicles ahead. Even the smartest car travelling at motorway speeds can "see" only around a second and a half ahead. What HD maps give self-driving cars is the ability to anticipate turns and junctions far beyond sensors' horizons.

Even more important for an autonomous vehicle is the ability to locate itself precisely; an error of a couple of metres could place a car on the wrong side of the road. Commercial GPS systems are accurate only to around 5 metres, but can be wrong by 50 metres in urban canyons and fail completely in tunnels. HD maps, however, can include a so-called localisation layer that works with a variety of sensors to position a car within centimetres.

HERE is experimenting with several such layers. One involves extracting features like bridges, road signs and guard rails from images shot by the mapping vehicle, and then comparing them to what the car sees through its own cameras.

TomTom, a mapping firm based in the Netherlands, rejected this process as too unreliable. “We found that trying to model reality down to every single bridge pillar and then triangulating it is too sensitive to change,” says Pieter Gillegot-Vergauwen, one of the firm’s vice-presidents. Problems can arise if, for instance, a tree is cut down or a street scene alters from summer to winter. “There are too many visual changes,” he adds.

Instead, TomTom captures a “depth map” using its mapping vehicles’ LIDARS. This system continuously records the distinctive shapes and distances of roadside scenery, without trying to identify what the individual things are. By considering the whole stretch of road it is possible to correlate the output from the autonomous car’s own LIDAR unit with the pattern of the depth map and calculate its location even if, say, a tree grows or a lorry is in the way, says Mr Gillegot-Vergauwen.

Google, which has long been testing autonomous cars, builds its localisation layer in a similar fashion. HERE is also trying out a system that uses artificial intelligence to identify features from cameras and LIDARS. Whatever the approach, all three companies claim that they can now position a self-driving car on the road to an accuracy of within 10-20cm.

Some car firms, including Nissan, Ford, Kia and Tesla, think self-driving technology will be ready by 2020. Volvo plans to offer fully autonomous cars to 100 drivers as early as next year. All this increases the pressure to map the world in high definition before cars begin to drive themselves out of showrooms. HERE has several hundred vehicles like George mapping millions of kilometres of roads annually in 32 countries. TomTom has 70 on

motorways and major roads in Europe and North America. Zenrin, a Japanese mapping firm partly owned by Toyota, is particularly active in Asia.

Analysing and processing data from so many vehicles is one of the biggest challenges. HERE originally had people inspecting the raw LIDAR data and turning it into a digital model using editing software—rather like “Minecraft for maps”, says Mr Ristevski. But manually extracting the data was painfully slow, and the company has now developed machine-learning algorithms to find automatically such things as lane markings and the edges of pavements. HERE’s AI systems can identify road signs and traffic lights from George’s still photos. Humans then modify and tweak the results, and check for errors.

Yet George’s data begin to age as soon as they are collected. Subsequent construction, roadworks or altered speed limits could lead to a self-driving car working from a dangerously outdated map. Maps will never be completely up-to-date, admits Mr Ristevski. “Our goal will be to keep the map as fresh and accurate as possible but vehicle sensors must be robust enough to handle discrepancies.”

Mapping vehicles are sent back to big cities like San Francisco regularly, but the vast majority of the roads they capture might be revisited annually, at best. A partial solution is to use what Mr Ristevski euphemistically calls “probe data”: the digital traces of millions of people using smartphones and connected in-car systems for navigation. HERE receives around 2 billion individual pieces of such data daily, comprising a car’s location, speed and heading, some of it from Windows devices (a hangover from when HERE was owned by Nokia, now part of Microsoft).

These data are aggregated and anonymised to preserve privacy, and allow HERE quickly to detect major changes such as road closures. As cars

become more sophisticated, these data should become richer. Ultimately, reckons Mr Ristevski, self-driving cars will help to maintain their own maps. This is already the case with Google's self-driving cars, which can detect and report traffic cones and construction workers in high-visibility vests. Not only does Google have more autonomous vehicles on the roads than any other carmaker, it has access to navigation and traffic data from the estimated 1.5 billion Android phones and devices active globally. (Google says it is currently concentrating its HD-mapping efforts on just its self-driving test locations in Mountain View, California; Austin, Texas; Kirkland, Washington, and Phoenix, Arizona.)

As more new cars are fitted with smart-driving features, such as automatic braking, lane control and overtaking, technology will continue to lead vehicles towards full autonomy. And HD maps will extend beyond the road. Both HERE and TomTom include low-level aerial information, such as utility wires, bridges, trees and, in some cases, details of buildings up to 15 storeys. Such data could be used for navigation by another type of robotic vehicle—drones—which is why one company with drone-delivery ambitions, Amazon, is in talks to buy a stake in HERE. ■



高清地图

自动驾驶汽车的现实检验

为全自动汽车绘制详实地图

从车顶上伸出一个圆顶，内有旋转激光传感器及多台摄像机，这样的车在穿过伯克利拥挤的街道时却几乎无人注目。在加州，自动驾驶汽车已不是稀罕事物。十多家厂商生产的上百辆自动驾驶汽车正在公开测试，每年行驶数十万公里。

但这辆汽车与众不同：内有真人司机紧握方向盘。总部在柏林的地图公司HERE（为宝马、奥迪和戴姆勒共同所有）的这辆绰号为“乔治”的汽车并非在自动驾驶，而是在收集信息，方便其他汽车实现无人驾驶。

| “乔治”出品

行驶中的每一秒，“乔治”车顶上的高精度GPS接收器会反复十次收集所在位置的经纬度及海拔高度信息；惯性运动追踪系统会对其偏航、俯仰及滚转数据记录100次；激光扫描仪则计算与树木、路缘及建筑物等约60万个不同点之间的距离。同时，车辆在路上每移动六米，四台摄像机便拍下一幅9600万像素的360度全景图像。

行驶一天可以累积100GB乃至更多的数据。整合起来，这些数据可让HERE对“乔治”行经的路线制做出极为详实的三维图像——数字制图人员称为高清（HD）地图。

几年前，一些汽车制造商曾经希望自动驾驶汽车能靠如今的逐向导航设备和应用中的低清晰度地图来定位，其余工作则由传感器负责。比如，道路标记清晰的话，视觉传感器已经可以让汽车安全地保持在车道内，甚至还可辨别标识停车标志和出口处的实线和虚线。

难题在于，全自动无人驾驶汽车要能在各种环境中安全行驶。“只是为了保持车道的话，还真不需要地图，”HERE名头不小的“现实捕捉”副总裁约

翰·利斯特夫斯基（John Ristevski）说道。“但假如是在五车道的高速公路上，你就需要知道自己在哪条道上，哪些车道可以安全跨越，出口匝道具体在哪里。”

问题是路面标志可能磨损不清或者被积雪覆盖，而现代激光测量传感系统（LIDAR，光学探测和测距，即“光学雷达”）在那样的环境下未必能精准运作。LIDAR向目标物发射激光并计算光束反射回来所需的时间，从而测算距离，这与普通雷达运用无线电波测距的原理大致相同。车载LIDAR和雷达的有效测距范围约为50米，但在雨中或目标物被前面汽车阻挡时，测距范围便大大减小。在高速行驶时，即便最智能的汽车也只能提前大约一秒半“看到”路况。高清地图则让自动驾驶汽车能够远在传感器范围之外预知转弯及路口情况。

对自动驾驶汽车而言，更重要的是准确定位的能力；两三米的误差就可能把汽车错误定位在路的另一边。商用GPS系统精度只有约五米，但在高楼林立的都市环境里误差可达50米，在隧道里更完全不起作用。而高清地图可以包含一个所谓的“定位层”，利用一系列传感器把车辆定位精确到厘米级。

HERE正在试验多个这样的定位层。其中一个能从地图测绘车拍摄的图像中提取桥梁、道路标志及护栏等信息，然后与车载摄像头所见的路况进行比较。

总部设在荷兰的地图测绘公司TomTom认为这一方法太不可靠，并未采纳。“模拟现实细致到每根桥墩然后作三角测量，我们认为这种做法会令系统难以应对路况变化。”该公司的一位副总裁彼得·吉尔哥特-沃高文（Pieter Gillegot-Vergauwen）说道。例如，一棵树被砍掉或街景从夏天变成冬天的景象时，都可能出问题。“视觉变化太多了。”他补充道。

相反，TomTom公司利用其测绘车辆的LIDAR来捕捉“景深地图”。该系统能连续记录路边景物的不同形状及距离，但并不去辨识每个物体是什么。吉尔哥特-沃高文表示，通过考虑整段道路的景致，系统可以把自动驾驶车

辆上LIDAR装置的探测结果与景深地图的图案关联起来，即使路上一棵树长高了或者有一辆货车挡在前面，也能计算出汽车的位置。

长期测试研发自动驾驶汽车的谷歌在用类似方式打造定位层。HERE也在试验一种系统，它运用人工智能辨别摄像头及LIDAR捕捉到的路况特征。无论是哪种方式，三家公司都声称自己的系统如今能够把行驶中的自动驾驶汽车定位到10到20厘米的精度。

日产、福特、起亚及特斯拉等汽车公司认为自动驾驶技术将在2020年前成熟。沃尔沃计划最早将于明年向100位车主交付全自动驾驶汽车。这一切都加大了绘制高清地图的迫切性，毕竟这要赶在汽车自行驶出展厅前完成。HERE拥有几百台像“乔治”这样的车辆，穿行在32个国家，每年测绘数百万公里的道路。TomTom拥有70台测绘车，行走于欧洲及北美的高速公路及主干道上。丰田部分持股的日本地图绘制公司Zenrin在亚洲尤其活跃。

分析处理这么多车辆收集到的数据是最大的挑战之一。HERE原本有员工检查LIDAR的原始数据并用编辑软件将其转换为数字模型——挺像“沙盘游戏《我的世界》的地图版”，利斯特夫斯基说道。但人工提取数据缓慢费力，现在该公司已研发出机器学习算法来自动查找车道标线和路面边沿这类信息。HERE的人工智能系统可从“乔治”拍摄的静止图片识别路标和交通灯。得出的结果再经由人工修改、调整并查错。

但“乔治”的数据从收集的那一刻就开始过时。之后出现的新建筑、道路施工或者限速改变，都会令自动驾驶汽车按照危险的过时地图进行驾驶。地图永远不会是最新的，利斯特夫斯基承认。“我们的目标是尽量保持地图更新及时、准确，但车载传感器必须强大到足以处理地图与现实的差异。”

对于旧金山这类大城市，地图测绘车会定期回访，但大多数道路最多也就一年才会重新测绘一次。一个不完全的解决方案是运用利斯特夫斯基美其名曰的“探针数据”：数百万人们使用智能手机及联网车载导航系统的数字

痕迹。HERE每天收到约20亿条这类数据，包括汽车的定位、速度、方向，其中一些是使用Windows系统的设备收集到的（因HERE曾为诺基亚旗下公司，而后者如今为微软所有）。

这些数据会被汇总并匿名处理以保护隐私，HERE能借此快速发现封路等重大变化。随着汽车变得越来越精巧复杂，这类数据也会愈加丰富。利斯特夫斯基认为，自动驾驶汽车最终将能帮助维护它们自己所使用的地图。这已经体现在谷歌的自动驾驶汽车上，它能检测并报告所发现的交通锥标和身穿荧光背心的建筑工人。相比其他汽车厂商，谷歌不但有更多自动驾驶汽车上路，而且还能从全球约15亿活跃使用的安卓手机和设备上收集导航和交通数据。（谷歌表示目前其高清地图的绘制工作仅集中在其自动驾驶汽车测试地：加州山景城、德州奥斯汀市、华盛顿州柯克兰市及阿里桑那州凤凰城。）

随着越来越多的新车配备如自动刹车、车道控制及自动超车等智能驾驶功能，科技将继续引领汽车向全面自动驾驶发展。高清地图也将扩展至道路以外。HERE和TomTom都在收集低空信息，如电线电缆、桥梁、树木，有时还包括高度在15层以下的楼宇细节信息。这类数据可为另一种自动运载工具所用——无人机。所以，有意开展无人机快递业务的亚马逊正在谈论参股HERE公司。 ■



Oil markets

Drill will

America, not OPEC, decides the fate of global oil markets

“WE DON’T care about oil prices,” Muhammad bin Salman, Saudi Arabia’s deputy crown prince, recently told Bloomberg, a news agency: “\$30 or \$70, they are all the same to us.” Such comments by the man calling the shots in the world’s biggest oil power should be taken with a pinch of salt. Low oil prices cost the country billions, threaten its credit rating and are turning it from creditor to debtor: this week it set out to raise \$10 billion from global banks. Yet the claim is not entirely hollow, either. Saudi Arabia is determined not to give any succour to higher-cost producers, despite the damage the low price does to its own finances.

At a meeting in Doha, the Qatari capital, on April 17th Saudi Arabia blocked an agreement between OPEC and non-OPEC producers, such as Russia, to shore up global oil prices by freezing production at January’s level. The idea that such a deal could have been enforced was fantasy anyway. As Carole Nakhle of Crystol Energy, a consultancy, points out, Russia is pumping at record levels and there was no way to police its compliance with a freeze. Iran, which is vowing to raise output to pre-sanctions levels, had dismissed the notion that it would take part as “ridiculous”.

Prince Muhammad apparently forced his negotiators to shun a deal just as they were about to sign it, insisting that the kingdom would only freeze production if Iran were prepared to do likewise. Some participants were furious at his behaviour. The Saudi delegation “had no authority to decide on anything”, fumed Eulogio del Pino, Venezuela’s oil minister.

For decades Saudi policy has been steered by deft negotiators such as Ali al-Naimi, the kingdom’s oil minister. Now it is under the thumb of the

30-year-old prince, who believes low oil prices will help his drive for economic reform at home and weaken Iran, Saudi Arabia's arch-rival. "For years we've been told that Saudi oil policy is driven by commercial and economic considerations," says Jason Bordoff of Columbia University's Centre on Global Energy Policy. "Yet what happened in Doha seems to have had a big geopolitical dimension to apply pressure on Iran."

Fortuitously for oil prices, the Doha debacle coincided with the start of a three-day strike in Kuwait that temporarily dented the emirate's crude production. Yet that underscored how daft the effort to impose a freeze was in the first place: low oil prices are already dampening global supply. The strike in Kuwait was the result of public-sector pay cuts brought on by lean oil revenues. Schlumberger, an oil-services firm, says it is reducing activity in Venezuela because the cash-strapped state oil firm there has not paid its fees. Oil traders say they can no longer get letters of credit to trade with Venezuela. They also worry about the counterparty risk of dealing with oil-dependent countries like Nigeria.

The real freeze, says John Castellano of Alix Partners, a debt consultancy, is taking place in America. Shale producers that borrowed heavily to increase production in the boom years are likely to flock to bankruptcy court this year in even greater numbers than in 2015, he predicts. On April 14th and 15th respectively two such firms, Energy XXI and Goodrich Petroleum, filed for Chapter 11 protection. Even those that are still going concerns have no money to invest in maintaining production. As a result, shale production has fallen by 600,000 barrels a day since its peak last year, according to the Energy Information Administration, an official body. That, more than any OPEC posturing, is what is underpinning oil prices. ■



石油市场

钻头走向

决定全球石油市场的是美国，而不是欧佩克

沙特副王储穆罕默德·本·萨勒曼（Muhammad bin Salman）最近在彭博社的采访中说：“我们根本不在乎油价，30美元还是70美元对我们都一样。”这位全球第一石油大国的掌门人的话也不能全信。石油价格走低让沙特收入锐减数百亿美元，信用评级受到威胁，并且正在从债权国变为债务国。为此，本周沙特拟向全球各大银行贷款100亿美元。然而他的话也并非毫无根据。尽管低油价对沙特自身财政冲击很大，但沙特依然决意不向生产成本较高的产油国提供任何帮助。

4月17日在卡塔尔首都多哈举行的会议上，沙特阻止了欧佩克和非欧佩克产油国（如俄罗斯）之间达成一项协议，即将石油产量冻结在一月份水平以支撑全球石油价格。这样的协定即使签订了，执行起来也是天方夜谭。咨询公司Crysol Energy的卡罗尔·纳克莱（Carole Nakhle）指出，俄罗斯现在的石油产量是历史最高水平，根本无法监督其是否按照协议规定冻结产量。伊朗郑重宣布要将产量提升至制裁前的水平，对加入这样一个协定“嗤之以鼻”。

穆罕默德副王储显然强令他的谈判代表在协议签订前最后一刻离开了谈判桌，坚称只有伊朗同意冻结产量，沙特才会采取同样的行动。一些与会国对他的行为极为愤怒。委内瑞拉石油部长欧罗西奥·德里·皮诺（Eulogio del Pino）火冒三丈地说沙特代表团“谈任何事情都没有决定权”。

数十年来，沙特的石油政策一直由灵活的谈判代表来掌舵，如石油部长阿里·阿尔-奈米（Ali al-Naimi），而现在则完全由30岁的副王储一人说了算。他认为低油价有助于推动他在国内的经济改革，以及削弱沙特的夙敌伊朗。哥伦比亚大学全球能源政策研究中心（Centre on Global Energy Policy）的杰森·波尔多夫（Jason Bordoff）说：“多年以来沙特一直宣称

其石油政策是基于商业和经济的考虑。而此次在多哈的决定看起来却包含了很大的地缘政治因素，旨在向伊朗施压。”

巧合的是，多哈谈判失败恰逢科威特三日罢工的开始，罢工期间该国原油产量暂时减少。然而这进一步凸显了实施冻产的愚谬：低油价已经抑制了全球的石油供应。科威特罢工就正是由于石油收入缩水、公共部门降薪所引发的。石油服务公司斯伦贝谢（Schlumberger）称，由于委内瑞拉国有石油公司资金紧张，拖欠费用，它已减少在委的业务。石油贸易商们说，和委内瑞拉做生意已经开不出信用证了。他们对和尼日利亚等依赖石油的国家往来时的对手风险也甚为担忧。

债务咨询公司AlixPartners的约翰·卡斯特利亚诺（John Castellano）认为，真正的冻产正在美国展开。他预计由于很多页岩油公司在油价猛升的年头大量贷款提高产量，今年在破产法庭外会可能排起长龙，申请破产的公司数量甚至会超过2015年。4月14和15日，“二十一能源”（Energy XXI）和“古德里奇石油”（Goodrich Petroleum）两家此类公司分别申请了破产保护。即使那些仍在维持的企业，也担心没有资金来投入维持产量。因此根据官方机构美国能源信息署的数据，页岩油日产量较之去年的高峰期已经下降了60万桶。这才是真正支撑油价的原因，而非欧佩克的种种姿态。





China's consumers

Still kicking

Despite China's economic slowdown, consumption is resilient

IF YOU believe that China's economy is in trouble and that Chinese consumers are clinging tightly to their yuan, a visit to a local car dealership may make you think again. China has roared past America already to become the world's biggest car market. In March sales of passenger cars zoomed again, by nearly 10% year on year. Shiny sport-utility vehicles (SUVs), the hottest, shiniest items in April's biennial Beijing Auto Show (pictured), did even better: sales jumped by 46% in March from a year earlier. The car market is forecast to keep growing briskly for the rest of this decade (see chart).

The Chinese consumer is flashing his wallet elsewhere, too. China's box-office revenues shot up by nearly 50% on a year earlier in 2015, to \$6.8 billion. Cinema operators led by Wanda Group, an ambitious local conglomerate that recently bought Hollywood's Legendary Entertainment, have poured money into expansion; the number of screens across China has been rising at 36% a year since 2011.

After years of expansion, the smartphone market is peaking. Some firms still thrive: China's Huawei, a telecoms giant, predicts that revenues from its consumer-devices division will rise by about 50% this year. But Xiaomi, an innovative electronics firm once seen as China's answer to Apple, is losing steam. Apple itself announced weaker results on April 26th. Revenues from sales in greater China fell by 26% year on year. As the market for devices matures, however, consumer spending is shifting to services: data usage has grown at triple-digit rates since 2012.

The unrelenting march of e-commerce continues. In 2010 online shopping

accounted for only 3% of total private consumption, but it now makes up 15%. Alibaba, which processes more sales on its e-commerce platforms than eBay and Amazon combined, saw annual Chinese revenues grow to 63 billion yuan (\$9.7 billion) in 2015, a rise of nearly 40% compared with a year earlier. JD, its main local rival, saw revenues leap by nearly 58%.

Chinese are still spending heavily abroad. Their international tax-free shopping shot up 58% last year, according to a new report from Global Blue, a big operator of duty-free shops. Overall, Chinese tourists spent \$215 billion on outbound travel last year, a rise of 53% on the previous year. Ctrip, a big online travel firm partly owned by Baidu, a Chinese internet search giant, saw its revenues jump by nearly half last year, to 10.9 billion yuan.

As with cars, screens and travel, so with consumption generally. All retail sales across the economy, adjusted for inflation, rose by 9.6% during the first quarter, compared with the same period a year ago. The services sector, which caters to the growing demands of the middle class, has been rising by 8% a year in real terms since 2012 (see chart). Services made up 57% of economic output in the first quarter; electricity consumption in services rose by some 10%, but was flat for industry.

Not every market is as bouncy as it once was. A cooling economy and an official anti-corruption drive have squeezed luxury goods, sales of which fell by 2% year on year in 2015, to 113 billion yuan. But some firms are doing well. Rémy Cointreau, a premium liquor brand offering tamper-proof bottles on the mainland (“near field communications” tags tell your smartphone if the booze has been diluted), saw global revenues rise by nearly 10% last quarter and credited “improving trends in greater China”. According to Bernard Arnault, the boss of LVMH, a luxury goliath: “Analysts underestimate the Chinese economy... the fundamentals are good. Household spending is still increasing.”

Can consumption remain resilient given the troubles of the country's state-dominated industrial economy, ranging from vast overcapacity to record levels of debt? One temporary source of comfort is the fact that the state sector may now itself be stabilising, thanks to a massive, debt-fuelled government stimulus. But greater reassurance comes from the fact that even a big shakeout in heavy industry would be unlikely to derail the Chinese consumer. By one estimate, if 30% of capacity is slashed across China's most bloated state industries, perhaps 3m workers will lose their jobs over the next three years. But thanks largely to the private sector, the country created 64m jobs between 2011 and 2015, with more than 13m emerging in the past year alone.

The dynamism of the mostly-private consumer sector comes not from stimulus, argues Andy Rothman of Matthews Asia, an investment firm, but from strong income growth and low household debt. (Chinese household debt stands at about 40% of GDP, roughly half the level seen in America.) Real urban incomes rose by 5.8% in the first quarter. Willis Towers Watson, a consultancy, estimates that white-collar salaries are now significantly higher in China than in South-East Asia. That fuels a bristling optimism. A recent study by McKinsey, a consultancy, found that 55% of consumers in China are confident that their incomes will rise significantly over the next five years.

Many big firms seem willing to look past current clouds over China's economy to brighter days ahead. Pepsi, an American snack-food firm, opened its first Quaker Oats manufacturing plant on the mainland in October, and has launched oat-based dairy drinks to cater to local tastes. It even hopes to introduce Pepsi-branded smartphones. McDonald's, an American hamburger chain, wants 1,250 outlets in the mainland over the next five years on top of the 2,200 it operates already.

America's Walt Disney, an entertainment colossus, is set to open Shanghai Disneyland in June. The \$5.5 billion theme park is its biggest investment outside Florida. Keen to experience such wondrous novelties as Peking-duck-topped, Mickey-Mouse shaped pizza, Chinese families are now eagerly snapping up entry tickets online. Starbucks, an American coffee chain, plans to add 500 outlets this year in China, including one at the entrance of the new Disney park. Howard Schultz, its boss, predicts it will be "Starbucks' highest-grossing retail store overnight".

Firms such as these are betting on the continued rise of the affluent middle class. By 2020, the number of households earning above \$24,000 per year is expected to double to 100m, making up 30% of all urban households. They are also betting on the frivolity of the free-spending young. Consumption is rising at 14% a year among under-35s, twice the level of frugal oldies. But above all, they are betting on the law of large numbers. A joint study, by the Boston Consulting Group, another consultancy, and AliResearch, the research arm of Alibaba, predicts that even if economic growth falls to only 5.5% per year (well below official claims of nearly 7% a year now), China's consumer economy will expand over the next five years by some \$2.3 trillion. Despite the deficiencies in economic forecasts, that incremental gain would be bigger than the entire consumer economy in Britain or Germany today. ■



中国消费者 活力犹存

中国经济虽然放缓，消费却依旧坚挺

如果你相信中国经济已陷入困境，中国消费者会攥紧自己手中的人民币舍不得花，只要去当地的汽车经销店看看可能会改变你的想法。中国已经从美国身旁呼啸而过，一跃成为世界上最大的汽车市场。三月份，乘用车销量再度放大，同比增长近10%。在四月举办的两年一度的北京车展上，最炙手可热的是闪亮的运动型多用途车（SUV）（如图）。它的销售表现还要抢眼：三月份比上年同期增长了46%。预计在这个十年之内，汽车市场都将保持快速增长（见图表）。

中国消费者亮出钱包的地方还不止于此。2015年，中国的电影票房收入同比上涨了近50%，达到68亿美元。影院运营商万达集团，这个最近收购了好莱坞传奇影业（Legendary Entertainment）的本地公司雄心勃勃，为扩张投入巨资；自2011年以来，中国的银幕数量以每年36%的速度迅速增加。

经过多年的扩张，智能手机市场正在见顶。然而有些公司仍在迅猛发展：中国的电信巨头华为，预计今年其消费设备部门的营收将增长约50%。然而一度被视为“中国苹果”的创新电子公司小米则有些后劲不足。苹果本身也在4月26日公布了比较疲软的业绩，其大中国区销售收入同比下降了26%。不过随着手机市场的成熟，消费者的支出正转向服务：自2012年以来，数据用量每年都有三位数的增长率。

电子商务的铁蹄依然不可阻挡。2010年，网上购物仅占总个人消费的3%，但现在则已占到15%。阿里巴巴的电子商务平台上处理的销售比eBay和亚马逊加起来还要多，其2015年度在中国的收入增长到了630亿人民币（97亿美元），与上年同期相比增长了近40%。其主要本土竞争对手京东的收入则有将近58%的飞跃。

中国人还继续在国外一掷千金。大免税店运营商Global Blue在一份新的报告中显示，中国人的国际免税购物在去年猛涨58%。中国游客在出境游上总共花费了2150亿美元，比前一年增长53%。携程网，这家部分为中国互联网搜索巨头百度所有的大型在线旅游公司，去年的营业额有将近一半的增长，达到109亿人民币。

整体的消费情况也和汽车、银幕和旅游差不多。中国经通货膨胀调整后的零售总额在今年一季度与去年同期相比上涨了9.6%。服务业迎合了中产阶级不断增长的需求，自2012年起每年的实际增长达8%（见图）。今年一季度，服务业占到了经济产量的57%。服务业的电力消费上升了10%左右，但工业的电力消费持平。

然而并不是每一个市场都能像以前那样反弹了。经济降温和官方反腐败斗争挤压了奢侈品市场，其销售额在2015年同比下降了2%，至1130亿人民币。但还是有一些公司业绩傲人。高档烈酒品牌人头马君度（Rémy Cointreau）在中国大陆提供防篡改酒瓶（“近场通讯”可以告诉你的手机这瓶酒是否被稀释），上一季度的全球收入增长了近10%，并将其归功于“大中华区的趋势改善”。奢侈品巨人LVMH的老板贝尔纳·阿尔诺（Bernard Arnault）说：“分析师低估了中国经济……基本面是好的。家庭支出仍在增加。”

| 两个中国

从普遍的产能过剩到创纪录的债务水平，国有经济主导的工业陷入困境时，消费还能不能保持坚挺？一个暂时的安慰是，国有行业得益于由债务支撑的大量政府激励，其本身可能也在趋于稳定。但更大的安慰则来自于这样一个事实——即使重工业大洗牌，也不大会搞垮中国消费者。据估计，如果中国最臃肿的国有企业将产能砍掉30%，也许未来三年中会有300万工人失业。但是，中国在2011到2015年间创造了6400万个就业岗位，仅仅过去一年中就增加了1300多万个。这在很大程度上要归功于私营机构。

投资公司Matthews Asia的安迪·罗思曼（Andy Rothman）说，私营主导

的消费行业的活力并非来自刺激，而是来自于强劲的收入增长和较低的家庭债务。（中国家庭债务维持在GDP的约40%，差不多是美国一半的水平。）实际城市居民收入在今年一季度上涨了5.8%。咨询公司韬睿惠悦（Willis Towers Watson）估计，现在中国的白领工资比东南亚要高得多。这一点激起了昂扬的乐观情绪。咨询公司麦肯锡最近的一项研究发现，中国55%的消费者都对自己收入在未来五年会有显著提升充满信心。

许多大公司似乎都愿意透过中国经济眼前的阴霾，看到将来光明的日子。去年十月，美国快餐食品公司百事可乐在大陆开设了第一家桂格燕麦片生产厂，并已经推出了燕麦乳品饮料以迎合当地口味。它甚至希望推出百事可乐品牌的智能手机。美国的汉堡连锁店麦当劳，希望未来五年能在大陆再开设1250家门店，其目前在大陆运营的门店已有2200家。

美国娱乐巨头迪士尼在上海建设的迪士尼乐园定于今年6月开张。这座耗资55亿美元的主题公园是其在佛罗里达州以外最大的投资。中国家庭如今正急切地在线抢购门票，迫不及待地想要体验各种新奇的餐点，如米老鼠形状的北京烤鸭比萨饼。美式咖啡连锁店星巴克计划今年在中国新增500家门店，包括在新的迪士尼乐园入口处的一家。其老板霍华德·舒尔茨（Howard Schultz）预计它将“在一夜之间成为星巴克销售额最高的零售商店”。

这些公司都是在押注富裕的中产阶级会持续崛起。到2020年，预计年收入超过24 000美元的家庭数量将翻一番，达到一亿，占有城市家庭的30%。它们还赌年轻人花起钱来会大手大脚。35岁以下人群的消费每年增长14%，是节俭的老家伙们的两倍。但最重要的是它们在押宝大数定律。由另一家咨询公司波士顿咨询集团和阿里巴巴下属的研究机构阿里研究院联合完成的研究预测，即使经济增长率下降到每年只有5.5%（远低于现在官方报告的近7%），中国的消费经济规模仍将在未来五年增长约2.3万亿美元。尽管经济预测尚有不足，该增量仍然比今天英国或德国的整个消费经济规模还要大。■



Business in Iran

The over-promised land

It is proving harder than expected for investors to make a start

IT WAS billed as a once-in-a-generation opportunity. Iran is the “biggest new market to re-enter the global economy in decades”, British trade officials said in January, predicting more than \$1 trillion of investment over ten years. “Iran is a new region to conquer,” said an imperial-minded boss of a French luxury-goods firm in April. Sanctions had kept outsiders from an oil-rich economy worth an estimated \$400 billion. Although an American trade embargo remains in place, firms from other parts of the world were expected to scramble to enter after the lifting of nuclear-related sanctions in January.

At first glance the influx has begun. Soon after the IAEA, the international nuclear watchdog, said Iran had fulfilled the terms of an agreement with big powers, European firms trumpeted deals potentially worth billions. Airbus said it would sell Iran 118 jets, with bigger orders possibly to follow. PSA Peugeot Citroën and Renault-Nissan said they would assemble and sell cars to Iran’s 80m people. Analysts foresaw record car sales this year.

So many delegations of would-be investors flocked to Tehran that visitors reported struggling to find rooms in the smog-choked city. Earlier in April Italy’s prime minister, Matteo Renzi, became the latest to lead a gaggle of businessmen there, predicting a golden era for industrial ties. Italian fashion firms, such as Versace and Roberto Cavalli, and a French cosmetics firm, Sephora, have opened shops in Tehran or plan to do so. In cafés in north Tehran, where peroxide hairdos poke from veils, rumours circulate about a European arm of an American turbine-maker that has agreed a big joint venture. Local “business enablers”—such as Ilia, run by well-connected Iranians and Germans—are popping up like mushrooms. They

offer to help outsiders navigate markets, set up joint ventures, rent offices, find pre-paid credit cards and more.

Yet getting started is proving harder than many expected. The biggest problem is a lack of finance. On April 13th a Treasury official denied that America is continuing to freeze Iranian overseas assets. Yet such funds, worth perhaps \$100 billion, which had been expected to help pay for an investment boom, do not seem to be flowing. More importantly, America continues to deny firms that operate in Iran access to its financial system. That spooks foreign banks, which are wary of the long arm of American law. Since 2009 the Treasury's sanctions enforcer, the Office of Foreign Assets Control (OFAC), has imposed \$14 billion in fines on those dealing with Iran.

Without the banks, those headline-grabbing deals will struggle to go far. Uncertainty lingers. The US Treasury seems unable to define the benchmarks Iran has to meet to regain access to the American financial system. "It was better when sanctions were still in place," grumbles a wheat merchant, who traded with American suppliers (OFAC approved) throughout the sanctions era. "At least the banks then knew what they could and couldn't do. Now the lawyers, not the bankers, are taking decisions, and nothing is moving."

| *Lacking lubrication*

"We can't sell to Iran because our bank won't accept payment," says a British producer of drilling parts for oil platforms, who has stayed out of Iran's market for the past six years. European export credit agencies are issuing some credit notes, such as a recent Italian one for \$5 billion. A few European banks, including Belgium's KBC and Germany's DZ Bank, have started handling transactions, probably because neither has a big presence in America. Even so, they cannot trade in dollars (unless, America says, those dollars were already abroad) and appear only to be testing the water.

In Tehran, businessmen and officials say everything is stymied from afar. Ayatollah Ali Khamenei, Iran's religious leader, says Americans lifted sanctions only "on paper". Hamidreza Taraghi, who advises the Supreme Leader, says deals announced, including the largest with Airbus, were "just show". (Airbus executives have been in Tehran in April, but the deal is yet to be finalised.) An international trade forum due in Tehran this autumn has been cancelled for lack of interest. Iran's oil ministry has delayed a promised shindig in London five times.

A fast-growing Iranian e-commerce site, Netbarg, complains that an American server shut all its websites this year without warning. "They didn't do anything when Iran was under sanctions," says its owner, Ali Reza Sadeghian. Since the lifting of sanctions America has made it harder for Europeans who visit Iran to get visas. An American ban continues on commercial use of American products in Iran. A lawyer in London who advises firms on trade in Iran says visitors there should not use iPads, Microsoft PowerPoint or the like.

The headaches do not end there. Much excitement, for example, rested on the prospect of oil funds being splurged on infrastructure. But despite rising output, revenues will disappoint. In 2010 oil generated \$125 billion for Iran; this year, given low prices, it will be lucky to get \$25 billion.

Much of Iran's industry, oil included, is run-down. Once flourishing industrial parks are ghost towns. Though luxury-goods firms see an opportunity, many consumers are short of cash and opt for the cheapest goods. Chinese car parts, for example, outsell pricier European ones.

A labyrinthine bureaucracy frustrates everyone. Since last October many Western visitors (though not Britons or Americans) have been able to get visas on arrival. Getting a work visa, however, still involves tiresome wrestling with red tape. Worse, a few foreigners have been arrested, among

them Siamak Namazi, an Iranian-American businessman held since October, and his father, an ex-official at the UN. Statements from some public figures are discouraging. “We’re not going to go in their countries and we don’t want them to come and live in ours,” says Hadi Khamenei, the brother of the Supreme Leader.

Other sources of uncertainty include pervasive corruption and the activities of shadowy groups, such as the Revolutionary Guard Corps, which have big, hidden economic interests. It is hard to navigate Iranian politics, or even to find trusty accounting and legal firms, although several foreign outfits are returning to Tehran.

Iran has a modest ranking, 118th, on the World Bank’s ease-of-doing-business index (see chart). Things might improve if parliament, newly elected, were to pass laws to tidy up customs rules, or to make it easier to hire and fire workers. Some officials also talk of restructuring state-owned firms, such as Iran Air.

Such reforms would make sense, irrespective of the availability of outside financing. Relations with America are unlikely to warm up quickly. America says Iran’s government is violating the spirit of the international deal, by launching missiles and more. In April, Barack Obama told Iran to stop “engaging in a range of provocative actions that might scare business off”. America might not ease its position until after its presidential election in November. Were a Republican to win, that “poses a huge risk for investors”, says a Tehran-based consultant. Iran still holds huge promise, but the scramble will be more stately than expected. ■



伊朗商业

乐土之名，其实难副

投资者起步比预期艰难

这里曾被标榜为百年一遇的良机。今年一月，英国贸易官员说，伊朗是“几十年里重返全球经济舞台的最大新市场”，并预测未来十年将有超过一万亿美元的投资注入。“伊朗是我们要征服的一个新区域。”法国一家雄心勃勃的奢侈品公司总裁四月说道。之前的制裁令外界无缘涉足这个石油资源丰富、体量估计在四千亿美元的经济体。虽然美国贸易禁运依然存在，人们曾预测，伊朗核问题相关制裁在今年一月份解除后，世界其他地区的公司将争相抢占伊朗市场。

乍看之下，这股大潮已经开始。在国际核监督组织国际原子能机构（IAEA）确认伊朗已履行与六大国签署的核协议后，欧洲企业纷纷高调宣扬将与伊朗进行可能高达数十亿美元的交易。空客公司表示将向伊朗出售118架飞机，而且之后可能还会有更大的订单。标致雪铁龙集团及雷诺-日产联盟表示将面向伊朗的八千万人口组装并销售汽车。分析师估计今年的汽车销售数字将创新高。

潜在投资者的代表团蜂拥而至，让德黑兰这个雾霾严重的城市一房难求。最近来访的是四月初意大利总理马泰奥·伦齐（Matteo Renzi）率领的一批商人，他预期两国的产业合作将迈入黄金时代。范思哲（Versace）、罗伯特·卡沃利（Roberto Cavalli）等意大利时装公司和法国化妆品公司丝芙兰（Sephora）已经或正在筹备在德黑兰开店。在德黑兰北区的咖啡店里，人们漂染打理的发型在面纱之下隐现，有关美国一家涡轮厂商的欧洲分部已同意设立大型合资企业的传言四处流传。本地“商务助手”（例如由人脉通达的伊朗人和德国人运营的Ilia）如雨后春笋般涌现。它们帮助外国投资者探路伊朗市场、建立合资企业、租赁办公室、办理预付信用卡等。

但事实上，投资起步要比预期的更艰难。最大的问题是缺乏资金。4月13

日，美国财政部一名官员否认伊朗的海外资产仍被美国冻结。这些资金价值约一千亿美元，本来预期可帮助支付这轮投资热潮，但目前似乎仍不能自由流动。更重要的是，在伊朗运营的公司依然被美国阻挡在其金融体系之外。这让警惕着美国法律触手过长的外国银行心惊胆战。自2009年至今，美国财政部下属执行金融制裁的外国资产控制办公室（OFAC）已对涉及伊朗交易的金融机构罚款140亿美元。

没有银行融资，那些夺人眼球的大宗交易将举步维艰。个中变数挥之不去。伊朗要符合哪些条件才能重新接入美国金融体系？美国财政部似乎无法定下相应的基准。“实施制裁的时候还好一点。”一位小麦商人抱怨道。在制裁年代，他与OFAC批准的美国供应商一直保持交易。“那时候银行至少知道什么可以做，什么不可以做。现在，要由律师而不是银行来做决定，什么事都做不了。”

| 缺少润滑

“我们不能向伊朗出售产品，因为我们的银行不接受他们的付款。”英国一家钻井平台零件制造商表示。过去六年，这家公司一直没有涉足伊朗市场。欧洲的出口信贷机构已经发出了一些信用证，例如最近意大利一家出口信贷机构开出了50亿美元的信用证。比利时联合银行（KBC）及德国中央合作银行（DZ）等几家欧洲银行已开始处理涉伊交易，大概因为它们在美国的业务规模都不大。即便如此，这些机构还是不能以美元结算（除非美国说那些美元已经属于海外资金），而且看起来只是试水性质。

在德黑兰，商人和官员们表示，一切都受到远方势力的阻挠。伊朗的宗教领袖阿亚图拉·阿里·哈梅内伊（Ayatollah Ali Khamenei）说美国人只是“纸上”解除了制裁。伊朗最高领袖的顾问哈米德礼萨·塔拉吉

（Hamidreza Taraghi）表示，所宣布的交易，包括最大的与空客的交易，都“只是做秀”。（空客的高管四月到过德黑兰，但交易仍未最终确定。）原定今年秋天在德黑兰举行的一场国际贸易论坛因乏人问津已被取消。伊朗石油部已经五次推迟了计划在伦敦举行的交流宴会。

成长迅速的伊朗电商网站Netbarg抱怨说，美国一家服务器公司今年在毫

无警告的情况下关闭了其所有网站。“伊朗受制裁的时候，它们倒没什么行动。”Netbarg老板阿里·礼萨·萨德吉安（Ali Reza Sadeghian）说道。自从制裁解除后，进出伊朗的欧洲人申请美国签证变得更难。美国继续实施一道禁令——美国产品不得在伊朗作商业用途。向企业提供伊朗营商咨询服务的一名伦敦律师提醒，商务访客在伊朗不要使用iPad、微软PowerPoint这类产品。

头疼的还不止这些。之前的热情主要是人们以为将有大量石油资金投入基础建设中。但尽管产量增加，收入却会令人失望。2010年，伊朗的石油收入为1250亿美元；今年，鉴于油价低迷，能有250亿美元已算走运。

包括石油工业在内，伊朗的大部分产业都破败不堪。一度繁荣的工业园如今宛如鬼城。虽然奢侈品公司看到了机遇，但许多消费者手头并不宽裕，只能选择最廉价的商品。比如说，中国汽车零件的销量就胜过欧洲的高价产品。

迷宫般复杂的官僚作风让人处处碰壁。自去年十月起，许多西方访客（尽管不包括英国人和美国人）已可以获得落地签证。然而，要获得工作签证仍难逃各种繁文缛节。更糟糕的是，一些外国人被逮捕了，其中包括伊朗裔美国商人西亚马克·纳马齐（Siamak Namazi，自去年十月被羁押）和他的父亲（前联合国官员）。某些公众人物的言论令人沮丧。“我们不会到他们的国家去，也不希望他们来我们国家生活。”伊朗最高领导人的弟弟哈迪·哈梅内伊（Hadi Khamenei）说道。

不确定性还来自伊朗国内的腐败风气及灰色组织的活动，如拥有巨大隐藏经济利益的革命卫队（Revolutionary Guard Corps）。伊朗政治难以捉摸，甚至连值得信赖的会计师事务所和律师事务所也很难找得到，不过，几家外国事务所正计划重返德黑兰。

在世界银行的营商便利指数中，伊朗排名中游，处于118位（见图表）。假如新选出的议会能通过法律整顿海关规章，或简化聘用及解雇员工流程，情况也许会有改观。一些官员还提到要重组国企，比如伊朗航空公

司。

无论有没有外部融资，这类改革都很有意义。伊朗与美国的关系不太可能迅速升温。美国表示，伊朗政府发射导弹及其他行径违反了国际协议的精神。四月，奥巴马告诫伊朗停止“可能吓跑商业投资的一系列挑衅行动”。在11月大选之前，美国也许不会让步。驻德黑兰的一位咨询顾问说，假如共和党人最终胜出，将会“对投资者构成巨大风险”。伊朗仍旧潜力无限，只不过，“抢占市场”的步伐要比预期来得更稳重些。■



Bank of America

The limits of fasting

Severe cost-cutting is getting a giant of American banking only so far

INVESTORS in American banks are a hardened lot. Profits at the six biggest were down in the first quarter, year on year—by as much as 53% in the case of Morgan Stanley—thanks chiefly to dwindling earnings in their investment-banking units. Earlier this month regulators rejected the “living wills”—blueprints for breaking up or liquidating a bank should it get into trouble—of all six save Citigroup. Yet markets barely flinched. Limp profits and brickbats from regulators, alas, have become routine.

Yet even these grizzled veterans have their doubts about Bank of America. Its profits fell by 13% in the first quarter—much better than some. But that left its return on equity at a measly 4%, the lowest figure among the big six (see chart). Its shares are priced at just 66% of the value of the assets on its books, lower than any of its peers and far below figures of 106% at JPMorgan Chase and 150% at Wells Fargo.

This is all the more disappointing given Bank of America’s many strengths. Its funding is remarkably cheap (it pays just 0.12% interest, on average, on the \$1.2 trillion of deposits in its commercial bank). It is a more pervasive presence in America than its rivals, with branches all over the country, bringing it a degree of geographic diversification that others lack. And in Merrill Lynch, its wealth-management arm, it has the biggest salesforce for financial products in America, catering to a wealthy clientele.

What is more, Bank of America’s management has been avidly cutting costs to boost profits. The number of employees has dropped from 288,000 to 213,000; the number of branches has been cut from 6,100 to 4,700. The floorspace occupied by the bank has dropped by one-third, or 44m square

feet—equivalent, it proudly declares, to 14 Empire State buildings. All this has reduced operating expenses dramatically, from about \$17 billion a quarter to \$13 billion.

The current chief executive, Brian Moynihan, has also laboured to clean up the mess left by his predecessor, Ken Lewis, who bought Countrywide, a big subprime mortgage lender, in 2008. Since 2010 Bank of America has spent some \$194 billion to cover costs linked to the financial crisis, including \$36 billion for litigation and \$46 billion to address all Countrywide's dud loans. It had to hire 56,000 people to sort out delinquent mortgages, which peaked at 1.4m but now number only 88,000.

More prosaically, Bank of America has trimmed back the bewildering thicket of products and systems left over from the acquisitions of Mr Lewis and his predecessor, Hugh McColl. The number of different kinds of current accounts has fallen from 23 to 3, of credit cards from 18 to 6, of savings accounts from 44 to 11, of home loans from 136 to 39 and so on.

The relentless cost-cutting, however, is in part a reflection of how tricky it is for Bank of America to boost income. New rules on liquidity make it harder to lend out those cheap deposits, and low interest rates constrain the profits to be made. The bank's loan-to-deposit ratio, which often used to exceed 100%, is just 74%. Its net interest margin (the difference between the average rate it pays depositors and that it charges borrowers) is two percentage points, well below the historical average. "All of these numbers add up to significant unutilised earnings capacity," says Richard Bove of Rafferty Capital Markets, a broker.

Moreover, as one employee says with a sigh, the regulators "keep coming at us". The latest cudgel is the "fiduciary rule", which is intended to prevent financial advisers from elevating their own interests above those of their clients and in practice makes it hard to manage money in exchange for

trading commissions rather than fees. The companies that stand to benefit from the rule are asset managers that provide cheap index-tracking funds, such as Vanguard and BlackRock. Those that offer more complicated and expensive products face extra compliance costs, at the very least.

Given that Merrill Lynch has America's biggest network of what were once called brokers but are now wealth managers, Bank of America is bound to be affected. It is putting on a brave face, saying that the rule will affect only 10% of the almost \$2 trillion of assets it manages and will have no impact on earnings. But Keefe, Bruyette & Woods, a research firm, says that the rule will reduce the bank's earnings in 2017 by 2.7%—the most among the universal banks.

In short, regulation is making assets such as a mountain of cheap deposits and a huge network of brokers less valuable to Bank of America than they would have been in the past. Neither low rates nor the onslaught of new regulation will last forever. But in the meantime Mr Moynihan's response to the lacklustre first-quarter results gives a good sense of Bank of America's strategic impasse: he promised to cut costs even more fiercely. ■



美国银行

节食亦有限

对美国银行业巨人而言，拼命削减成本也只能帮到这里了

美国各家银行的投资者真可谓是铁杆了。今年一季度，六大银行的利润均同比下跌，摩根士丹利的利润更是暴跌53%，主要是拜其投资银行部门盈利衰退所赐。本月初，监管层否决了除花旗银行外所有六大银行的“生前遗嘱”——预备银行万一陷入困境后拆分或清算的蓝图。然而，市场几乎毫无惧色。算啦，反正疲软的利润还有监管层的申斥早已是家常便饭了。

不过，就算这些久经风霜的老手也对美国银行心怀疑虑。该行利润在一季度同比下降了13%，这比其他一些银行好得多了。但是这导致它的净资产收益率只有区区4%，在六大之中排名垫底（见图）。其股票价格仅为账面资产价值的66%，比任何同行都低，比摩根大通的106%和富国银行的150%更是低得多了。

考虑到美国银行的很多优势，这就更令人失望。它的资金非常便宜（它的商业银行存款达1.2万亿美元，平均只要支付0.12%的利息）。它在美国的分布比竞争对手更广，分支机构遍布全国，而一定的地理分布多元化是其他银行所缺乏的。其财富管理部门美林拥有美国最大的金融产品销售队伍，专为富有的客户服务。

更重要的是，美国银行的管理层已经竭力削减成本以提高利润。员工数已经从28.8万人减到了21.3万人，分支机构的数量也从6100个减到了4700个。银行占据的办公面积已经砍掉了三分之一，也就是4400万平方英尺——它骄傲地宣布这相当于14座帝国大厦的办公面积。所有这些都大大降低了运营成本，将其从每季度170亿美元降到了130亿美元。

目前的首席执行官布莱恩·莫伊尼汉（Brian Moynihan）也为清理他的前任肯·刘易斯（Ken Lewis）留下的烂摊子煞费苦心，后者在2008年买下了规模庞大的次级房贷公司Countrywide。自2010年以来，美国银行在与

金融危机相关的开支上已经花费了约1940亿美元，包括360亿美元的诉讼费用，以及460亿美元用来解决Countrywide的呆账。它不得不雇用56 000人来理清最多时达到140万份的违约房贷，不过现在只有88 000份了。

更通俗点说，对于刘易斯先生和他的前任休·麦科尔（Hugh McColl）进行收购留下的那堆乱麻般扑朔迷离的产品和系统，美国银行已经清理掉不少了。经常账户已经从23种砍到了3种，信用卡从18种减到了6种，储蓄账户从44种压到了11种，住房贷款从136种降到了39种等等。

然而，无情的成本削减，在某种程度上反映出美国银行要提高收入有多么棘手。对流动性的新规定使其难以借出那些廉价的存款，低利率也让获利受限。银行的存贷比以前经常超过100%，如今只有74%。它的净息差（向存款人支付的利率和向借款人收取的利率之间的平均差值）是两个百分点，远低于历史平均水平。“所有这些数字加起来，凸显出很大一部分收入能力都未被开发。”经纪商拉弗蒂资本市场（Rafferty Capital Markets）的理查德·博韦（Richard Bove）说道。

此外，就像一名员工叹着气说的那样，监管部门“来个没完”。最近的一击是“受托规则”，是为了防止财务顾问把自己的利益置于客户之前，在实践中让他们难以通过管理资金来得到交易佣金，只能收取管理费。从该规则中受益的公司是提供廉价指数跟踪基金的资产管理公司，如先锋（Vanguard）和黑石（BlackRock）。对于那些提供更复杂和昂贵产品的公司而言，退一万步说，也面临着更高的合规成本。

由于美林拥有美国最大的理财经理（以前称为经纪人，如今称为理财经理）网络，美国银行势必受到影响。它强作镇定，称该规则只会影响其管理的2万亿美元资产中的10%，也不会对盈利造成影响。但研究公司Bruyette & Woods的基夫（Keefe）说，该规则将导致银行2017年收入下降2.7%，是所有综合银行中最多的。

简而言之，监管使得美国银行的优势，比如巨量的廉价存款和庞大的经纪人网络变得不像过去那么有利了。低利率或是新规则的冲击并不会永远持

续下去，但在此期间，莫伊尼汉对低迷的第一季度业绩给出回应，让我们得以洞悉美国银行的战略困局：他承诺将更加猛烈地削减成本。■



Sonification

Now hear this

Scientific data might be filled with important things waiting to be discovered. Just listen to them

DURING the first world war Heinrich Barkhausen, a German physicist, carried into the trenches an antenna, a crude electronic amplifier and a pair of headphones. His mission: to intercept Allied field-telephone communications. The strange noises he heard among the transmissions were not, as he thought, a problem with his equipment; later it was discovered that these “whistlers” were radiofrequency bursts from extremely distant lightning. Barkhausen was among the first scientists to learn something new about the world from sound alone.

By the 1960s, seismologists were using instruments that recorded local tremblings as frequency modulations on magnetic tape. Days and weeks of data lay on these tapes, and the only way to sift through them for interesting events was to play them back at high speed, listening for any anomalies. The field of sonification—turning data into sound—had been born. When the *Voyager 2* space probe passed Saturn in 1981 and sent back a stream of data that its keepers could not decipher, they sonified it. The hailstorm-like sound, they determined, came from debris in Saturn’s rings striking the craft.

Sonifications make for attention-grabbing sounds on the news, so these days many scientific findings are sonified. Overwhelmingly, though, these are an afterthought; scientists still rely on their eyes and algorithms to spot interesting phenomena. That looks set to change as more scientists, engineers and even designers and artists look to exploit better what the seismologists and *Voyager* scientists knew decades ago: sound can be the key to scientific discovery.

| *Bring the noise*

One person currently championing sonification is Robert Alexander, a design scientist from the University of Michigan who spent time as a fellow at NASA's Goddard Space Flight Centre. His work with data from satellites measuring the stream of particles from the sun has yielded a number of discoveries (and also a number of musical compositions).

That is because hearing presents a different set of strengths from that of vision. Humans can hear frequencies across three orders of magnitude, from about 20 to 20,000 hertz, and can discern tiny differences in those frequencies. They can deal with volumes from that of a pin dropping to a rock concert. Perhaps hearing's greatest strength is its temporal resolution, 100 times finer than that of vision: you will know if your favourite band's drummer is as little as a few thousandths of a second late on the beat.

Dr Alexander found, through listening alone, that ions of carbon are better at indicating the regions from which the solar wind originates than the oxygen that was previously employed, and determined the cause of a long-lived storm of swirling particles within the wind. He even spotted an undocumented source of noise in the instruments aboard the *Ulysses* spacecraft.

A greater influence than these discrete discoveries, though, is the enthusiasm for sonification they have created among his colleagues. Lan Jian, a solar scientist at Goddard, has learned that sonification is a great way to search for unusual events within data from *WIND*, another spacecraft sent to observe the sun. It speeds things up by a factor of ten or more, she says. Dr Alexander has gone on to publish a kind of best-practice sonification guide for researchers swimming in the copious data from sun-studying satellites.

Such success stories remain rare, as visual analysis of data still dominates

the sciences. Yet vision has its limits. Many experiments measure a slew of variables at once, and the trick is to discover which of these are connected and how. As visual display technology has improved greatly it has been possible to display data in enhanced ways, but it is becoming a struggle. “Now we’re seeing people looking at very complicated graphs; they’re overloaded by data, and the visual system can’t handle it all,” says Matthew Schneps of the Harvard-Smithsonian Centre for Astrophysics.

Dr Alexander’s work—and indeed much of the work in science so far—falls under a category of sonification called audification. When a single measure is taken at regular intervals, the result is a simple stream of regularly spaced points. Audification is simply the shifting of such “time-series data” to a frequency within the audible range—exactly what the seismologists, *Voyager 2* scientists and lots of early radio astronomers did. As a reflection of change in just one variable in time, audification results in simple tones and rhythms.

But hearing can discern much more than just pitch and pace: it can pick up multiple instruments with differing timbres, keeping track of each note’s pitch, and even its attack and decay—how fast it rises and falls in volume. That is where another kind of sonification called parameter mapping comes in. This can turn scads of data sources into one stream of sound. The rise and fall of one variable is mapped to, say, the volume of a synthesised violin, while the shift of another is mapped to its pitch. Many different timbres of sound can be added, resulting in a data-rich soundscape.

Human hearing is extremely good at dealing with such noisy input. Making out what your interlocutor is saying at a crowded cocktail party, or noticing the approach of a predator among the cacophony of birds and bugs in a rainforest, can be done. “Where there are subtle changes of noise, or patterns in the change, that’s where the ear really takes over,” says Andy Hunt, of the University of York, in Britain.

| *Intelligent design*

Dr Hunt has parameter-mapped data ranging from images of cervical cells being screened for cancer to electrical signals from the muscles of recovering stroke patients. He has also worked with data from several hundred sensors fitted to helicopters during test flights. These data used to be printed out and laid on the hangar floor; engineers walked along them for hours, looking for anything untoward. Dr Hunt parameter-mapped the same data and turned them into a sound file, just seconds long, in which problems could be spotted.

David Worrall of the Australian National University believes parameter-mapping sonifications are particularly suited to monitoring of complex systems. When he began to work with the Fraunhofer Institute, in Germany, on a project to analyse network activity as a proxy for how much different departments were co-operating, those in the institute's IT department were sceptical. But through regular listening to his sonification, he says "they started to notice patterns in the flow of the network—this would happen, then that, and then suddenly the printer drivers would go down." What began as a managerial query has become a network-monitoring tool. Dr Worrall has also developed a sonification of the stockmarket for an Australian government research group, in order to spot insider trading. ■



可听化

兼听则明

科学数据中可能有很多重要的事情等着我们去发现。只需倾听

第一次世界大战时，德国物理学家海因里希·巴克豪森（Heinrich Barkhausen）把一根天线、一台原始的电子放大器和一副耳机带进了战场。他的使命是拦截盟军的战地电话通信。他在传输中听到了一些奇怪的杂音，以为是设备出了问题。然而后来人们发现，这些“哨声”是非常遥远的闪电产生的射频脉冲串。巴克豪森是最早的仅依靠声音来进一步了解世界的科学家之一。

二十世纪60年代时，地震学家用仪器把当地的震颤以频率调制的方式记录在磁带上。这些磁带上堆着日复一日、周复一周的数据，要快速筛选并找出有意义事件的唯一办法就是高速播放，听听有没有什么异常。“可听化”（sonification）——把数据变成声音的新领域诞生了。1981年，“旅行者2号”（Voyager 2）太空探测器在掠过土星时，发回了一组连它的负责人也无法解读的数据流。他们把它转成了声音，鉴定认为那冰雹般的声音来自于土星环中碎片对飞行器的撞击。

可听化得到声音可以在新闻中引人注意，所以如今的许多科学发现都被转成了声音。不过绝大多数情况下，这些都是“马后炮”——科学家们仍然依靠自己的眼睛和算法来发现有趣的现象。这一点似乎注定要改变，因为越来越多的科学家、工程师甚至设计师和艺术家都在试图更好地利用地震学家和“旅行者号”科学家在几十年前就知道的事情——声音可以是科学发现的关键。

| 让噪音来吧

目前，密歇根大学的设计科学家罗伯特·亚历山大（Robert Alexander）是可听化的倡导者之一，他还兼任美国航空航天局戈达德太空飞行中心的研究员。一些卫星会测量来自太阳的粒子流并发回数据，而他针对这些数据的工作已经带来了若干发现（还有一些乐曲）。

这是因为听觉与视觉的强项不同。人类能够听到的频率跨越三个数量级，从约20赫兹到20 000赫兹，并且可以分辨频率的细微差异。我们能够处理的音量小到针落在地上，大到摇滚音乐会。也许听觉的最强大之处在于时间分辨能力，它比视觉要精细100倍：如果你最喜欢乐队的鼓手有一拍晚了哪怕千分之一秒，你都能够听出来。

仅仅通过听，亚历山大博士就发现，碳离子比先前所用的氧更能说明太阳风来自于哪个区域。他还确定了风中长寿命涡旋粒子风暴的成因。他甚至发现了“尤利西斯号”（Ulysses）宇宙飞船上的仪器中一个从未记载的噪声源。

相比于这些个别的发现，更大的影响是它们在他的同事中掀起的对可听化的热情。戈达德的太阳科学家塞兰发现，可听化可以很好地在来自另一艘观察太阳的WIND飞船发送的数据中搜索不寻常的事件。她说这种方法可以把速度提高十倍甚至更多。亚历山大博士已经进一步发表了一些可听化最佳操作指南，提供给那些在来自太阳研究卫星的海量数据中遨游的研究者。

这样的成功案例尚不多见，因为数据可视化分析仍然是科学的主流。然而视力有其局限性。许多实验都会同时测量许多变量，关键是要发现哪些变量之间有联系以及如何联系。随着视觉显示技术的极大进步，以增强方式展示数据已成为可能，但这本身也是很大的负担。“我们发现大家在看非常复杂的图表。数据太多了，视觉系统招架不住。”哈佛-史密森天体物理学中心的马修·施内普斯（Matthew Schneps）如是说。

亚历山大博士的工作——事实上迄今大部分的科学工作，都可归于可听化中的所谓“音响化”（audification）一类。如果按照规则的间隔进行单项测量，其结果就是间隔一致的简单数据点流。“音响化”无非是把是这样的“时间序列数据”平移到听觉范围中的一个频率上，这正是地震学家、“旅行者2号”的科学家以及许多早期的无线电天文学家所做的事。音响化仅仅反映了一个变量随时间发生的变化，它得到的是简单的音调和节奏。

但是，听觉可以分辨的不仅仅是音高和节奏。它可以辨别很多不同音色的乐器，跟踪每一个音符的音高，甚至起音和衰减——音量变大和变小的速度。这就是另一种可听化即所谓的“参数映射”的用武之地。它可把一组数据源变成一个声音流。比方说，一个变量的上升和下降被映射到合成小提琴的音量，而另一个参数的偏移则映射为音调。还可以添加许多不同的音色，形成含有丰富数据的声景。

人的听觉能够极好地处理这样嘈杂的输入。我们可以在一个拥挤的鸡尾酒会上听出对方在说什么，或者在热带雨林鸟类和昆虫的嘲哳中注意到有捕食动物靠近。“在噪音有细微变化，或变化有某种模式的时候，那就是耳朵大显身手的地方。”英国约克大学的安迪·亨特（Andy Hunt）说。

| 智能化设计

从筛查癌症的宫颈细胞图像，到中风恢复期患者肌肉的电信号，亨特博士已经对许多数据做了参数映射。他还处理了在试飞的直升机上安装的数百个传感器产生的数据。以前这些数据要打印出来，摊在飞机库的地板上，工程师要花几个小时巡视它来寻找异常。利用参数映射，亨特博士把同样的数据变成了一个只有几秒钟的声音文件，从中就能找到问题。

澳大利亚国立大学的大卫·沃勒尔（David Worrall）认为，参数映射可听化特别适合监控复杂系统。当他开始与德国弗劳恩霍夫研究所合作一个项目，通过分析网络活动来了解很多不同的部门如何协同工作时，该研究所的IT部门对此持怀疑态度。但是他说，在定期聆听他的可听化声音后，“他们开始在注意到网络流中的模式——先发生这个，然后是那个，然后突然打印机驱动程序就不工作了。”它一开始是管理上的需求，后来成了网络监测工具。沃勒尔博士还为一个澳大利亚政府研究小组开发了一套股市的可听化工具，以发现内幕交易。■



China's economy

Neither a bull nor a bear

Growth is slowing but fears of collapse are overdone

CHINA'S economy inspires extreme and, often, diametrically opposed views. There is the bear case: growth is severely unbalanced, waste unbearably high and collapse nigh. And the bullish: past performance is proof of the government's managerial skill, innovation is blossoming and China will soon surpass America as the global economic powerhouse. But between these extremes lies a wide expanse of "muddle-through" alternatives, which hold that China's future will be far less spectacular: neither especially bright nor very gloomy.

If the notion of a middle way sounds intuitively appealing, Arthur Kroeber's book brings rigour to the debate to show why it is also the most likely outcome. A longtime China analyst now managing an independent research firm, he launches an assault, albeit courteously worded, on conventional wisdom from the two opposing camps. What emerges is a nuanced take on an economy facing serious challenges, ones that do not spell its collapse but could prove intractable all the same.

Many of the commonly heard warnings about China's economy are exaggerated. Take the opinion that it suffers from pervasive over-investment. At the start of its reform period in 1980, China had a paltry stock of factories, infrastructure and homes. The tried-and-tested way for an economy to modernise is to accumulate all of these, requiring a lengthy period in which investment grows faster than GDP. China's experience in this regard has not been dramatically different from that of Japan, South Korea and Taiwan in their heady years; its investment mania has run on too long, but the benefits of the 30-year boom outweigh the waste. Most rich economies have capital stocks more than three times as big as their GDP;

China's was still just 2.4 times as high in 2010.

Similarly, fears about a property crash are overblown. China did not privatise home ownership until the 1990s, and prices were still far below their true value in the early 2000s, laying the groundwork for a surge. The leverage that caused havoc in property markets elsewhere in the last decade is not an issue: minimum down-payments are still 20% and buyers often pay closer to half in cash. Far more problematic is an excess of high-end homes and insufficient supply of affordable housing. The solution is more, not less, government involvement in helping home construction and guaranteeing mortgages.

Ultimately China should be able to do this, because marshalling resources to build stuff is its strength. But it is also clear that its growth model needs to change. Since the global financial crisis of 2008, it has become too reliant on debt and productivity growth has steadily fallen. Mr Kroeber lays out grounds for pessimism. Xi Jinping, China's president, seems intent on a model of "Leninist capitalism", reinforcing the Communist Party's political grip, while also strengthening the economy with market reforms. This can work for a while: China still has scope to grow through industrial reforms, urbanisation and partial deregulation. Yet in order to become a high-income country, it needs innovation and efficiency, which are inconsistent with an overweening government. The model is not broken, but it is clearly running out of steam.

For all the clarity of Mr Kroeber's writing, his book is heavy going for the general reader. Rob Schmitz's book makes a useful complement. Its approach is the opposite: a portrait of China from the stories of a single Shanghai street. Still, there is much to link the two books in their marvelling at what China has accomplished, mixed with sadness at the human costs of its breakneck development.

Changle Road, the “Street of Eternal Happiness” of the title, is a poignant microcosm. Most visitors see only its exterior: a tree-lined street with expensive apartment buildings and trendy cafés. Mr Schmitz, a radio correspondent, chose to live there. Over the years, he learned about the ambitions, corruption and daily struggles seething just beneath its surface.

One neighbour, from a poor village, lifted herself from rural poverty into relative wealth by running a flower shop. Another is an older woman easily seduced by get-rich-quick investments, burning through her savings on one far-fetched idea after another. Most harrowing are the lives of the residents clinging to their homes on an abandoned block. The local government tried to seize their land. Demanding the compensation promised by law, they protested, and have faced harassment and intimidation ever since.

Yet coursing under even the bleakest stories is a sense of optimism that tomorrow will be better, with some evidence to support it. Families invest in their children’s education and, in time, reap the dividends. Migrant workers transform themselves from factory workers into cooks as the economy changes. Small entrepreneurs scrape their way to small successes. The energy and talents of China’s people are undiminished. The task for the government is to give them the space to thrive. ■



中国经济

非牛市，亦非熊市

增长虽放缓，但担心经济崩溃有点杞人忧天

中国的经济引发了各种极端的、且往往截然相反的观点。有人认为是熊市：增长严重不平衡，浪费严重得难以忍受，经济崩溃迫在眉睫。也有人认为是牛市：过去的表现证明了政府的管理能力，创新正如火如荼，中国作为全球经济强国将很快超越美国。但是在这两种极端观点之间，还有林林总总的“折衷”看法，认为中国的未来远没有那么可观：既不会特别光明也不会非常暗淡。

如果说中间路线这一概念直觉上听起来很有吸引力，那么葛艺豪（Arthur Kroeber）的书为这场辩论带来了严谨性，说明了为什么这也是最可能出现的结果。作为长期分析中国问题的专家，葛艺豪目前管理着一家独立研究公司，他对针锋相对的两大阵营的传统思维发起了攻击，尽管措辞谦恭有礼。他对这个面临严峻挑战的经济体表达出了微妙的态度，这些挑战并不预示经济崩溃，但仍然能够说明它的棘手。

我们常听到的很多关于中国经济的警告其实是被夸大的。例如有人认为它正经受着普遍存在的过度投资之苦。1980年改革伊始，中国的工厂、基础设施和住宅数量微不足道。经济要现代化，一种经过实践检验的方式是积累上述所有资源，这需要一个漫长的时期，其间投资增长要快于GDP。在这方面中国的经历与日本、韩国和台湾在急进岁月里的经历并无显著不同；它的投资热潮已经持续了太久，但30年蓬勃发展的成效超过了浪费。大部分富裕经济体的资本存量都是它们GDP的三倍多；而在2010年，中国的资本存量仅是其GDP的2.4倍。

与此类似，对房地产崩盘的担忧也过头了。中国直到20世纪90年代才实行房屋产权私有化，在本世纪初期房价还远低于其真正价值，这为飙升奠定了基础。加杠杆在过去十年为其他地区的房地产市场带来了灾难，但在中国这不是问题：最低首付仍为20%，而买家常常以现金支付近一半房款。

更有问题的是高端住宅过剩，而保障性住房供应不足。解决方法是要政府更多而不是更少地参与，协助房屋建设并且提供抵押贷款担保。

中国最终应该能够做到这一点，因为整合资源用于建造是它的强项。但是它的增长模式需要改变，这一点也很清晰。自2008年全球金融危机开始，中国已经太过依赖负债，生产率增长逐步下滑。葛艺豪列出了悲观的理由。中国国家主席习近平看来下定决心实行“列宁资本主义”，巩固共产党的政治掌控，同时也通过市场改革加强经济。这能够见效一时：通过产业改革、城市化和部分放宽管制，中国仍有增长空间。不过要成为高收入国家，中国需要创新和高效，这与唯我独尊的政府格格不入。这一模式并未失效，但显然渐渐难以为继。

葛艺豪的行文虽然清晰，但对于大众读者而言，他的书读来仍然费力。罗勃·施密茨（Rob Schmitz）的著作是一个有益的补充。它的方式恰恰相反：以上海一条街道的故事描绘中国。不过，这两本书仍有不少联系，它们都对中国的成就惊叹不已，也间或悲叹中国极速发展中人民付出的代价。

长乐路，即英文书名中的“永远快乐之路”，是一个辛酸的小世界。大多数观光客只看到它的外表：路边绿树成荫，遍是昂贵的公寓楼和时髦的咖啡馆。施密茨是一名广播电台记者，他选择住在那里。多年来，他了解到长乐路表面之下沸腾着的野心、腐败和每日的争斗。

一位来自贫穷村落的邻居通过开花店摆脱了贫困，达到了相对富裕。另一位老太太轻易被快速致富的投资方式所吸引，在一个又一个荒谬的想法上耗尽了她的积蓄。最让人痛心的是在被遗弃的街区苦苦坚守自己家园的居民的生活。当地政府想攫取他们的土地。他们抗议，要求按法律规定获得赔偿金，但一直面临骚扰和恐吓。

但是即便是在最冷酷的故事中仍有着乐观的态度，相信明天会更好，并且有据可依。每家每户都投资孩子的教育，并且最终获得回报。随着经济变革，外来劳工从工厂工人转变为厨师。小企业家排除万难争取一个个小小

的成功。中国人民的能量和才干是取之不竭的。政府的任务是给他们空间茁壮成长。■



Schumpeter

What do the Foxes say?

The success of Leicester City will be pored over for management lessons

IN FOOTBALLING terms, Claudio Ranieri, an affable Italian, has found a way to turn water into wine. Mr Ranieri manages a club in England, Leicester City, which historically has not been very good. On May 2nd his team were crowned champions of the English Premier League, a competition more watched than any other on the planet, and reliably won—including in every one of the preceding 20 years—by one of four much bigger clubs. The Foxes had been 5,000-to-1 to win the title on the season's opening day.

Sports obsessives will spend the summer debating how the cunning Foxes did it—swift counter-attacks, regular interceptions and deep defence all helped on the field—and if their good form can be sustained. But Leicester's triumph will also spark inordinate interest in the world of business, which has long looked to sport for lessons on management and leadership. Sir Alex Ferguson, a wildly successful former boss of Manchester United, has taught courses at Harvard Business School. Billy Beane's use of statistics at the Oakland Athletics, a baseball team with limited means, was an early parable of the power of "big data"; Mr Beane now sits on the board of Netsuite, a software firm. Steve Peters, a psychiatrist who has worked with a range of elite athletes, runs programmes promising to help stressed business folk manage their "inner chimp". It's a fair bet that Mr Ranieri will be asked onto the corporate-speaking circuit next year, or urged to pen a book on leadership ("I, Claudio", anyone?).

He can certainly draw on several management themes to offer up lessons for the boardroom. Business leaders are routinely exhorted to learn from, and even celebrate, their mistakes. Walt Disney's early bankruptcy is said only to have strengthened his resolve to succeed. Henry Ford called

blunders necessary for achievement. And Bill Gates has declared success a much lousier teacher than failure. Mr Ranieri, who is 64, took over at Leicester last July and brought 30 years of experience as a manager. He had never won anything notable in England before, being known as a “nearly man” for finishing second in the Premier League when he coached Chelsea. One big criticism then was that he fiddled too much with his team choices, a trait that earned him the nickname “The Tinkerman”. At Leicester, however, he resisted meddling. It can be hard to know precisely what to change; Mr Ranieri, by design or good fortune, found the right thing to adjust.

The club’s story will be seized on by management gurus as a reminder of an increasingly popular business theme: that the opportunities for smaller fry to emulate giants have got bigger, thanks to technology. Where it once took hefty budgets and in-house data centres for retailers like Walmart to analyse sales data and lure shoppers to out-of-town malls, for example, now cloud computing means that smaller firms can crunch data to draw likely buyers to their wares online. Leicester, too, adopted the approaches of the biggest football clubs in using new technology and analysing lots of data on how players perform.

Mr Ranieri might also reflect that not succeeding in one area can be helpful—if you can then focus on doing better elsewhere. The team fared badly in cup competitions, but was then free to concentrate on winning league games. In business, too, avoiding distractions and focusing on the “core” is a well-worn management theme. Total, a huge French energy company, had hoped to get into gas production in America, but is now thankful it missed out. More deliberately another French firm, Kering, has withdrawn from general retailing in the past few years—selling off brands such as Printemps, Fnac and Conforama—and now specialises in far more lucrative luxury goods.

Finally, there are the lessons to be reeled off from Mr Ranieri's own relaxed management style. In training sessions he used an invisible bell—calling out “dilly ding, dilly dong”—to keep his team focused; he bought them all pizza when they performed well. The result was to cultivate a particularly strong sense of team spirit. Tech firms are well-versed in team-building tricks, using perks such as food, nap pods and idiosyncratic slang (“Googlers”, “Softies” and “Amazonians”) to bind employees together. As expectations and pressure grew, Mr Ranieri downplayed his team's ambitions. Modesty in public can be shrewder than hyping up expectations. Plenty of unicorns will end up regretting claims that they are about to change the world.

| *No “T” in Leicester*

There is another way of looking at Leicester's triumph, however, and one that the self-deprecating Mr Ranieri might endorse. “The Halo Effect” (2007), a book on management delusions by Phil Rosenzweig, argued that great performance by a business often leads to managers being feted for their brilliance, just as poor performance sees them pilloried for their bad decisions. In truth, it is very hard to identify the sources of outperformance, and success is not necessarily the result of things a manager can control. Luck, in the form of a lack of injuries, played its part in Leicester's success; so too did the shortcomings of rivals. It is easier to cultivate team spirit when you are winning. Mr Ranieri himself has not suddenly gone from good to great: he has been using his imaginary bell to decent effect throughout his career.

The big test for Leicester will be if they can sustain their success. Being champions will bring a financial fillip: a prize of about £90m (\$131m), which is a share of the £1.7 billion the league gets in broadcast income yearly. Other blessings will follow. Leicester will now also play (for a while) in the Champions League, generating more income. But unglamorous clubs

have previously won the Premier League, only to revert to relative mediocrity. Blackburn Rovers triumphed in 1995, but now languish in a lowlier division; most fans, and players, will remain keen on the biggest clubs. Winning the league has gone far beyond most expectations. But if Leicester were to do it again, the Tinkerman really should get ready to lecture at Harvard. ■



熊彼特

狐狸怎么说？

人们会仔细研究莱斯特城的成功，汲取管理经验

就足球而言，克劳迪奥·拉涅利（Claudio Ranieri）这位和蔼可亲的意大利人已经找到了点石成金的秘方。拉涅利先生执掌着英格兰的一家足球俱乐部——历史上乏善可陈的莱斯特城。然而5月2日，他的球队夺得英格兰超级联赛冠军。英超联赛是地球上观看人数最多的比赛，并且非常稳定地——尤其是近20年来无一例外——由四大豪门之一夺冠。在本赛季开幕的当天，“狐狸”（译注：莱斯特城队绰号）夺冠的赔率是5000比1。

今年整个夏天，体育迷们都会争论这支狡猾的“狐狸”是如何成功的——快速反击、频繁抢断以及稳固防守都在球场上帮了他们的大忙——以及他们的大好形势是否能够持续。然而莱斯特城的胜利也会引发商界的强烈关注，因为后者长期以来都从体育竞技中汲取管理和领导经验。曼联极度成功的前任老板亚历克斯·弗格森爵士就曾在哈佛商学院授课。在经费不足的奥克兰运动家棒球队，比利·比恩（Billy Beane）对统计学的运用早早展现了“大数据”的威力。如今比恩先生是软件公司NetSuite的董事会成员。曾为多位精英运动员服务的精神科医师史蒂夫·彼得斯（Steve Peters）开办了一个项目，承诺帮助压力过大的商务人士管理他们“内心的黑猩猩”。我们可以打赌，明年必然有人请拉涅利先生到企业巡回演讲，或者催他写一本关于领导力的书（《我，克劳迪奥》，有人要买吗？）

他当然可以挑出几个管理话题，给董事会讲解一些经验教训。经常有人劝诫企业领导者说，要从自己的错误中学习，甚至还要歌颂它。有人说沃特·迪斯尼早期的破产只是坚定了他成功的决心。亨利·福特把错误说成是成功的必要条件。比尔·盖茨也说成功是比失败更糟糕的老师。64岁的拉涅利先生去年7月接手莱斯特城队，带来了他30年的管理经验。他之前从来没有在英国赢得什么响亮的头衔，当年执教切尔西时因获得英超联赛亚军而被称为“千年老二”。当时对他的一大批评是他对阵容调整太多，这让他背上了一个“补锅匠”的绰号。然而在莱斯特城，他忍住没有乱插手。要

知道到底应该改变什么可能很难，但不管是有意为之还是纯粹靠运气，拉涅利先生找对了应该调整的东西。

管理大师们会抓住这家俱乐部的故事，强调一种日益流行的商业主题：由于技术的出现，小人物有更多的机会来效仿巨头。比如以前，要想通过分析销售数据把顾客吸引到城外的商场，沃尔玛这样的零售商需要巨额的预算和自有的数据中心才能完成。而如今的云计算意味着小公司也可以榨取数据，把可能的买家引到自己的网上商店来。在利用新技术来分析大量的球员表现数据方面，莱斯特城队也采用了和顶级足球俱乐部一样的做法。

拉涅利的成功也许还反映出，在一个领域不成功可能反而是件好事——如果你之后可以集中精神把其他事做好的话。球队在杯赛中表现不好，但这样就可以专注于赢得联赛。在商业上，避免分心，专注于“核心业务”是一个老生常谈的管理话题。超大型法国能源公司道达尔（Total）一直希望进入美国天然气生产，但它现在庆幸自己错过了。更深思熟虑的一个例子是另一家法国公司开云集团（Kering），它在过去几年中撤出了百货零售业，出售了巴黎春天（Printemps）、法雅客（Fnac）和康夫罗马（Conforama）等品牌，而它现在专注的奢侈品业务利润就要丰厚得多了。

最后，从拉涅利自己轻松的管理风格中也可以汲取一些经验。在训练时，他用一个无形的铃铛——喊“嘀哩叮、嘀哩咚”来让球队保持专注，并在球队表现良好时给所有人买比萨饼，从而培育了非常强烈的团队精神。高科技公司都非常精通团队建设技巧，用食品、打盹舱和怪异的俚语

（“Googler”、“Softies”和“Amazonians”）来把员工凝聚在一起。随着期望和压力的增长，拉涅利刻意淡化了球队的雄心。在公众面前保持低调要比炒作预期来得精明。很多独角兽公司到头来都会后悔声称自己即将改变世界。

| 在莱斯特城没有“我”

莱斯特城的胜利还可以从另一个角度来观察，善于自嘲的拉涅利先生可能会同意。罗森维（Phil Rosenzweig）在描述管理误区的《光环效

应》（“The Halo Effect”，2007）一书中说，人们常常在企业业绩辉煌时认为管理者厥功至伟，而在业绩不佳时则对他们大加挞伐。事实上，要找到跑赢市场的原因非常难，而成功也不一定源自于管理者可以控制的东西。运气——体现为伤病不多，就对莱斯特的成功有所助力，对手的缺陷也是如此。连胜的时候要培养团队精神就比较容易。拉涅利本人也不是一夜之间就从优秀变成卓越：在他整个职业生涯中，一直使用那个想象中的铃铛效果都还不错。

莱斯特面临的最大考验，将是他们能否延续自己的成功。伴随冠军而来的是金钱上的刺激：约9000万英镑（1.31亿美元）的奖金，这是从联赛每年得到的17亿美元转播收入中分到的一份。其他好处也会接踵而至。莱斯特现在也可以参加（一阵子）冠军联赛，获得更多的收入。但以前也有不起眼的俱乐部赢得了英超联赛，后来却变得相对平庸。布莱克本流浪者队于1995年取得了胜利，但如今却在低级别联赛中衰颓。大多数球迷和球员总归是热衷于最大的俱乐部。获得联赛冠军远远超出了大多数预期，但如果莱斯特城想再创辉煌的话，补锅匠真的应该准备好去哈佛大学演讲了。■



Augmented reality

Here's looking at you

Smart glasses may have a big future at work

AHEAD of its time or just plain weird? Whatever the answer, Google last year stopped selling consumer prototypes of its controversial Google Glass, a camera-equipped head-mounted display resembling a pair of spectacles. Using a process known as augmented reality (AR), Glass can display in the viewer's line of sight information about what they are looking at, among other things.

What consumers found unusual, factories and other businesses may not. Workers are often required to wear odd-looking safety equipment, such as helmets and protective glasses. It is more normal to be filmed. And indeed, the workplace is where AR equipment is taking hold, which is why Google is revamping Glass with business uses in mind.

Engineers that work on and repair transformers that distribute electricity can spend up to half their time searching for technical data in assorted software, databases, activity logs and even old-fashioned filing cabinets, says Alain Dedieu, a vice-president in the Shanghai operations of Schneider Electric. The French multinational is now testing AR systems that make the technical information that is being sought appear before their engineers' eyes.

Schneider is doing this with headsets and tablet computers, both of which superimpose information onto an image of the object on either the lenses in the headset or the screen on a tablet. The system uses image-recognition software, and sometimes a bar code stuck on equipment, to determine what the piece of kit is. It then wirelessly fetches any data relevant to it, such as its optimum operating temperature, fluid levels and maintenance

history.

Software then “sticks” that information to the image on the screen, so that it disappears if the camera is turned to something else. The data reappear if the equipment comes back into view. Early results from China suggest AR can slash the amount of time engineers spend looking for information to about a tenth of current levels, says Mr Dedieu.

| *One in the eye*

In America, ITAMCO, an Indiana-based engineering company, has found similar benefits. Some of its operators use an AR system with Google Glass headsets. Having data automatically pop into their field of view saves enough time for two machine operators to do work that previously required three or four, says Joel Neidig, an ITAMCO technologist who has helped clients including Caterpillar and General Electric set up similar systems.

The use of AR systems in Europe is proving more difficult to implement because some unions deem the technology to be a sneaky way for management to monitor workers, says Mr Neidig. He maintains management wants to reduce accidents by ensuring workers see proper procedures and danger alerts.

Some European firms are using the technology. Siemens, a German engineering giant, is using JoinPad, an Italian firm, to set up an AR system to help with a number of tasks, including the prevention of hazardous and costly oil fires in high-voltage transformers. Productivity gains from AR are not always dramatic, but 20% or more is typical, says Nicolas Pezzarossa of JoinPad.

The technology still has room for improvement. Around 200 workers using AR on tablets at Newport News Shipbuilding in Virginia don't yet rely on it to find the exact location to install critical equipment. But it still beats

flipping through lots of paper diagrams and determining if one piece of equipment has to be installed above or below another, says Patrick Ryan, an engineer overseeing the roll-out of AR in building an aircraft-carrier and half-a-dozen submarines for the US Navy. Once the price of headsets come down, the firm may well start using them as well as tablets.

Headset prices are getting keener. Atheer, a Silicon Valley firm, will begin shipping its Air Smart Glasses to industrial users within a few months for some \$4,000; a current model for software developers costs \$9,000. The Smart Helmet, an AR headset made by DAQRI, a Los Angeles firm, is being used at KSP Steel in Kazakhstan. It costs \$10,000, but also doubles as a hard-hat and eye shield. It automatically switches off instructions if hand movements detected by the camera suggest that the user has learned what to do.

Headsets can also augment communications. Microsoft's HoloLens, an AR headset that is being used on the International Space Station, sends video of the astronaut's field of view to a tablet at mission control on Earth, where a technician can draw on the touchscreen—putting, say, a circle around a switch that has to be flipped—and have that circle appear in the astronaut's view. Vuzix, an American firm, is developing smartglasses for use in a variety of business locations, from warehouses to field training.

Augmedix, a San Francisco company, is developing a Glass-based system for hospitals and clinics. The idea is that rather than burying their head in a computer screen when a patient walks into the consulting room, a doctor will be able to look at them and see that person's medical history, prescriptions and other information in his field of view. Augmedix reckons the system can increase a doctor's productivity by more than 30%.

Whether people become comfortable with such devices in everyday life remains to be seen. It is not unusual for new technologies to take off in

business first, as mobile phones did and Apple Watches are with some firms using them to send employees messages. In the workplace, smart glasses are already less of a spectacle. ■



增强现实 看你的

智能眼镜可能有巨大商用前景

超越时代还是纯粹怪异？不管答案如何，谷歌已于去年停售了备受争议的消费者测试版谷歌眼镜，那是一款配备摄像头的头戴式显示器，看起来就像一副眼镜。利用一种名为“增强现实”（AR）的处理技术，谷歌眼镜可在佩戴者眼前显示诸多信息，比如所见事物的相关信息。

有些东西可能让普通消费者觉得奇怪，但工厂和其他企业也许却习以为常。工人往往需要穿上外观古怪的安全装备，比如头盔和护目镜。拍摄监控就更是常见。事实上，工作场所才是AR设备渐渐站稳脚跟的地方，这也是谷歌正着眼商用改进谷歌眼镜的原因。

工程师在调试和维修配电变压器时，往往需要把近半天时间花在从各种软件、数据库、调试记录甚至是老式的文件柜中搜寻技术数据，施耐德电气上海公司的副总裁阿兰·德迪埃（Alain Dedieu）说道。这家法国跨国公司正在测试AR系统，能够在工程师眼前实时显示所需的技术信息。

施耐德的系统利用头戴设备和平板电脑来实现，两者都可以在物体的影像上叠加信息，或显示在眼镜上，或显示在屏幕上。该系统利用图像识别软件，有时也凭设备上贴的条形码来判断使用了哪种设备。然后通过无线网络读取相关信息，如设备的最佳工作温度、液位水平及维护历史。

软件再把那些信息“贴”到屏幕影像上，当镜头转向其他物件时，信息就会消失。设备如果再回到视线内，相关数据也会重现屏幕。德迪埃表示，在中国的前期测试结果表明AR可减少工程师在搜寻信息上花费的时间，只需目前耗时的十分之一。

| 看在眼里

总部位于美国印第安纳州的工程公司ITAMCO已经发现了类似的好处。该

公司部分操作人员使用了谷歌眼镜AR系统。由于数据能自动出现在眼前，节省了很多时间，如今两名机器操作员就能完成以往需要三四个人做的工作，ITAMCO的技术员乔尔·尼迪格（Joel Neidig）说道。他曾帮助卡特彼勒和通用电气等客户建立类似系统。

目前看来，AR系统在欧洲的应用推广较为困难，因为有些工会认为此技术是管理层偷偷摸摸监视员工的一种方式，尼迪格说。他坚持认为，管理层只是希望确保工人看到适当的程序及安全警示，以减少事故的发生。

一些欧洲公司正在使用该技术。德国工程巨头西门子正采用意大利公司JoinPad建立的AR系统来辅助完成多项任务，包括防止危险且损失严重的高压变压器油起火事故。AR技术并不总是能让生产率大幅提升，但一般能达到20%或以上，JoinPad的尼古拉斯·佩扎罗萨（Nicolas Pezzarossa）说道。

该技术仍有提升的空间。在弗吉尼亚州的纽波特纽斯船厂（Newport News Shipbuilding），使用平板电脑AR技术的约200名工人尚未依赖该技术来精确定位安装关键设备。然而，采用AR技术还是比翻阅一大堆图纸，只为搞清楚两个设备谁在上谁在下要强，负责为美国海军在制造一艘航空母舰及多艘潜艇时推广AR系统的工程师帕特里克·瑞恩（Patrick Ryan）说。只要头戴式设备的价格降下来，这家船厂就很可能开始同时使用头戴式设备和平板电脑。

头戴式设备的价格也更加平易近人。硅谷公司Atheer将在几个月内开始向工业用户交付4000美元左右的Air智能眼镜，而目前面向软件开发人员的型号售价则为9000美元。洛杉矶公司DAQRI研发的一款AR头戴式设备“智能头盔”（Smart Helmet）已被哈萨克斯坦KSP钢铁公司（KSP Steel）采用。其售价为一万美元，但还可兼作普通安全帽及眼罩。如果头盔上的摄像头探测到的手势表明用户已经知道怎么做，它就会自动不再显示说明。

头戴式设备还可以辅助增强通讯。微软的AR头戴式设备HoloLens正为国际空间站所用，它能把宇航员的视野以视频形式传回地球上的太空任务控

制中心，显示在一台平板电脑上。技术人员可在触摸屏上写写画画，比如把某个需要按下的开关圈起来，那个圈就会出现在宇航员眼前。美国公司Vuzix则正研发智能眼镜，可以用于从仓库到在职培训等各类商业场所。

旧金山公司Augmedix正在为医院和诊所研发AR眼镜系统。其想法是，当病人走进诊室时，医生不用埋头看电脑，而是可以看着病人，其病历、处方及其他信息就会出现在眼前。Augmedix估计该系统可将医生的工作效率提高30%以上。

人们在日常生活中是否会接受这类设备还是未知数。新科技先在商用领域起飞并不稀奇，手机就是个例子，而也有一些公司在使用苹果手表向员工发送信息。在工作中，智能眼镜已经不再是那么稀罕的东西了。■



Crony capitalism

Dealing with murky moguls

How to disentangle business from government

THE past 20 years have been a golden age for crony capitalists—tycoons active in industries where chumminess with government is part of the game. As commodity and property prices soared, so did the value of permits to dig mines in China or build offices in São Paulo. Telecoms spectrum doled out by Indian officials created instant billionaires. Implicit state guarantees let casino banking thrive on Wall Street and beyond. Many people worried about a new “robber baron” era, akin to America’s in the late 19th century. They had a point. Worldwide, the worth of tycoons in crony industries soared by 385% in 2004-14, to \$2 trillion, or a third of total billionaire wealth; much of it (though by no means all) in the emerging world.

Now cronies are on the back foot. Their combined fortunes have dropped by 16% since 2014, according to our updated crony-capitalism index. One reason is the commodity crash. Another is a backlash from the middle class. Corruption scandals have lit a fire under governments in Brazil and Malaysia. Elsewhere, pressure is coming from the top down. India’s reforming prime minister, Narendra Modi, is trying to subject his partly closed economy to a blast of competition. Xi Jinping, China’s autocrat, thinks graft is the big threat to one-party rule, and is trying to root it out.

Crony capitalism—or “rent-seeking”, as economists call it—shades from string-pulling to bribery. Much of it is legal, but all of it is unfair. It undermines trust in the state, misallocates resources and stops countries and true entrepreneurs from getting rich. So the dip in crony activity is welcome. To stop it roaring back, governments need to seize the moment.

A few will not want to. Cronyism is central to Vladimir Putin's vision of Russia, the country that scores worst in our ranking. Others, though goaded by public anger at inequality and corruption, will find it hard to confront vested interests. On April 29th Mexico's Senate failed to pass two anti-corruption measures. Often the biggest difficulty is knowing where to start. It is all very well to demand efficient courts, fair regulators and an end to illicit political funding. These matter, but are the work of generations.

| *The quickest fixes*

So governments should focus on four quicker steps. The first is to take care when public resources pass into private hands. Botched privatisations created Russia's oligarchy—and many cronies elsewhere. Mexico is opening up its oil monopoly; Saudi Arabia plans to; and other developing countries, from Brazil to India to China, may privatise state-controlled firms to raise cash and improve efficiency. Unless the sales are fair, a new generation of cronies will be born.

Second, governments must rein in state-owned banks. In the past decade state-lending booms in Brazil, India and China have enriched well-connected moguls—and built mountains of bad debt. Rather than prop up the banks, governments should overhaul the way they are run.

The third step is to make it harder to stash crony cash overseas. Global capital flows have made the world richer, but also allowed cronies to hide in tax havens. Public registers of "beneficial ownership"—the humans behind the trusts and shell companies—would make that harder. This is on the agenda of an anti-corruption summit in London in May.

Finally, be prepared for cronyism to adapt. China's epic industrial boom will not be repeated; the days of making billions by shipping iron ore from Goa to Guangdong are over. Technology may be cronyism's next frontier. It is ripe for rent-seeking: profits are huge and monopolies arise naturally.

Governments should not seek to micromanage tech firms, but ought to push vigorously for competition and transparency.

America's original robber barons provoked a reaction that led to the Progressive era. At the turn of the 20th century, politicians passed antitrust laws and corruption ebbed. America became richer, stronger and more politically stable. Emerging economies face a similar moment. They should not waste it. ■



权贵资本主义

对付阴暗的巨头

如何让商业摆脱政府

过去20年是权贵资本家的黄金时代——在这些富豪所处的行业，与政府的亲密关系不可或缺。随着大宗商品和房地产价格飙升，在中国开采矿山或是在圣保罗兴建办公楼的许可证也变得千金难求。印度官员发放的电信频谱瞬间造就了一批亿万富翁。隐性的政府担保让赌博式银行在华尔街和更多的地方兴起。很多人担心会出现一个类似于19世纪末美国的新“强盗大亨”时代。这确实有道理。在世界范围内，裙带行业富豪的身价在2004-2014年猛增了385%，达到2万亿美元，占有所有亿万富翁财富的三分之一，其中很大一部分（虽然绝不是全部）出现在新兴世界。

不过现在权贵们处于守势。根据我们最新的权贵资本主义指数，他们的整体财富自2014年以来下跌了16%。一个原因是大宗商品崩盘，另一个原因则是中产阶级的强烈反弹。腐败丑闻在巴西和马来西亚政府的屁股下点了一把火，而在其他地方，压力则是自上而下的。印度改革派总理纳伦德拉·莫迪正在努力把部分封闭经济置于爆发性的竞争中。在中国独裁的习近平则认为贪污是一党统治的巨大威胁，并试图铲除它。

权贵资本主义，或经济学家口中的“寻租”，可以有暗中操纵或是贿赂等多种形态。其中很大一部分是合法的，但绝不是公平的。它破坏了对国家的信任，错误地分配资源，并让国家和真正的企业家无法致富。因此，打击权贵活动受到了欢迎。为了阻止它卷土重来，政府需要抓紧时间。

但还有一些人不这么想。任人唯亲是弗拉基米尔·普京的俄罗斯战略的核心，该国在我们的榜单中排名垫底。有些人虽然迫于公众对不平等和腐败的熊熊怒火，却很难直面既得利益者。4月29日，墨西哥参议院未能通过两个反腐败措施。最大的困难往往是不知从哪里下手。要求法院高效，监管机构公平和消灭非法政治献金当然都非常好，这些问题也确实很重要，但都需要几代人的努力。

| 快速补救措施

所以，政府应该集中精力，采取四个快速步骤。首先是盯紧公共资源私有化的过程。拙劣的私有化造就了俄罗斯的寡头政治，也在许多其他地方造就了权贵。墨西哥正在开放其石油垄断，沙特阿拉伯亦有此意。从巴西到印度再到中国，另外一些发展中国家可能会将国有控股企业私有化，以便筹集资金，提高效率。除非销售是公平的，否则新一代权贵必将诞生。

其次，政府必须约束国有银行。在过去的十年中，巴西、印度和中国国家主导的借贷猛增让关系紧密的巨头们大发其财——也带来了堆积如山的坏账。政府不能一味支持银行，而应该彻底转变其运营方式。

第三步是让权贵更难把现金藏匿到海外。全球资本流动让世界变得更加富有，也让权贵们得以躲藏在避税天堂。公开登记“受益所有权人”——信托和空壳公司背后的自然人——会让这变得更困难一些。这已经列入了本月在伦敦召开的反腐败峰会的议程。

最后，要为权贵们的对策做好准备。中国史诗般的产业热潮不可重复，把铁矿石从果阿运到广东就能豪赚亿万的日子一去不复返。技术可能是权贵们的下一个阵地。它已经是成熟的寻租场所——利润巨大，垄断自然出现。政府不应当试图对科技公司进行微观管理，而是应该大力推动竞争和透明度。

美国最初的强盗大亨引起的反应导致了进步时代的出现。在19世纪末，政治家们通过了反托拉斯法，遏制了腐败。美国变得更富有，更强大，政治也更稳定。新兴经济体如今面临着类似的时机，不应把它白白浪费。■



Chinese loans to Africa

Credit limit

New data suggest that China lends less to Africa than is commonly assumed

CHINESE loans to Africa generate frenetic commentary. Some say they prop up dictators; others, that they spur development. The figures quoted are often enormous. Visiting South Africa in December, for example, Xi Jinping, China's president, pledged \$60 billion in funding to Africa, mostly in the form of loans and export credits.

But don't be dazzled by the headlines, say researchers at the China-Africa Research Initiative (CARI), based at Johns Hopkins University in America. Since 2007 they have been trying to track the African lending of China's notoriously opaque state-owned banks. Their findings suggest that China lends much less to Africa than is commonly reported.

The researchers doggedly followed up 1,223 reports of Chinese loans, looking for evidence like the start of works or a notice on an official website. They found that only 56% of the loans actually materialised. In 2011 Fitch, a rating agency, reported that over the previous decade the China Export-Import Bank had lent more than the World Bank to sub-Saharan Africa. In fact, say the CARI team, the World Bank has been the bigger lender every year in the past decade bar two, although Chinese lending is catching up (see chart).

There are other surprises, too. China-watchers sometimes talk of an "Angola model": low-interest loans, using commodities as collateral. Oil-rich Angola has indeed received more Chinese loans than any other African country: it accounts for a quarter of the \$86.9 billion lent to African governments and state-owned enterprises between 2000 and 2014. But across the continent only about a third of Chinese loans were tied to

natural resources, says Deborah Brautigam, who led the research project. The second-biggest borrower was resource-poor Ethiopia, which is apparently deemed a good investment thanks to its China-like approach to development. ■



中国对非贷款 信用额度

新的数据表明，中国对非贷款要比通常认为的少

中国对非洲的贷款引发了评论的狂潮。有人说它们是在给独裁者撑腰，也有人说它们促进了发展。这些评论中引述的数字往往很大。比如，在2015年12月访问南非期间，中国国家主席习近平承诺为非洲提供600亿美元资金支持，主要是以贷款和出口信贷的形式。

但是，不要被新闻标题冲昏了头脑，总部设在美国约翰·霍普金斯大学的中国—非洲研究计划（China Africa Research Initiative, CARI）的研究人员说。自2007年以来，他们一直试图跟踪中国国有银行素以不透明著称的对非贷款。他们的研究表明，中国借给非洲的钱比通常报道的要少得多。

研究人员坚持不懈地跟踪了1223份中国贷款报告，并寻找工程启动或官方网站通告等证据。他们发现，仅有56%的贷款最终落实。2011，评级机构惠誉（Fitch）报告说，在过去十年中，中国进出口银行对撒哈拉以南非洲的借款已经超过了世界银行。然而CARI团队表示，事实上在过去十年中，世界银行只有两年不是最大的贷款方，虽然来自中国的贷款正在迎头赶上（见图）。

惊人之处还不止于此。中国观察家有时会谈到“安哥拉模式”：使用商品作抵押的低息贷款。石油资源丰富的安哥拉拿到的中国贷款确实比其他任何非洲国家都多：在2000年至2004年间借给非洲各国政府和国有企业的869亿美元中，它占了的四分之一。但领导研究项目的德博拉·布劳提干（Deborah Brautigam）说，纵观非洲大陆，中国贷款中大约只有三分之一与自然资源挂钩。第二大借款人是资源匮乏的埃塞俄比亚，它显然是由于发展模式与中国类似才被认为是良好的投资对象。■



Banks and state aid

The rule of law

Italy has been flirting with a banking crisis—and Brussels is partly to blame

ATLAS could hold up the sky. Atlante, Italy's bank-rescue fund, looks like a weakling. The fund, which raised €4.25 billion (\$4.9 billion) last month, almost half of it from Italy's two largest banks, has two purposes. One is to act as an emergency investor in banks starved of funds; the other is to kick-start a market in dud loans clogging up banks' balance-sheets. On both counts, the fund has not done enough to calm nerves. Italy should have acted sooner to sort out its banks. But Europe's approach to financial crises is also to blame.

Italian officials talk about the fund as a “game-changer”—partly because it has already pulled off a rescue of Banca Popolare di Vicenza (BPVi), a regional bank whose initial public offering (IPO) flopped. But that only underlines how close Italy has come to disaster. BPVi's IPO had been fully, and foolishly, underwritten by UniCredit, Italy's largest bank: had not the fund stepped in, UniCredit itself might have run short of capital. A banking crisis at the heart of the euro zone might by now have been raging. As it is, the BPVi's rescue has depleted Atlante's firepower. More calls on its cash may be imminent—an IPO by Veneto Banca hardly has investors swooning.

Defenders of Atlante pooh-pooh the critics. The fund has seen off the immediate risk of a crisis, they say, and enough money is left to put a big dent in Italy's €360 billion of gross non-performing loans (NPLS). Specifically, Atlante is meant to help close the gap between the value that banks put on such assets and the price that investors in distressed debt will pay for them. It is supposed to accomplish this by acting as a junior investor in financial instruments that bundle banks' bad debts together; by buying the riskiest slices of these investments, it will reduce the chance of

losses for those higher up the ladder of investors. The theory is fine. But the appetite of those other investors is unproven. And as the amount of equity in Atlante goes down, so does the amount of risk it can take on.

In the meantime, it is true that the number of duff loans in the system has stabilised and that banks have set aside lots of provisions. A new bankruptcy law, by bringing down the time needed to foreclose on loans, ought to encourage investors to buy NPLs from banks. But gross non-performing loans still make up around 18% of total loans, equivalent to a fifth of Italy's GDP. And the law applies directly only to new lending; its impact on the stock of bad loans will be more muted.

| *State flayed*

If Atlante is an unconvincing answer to Italy's woes, that is partly the country's own fault. It stood by as NPLs soared. But blame also lies with Europe's new rules for handling banking crises. Tighter restrictions on state aid have prevented Italy from setting up a government-backed "bad bank" of the kind that Spain used to cleanse its banks. In late 2015 the European Commission also ruled that tapping Italy's deposit-insurance fund to recapitalise four troubled lenders would count as state aid. If the commission concludes that state aid has been given, it automatically means that a bank is deemed to be failing, or close to it, triggering Europe's new "bail-in" regime. That in turn starts to hand out losses to shareholders and creditors (retail investors among them), risking contagion at other banks. Atlante exists because Italy has precious few alternatives.

The new rules are well-intentioned. State aid can distort competition; bail-in is designed to protect taxpayers from paying for bank failures. But in this instance the outcome is perverse. The Italian state is being forced, in effect, to stand back while its better banks risk being poisoned by the weaknesses of its worse ones. As a result the euro zone's third-largest economy, and its second-largest public debtor, has been made more vulnerable to a banking

crisis. Given a choice between financial stability and the rule book, ditch the rule book. ■



银行与国家援助

法规有瑕

意大利银行业危机隐现，部分应归咎于布鲁塞尔

希腊神话中的亚特拉斯是擎天之神。然而意大利语中同名的亚特兰特（Atlante）银行救助基金看起来却有点弱不禁风。它于上月募资42.5亿欧元（49亿美元），几乎半数都来自意大利最大的两家银行。设立这一基金的目的有二：其一是在银行资金紧缺时充当紧急投资者，其二是在不良贷款充塞银行的资产负债表时对市场注入活力。但无论哪方面，该基金所做的都不足以安抚大家的神经。意大利早就应该采取行动来搞定它的银行。但欧洲应对金融危机时的做法也难辞其咎。

意大利官员称该基金“改变游戏规则”——一部分是因为它成功挽救了维琴察人民银行（Banca Popolare di Vicenza, BPVi），这家区域性银行的首次公开募股（IPO）以失败告终。但是，这正突出了意大利离灾难只有半步之遥。BPVi的IPO由意大利最大的银行——意大利联合信贷银行

（UniCredit）愚蠢地全额包销。要是没有该基金介入，联合信贷银行本身都可能陷入资金短缺的困境，一场银行危机就可能已经在欧元区的心脏肆虐了。事到如今，救援BPVi已经大量消耗了亚特兰特的弹药。它的现金也许马上又要派上用场——几乎没有什么投资者对威尼托银行（Veneto Banca）的IPO心驰神往。

亚特兰特的捍卫者们对批评嗤之以鼻。他们说，该基金已经消除了眼前的危机风险，而且还留下了足够的钱，可以把意大利总计3600亿欧元的不良贷款（NPL）砍掉一大块。具体来说，亚特兰特可帮助弥合银行对这些资产的估值与问题债务投资者的出价之间的鸿沟。它的做法应该是作为一个次级投资者，购买把银行坏账捆绑在一起的金融工具。在购买了这些投资中风险最大的部分后，它就能减少那些优先层次较高的投资者出现损失的机会。理论上这能说得通，但是其他投资者的胃口如何还有待验证。随着亚特兰特的资产净值下降，它能承担的风险也越来越小。

在此期间，系统中劣质贷款的数量确实已经稳定，银行也有了大量拨备。新的破产法减少了贷款止赎所需要的时间，这理应鼓励投资者从银行购买不良贷款。然而不良贷款的总额仍占贷款总额的18%左右，相当于意大利GDP的五分之一。而且法律只能直接适用于新的贷款，其对存量不良贷款的影响将更加微弱。

| 国家束手

如果亚特兰特并不能令人信服地解答意大利的困境，部分是意大利自身的过错，因为它对不良贷款的飙升袖手旁观。不过这也要怪欧洲处理银行危机的新规则。更严格的国家援助限制阻碍了意大利设立政府支持的“坏账银行”，就像西班牙用来清理银行的那种。2015年末，欧盟委员会还裁定，利用意大利的存款保险基金注资四家陷入困境的贷款人也要算作国家援助。如果委员会得出结论，认为已经进行了国家援助，就自动意味着将这家银行视为崩溃或接近崩溃，从而触发欧洲新的“内部纾困”制度。这反过来会把损失分配给股东和债权人（其中包括散户投资者），而这又有把危机传染到其他银行的风险。亚特兰特之所以存在，是因为意大利几乎已经别无他途可走。

新规则本是用心良苦。国家援助会扭曲竞争，而内部纾困的目的则是保护纳税人不用为银行倒闭买单。但在这个例子中，结果却与其初衷背道而驰。在意大利较好的银行被糟糕的银行拖累时，国家却被迫置身事外。这让身为欧元区第三大经济体和第二大公债债务国的意大利更容易出现银行业危机。要在金融稳定和法规条文之间选择的话，还是把条文扔了吧。■



Buttonwood

A chronic problem

Ideas for reducing the debt burden

DEBT levels grew spectacularly in the rich world from 1982 to 2007. When the financial crisis broke, worries about the ability of borrowers to repay or refinance that debt caused the biggest economic downturn since the 1930s.

It could have been worse. The danger was that, as private-sector borrowers scrambled to reduce their debts, the resulting contraction in credit would drive the world into depression. Fortunately, this outcome was averted. First, the governments of rich countries allowed their debts to rise, offsetting the reduction in private debt. In addition, emerging markets (notably China) continued to borrow. So there was no global deleveraging; quite the reverse (see chart). Central banks also helped, slashing interest rates to zero and below. Although lower policy rates have not always resulted in cheaper borrowing costs (in Greece, for example), debt-servicing costs have fallen in most developed countries.

Although this approach has staved off disaster, it has not got rid of the problem, as a research note from Manoj Pradhan, an economist at Morgan Stanley, makes clear. “High debt forces interest rates to stay low, which encourages yet more debt,” Mr Pradhan writes. Central banks dare not push interest rates up too quickly for fear of causing another crisis; hence the stop-start nature of the Federal Reserve’s statements on monetary policy. The developed world seems stuck with sluggish growth and low rates.

In health terms, the disease is chronic, not acute. A lurch into another global crisis, Mr Pradhan reckons, would require three ingredients. First, the assets financed by the debt build-up would need to fall sharply in price or prove uneconomic. Second, the debtors would have to be concentrated

in big, globalised economies. Lastly, global investors would have to be heavily exposed to the debt in question. All this was the case in 2007-08, as debt secured by American housing turned bad, raising doubts about the health of the Western banking system.

This time round the debtors are in different places. Some of them are emerging-market governments and commodity producers. But, except for China, none of these is crucial to the world economy. And China's debts are mainly in domestic hands, rather than widely dispersed in the portfolios of international banks, pension funds and insurance companies.

Large, rich countries are systemically important, and their government debt is at the heart of most institutional portfolios. If a President Trump were to follow through on his confusing statements about buying back Treasury bonds for less than face value, that would trigger a crisis. In the absence of such a cataclysm, and with the support of central banks, governments that have borrowed in their own currency should not face an imminent problem.

But that doesn't mean getting rid of the debt will be easy. Debt has been inflated away in the past, but central banks are still struggling to meet their current inflation targets of 2% or so. It is not clear that governments, which set the mandates central banks must follow, would be willing to put up with the high rates of inflation needed to reduce the real value of debt substantially, even if central banks could find a way of generating it. Debt forgiveness (the old idea of a jubilee) sounds good in theory. But writing off either private-sector or government debt could cripple the financial sector, creating the very crisis the measure was designed to avoid.

Morgan Stanley has some alternative suggestions. One would be to replace debt with equity-like capital. In the public sector, governments could issue GDP-linked bonds, akin to the inflation-linked debt that America, Britain

and others already offer. If a bond's repayment value is linked to real GDP, then governments would be spared the crippling surge in debt-to-GDP ratios that occurs during recessions. Governments could also issue irredeemable debt, or "consols", which eliminate the risk of a refinancing crisis.

In the private sector, equalising the tax treatment of equity and debt would be a good idea, although tricky to implement. Creating "shared-responsibility mortgages", in which lenders take an equity stake in the homes they finance, would make borrowers less vulnerable to house-price declines.

All these ideas seem sensible, but they can be applied only to newly issued debt, not to the mass of obligations that has already been accrued. So they will help only over the long term. The next global debt crisis will almost certainly occur before they become widespread. ■



梧桐

慢性病

为减债支招

在1982至2007年间，发达国家的债务水平增长蔚为壮观。金融危机爆发时，对借款人还债或债务再融资能力的担忧，导致了1930年以来最大的经济衰退。

本来情况还可能更糟。危险在于，由于私营部门借款人争相减少他们的债务，其导致的信贷收缩会把世界经济带入萧条。幸运的是我们避免了这一结果。首先，富裕国家的政府允许其债务上升，抵消了私人债务的减少。此外，新兴市场（尤其是中国）继续借钱。所以全球的去杠杆化并未发生，而是完全相反（见图）。央行出手相救，将利率削减至零甚至更低。虽然政策利率低未必意味着借贷成本降低（比如希腊），但大多数发达国家的偿债成本都有所下降。

虽然这种方法阻止了灾难，却并没有解决问题，摩根士丹利的经济学家马诺·普拉丹（Manoj Pradhan）在一份研究报告中明确指出了这一点。“高负债迫使利率维持在低位，而这又鼓励更多的债务。”普拉丹写道。因担心引发另一场危机，央行不敢升息太快，美联储对货币政策的态度也因此踟蹰不前。发达国家似乎困在了缓慢增长和低利率上。

用医学的术语来说，病症是慢性的，不是急性的。普拉丹认为，需要备齐三种因素才会滑向另一场全球性危机。首先，依赖债务融资的资产必须要价格大幅下跌，或被证明效益不佳。第二，债务人必须集中在大型全球化的经济体。最后，全球投资者必须大规模持有这些债务。2007至2008年，由美国住房担保的债务出问题，这三条都满足了。这让人们对西方银行系统的健康状况感到担忧。

这次的债务人则是在别的地方。有些是新兴市场国家的政府及大宗商品生产商。不过除中国外，它们中没有一个对世界经济有致命的影响。而中国

的债务主要集中在国内，而不是广泛分布在国际银行、养老基金和保险公司的投资组合中。

富裕的大国具有系统重要性，其政府债务是大部分机构投资组合的核心。如果特朗普成了总统，得以实施他关于低于面值回购国债的混乱说法，就可能引发危机。如果没有发生这种灾难，在央行的支持下，以本国货币借贷的政府应该不会有燃眉之急。

但是，这并不意味着摆脱债务轻而易举。通胀在过去曾经消解过债务，但央行如今想要来达到2%左右的通胀目标都不容易。就算央行有办法制造通胀，我们也不知道为央行规定授权的政府是否愿意定下高通胀率来大幅削减债务的实际价值。债务减免（“大赦”的古老观念）在理论上听起来不错，但免除私营部门或是政府债务可能会重创金融业，由此造成的危机正是这些措施本要避免的。

摩根士丹利还有些其他的建议。其中之一是用权益类资本来替代债务。在公共部门，政府可以发行与GDP挂钩的债券，类似于在美国、英国和其他一些国家发行过的与通胀挂钩的债券。如果债券的偿付价格与实际GDP挂钩，那么在经济衰退期间，政府就不会面临债务与国内生产总值之比激增的可怕问题。政府还可以发行不可兑现债券，即“永续债券”，这消除了出现再融资危机的风险。

对私营部门而言，平衡股权和债务的税务处置会是个不错的主意，但实施起来会很棘手。建立“共同责任抵押贷款”，即贷款人在其资助的房屋中拥有一定的股权，会使得借款人更不容易受到房屋价格下跌的影响。

所有这些想法似乎都合情合理，但它们只适用于新发行的债券，而非那些已经累积起来的庞大债务，因此它们只会在长期有所帮助。在这些举措普遍推行之前，下一次全球债务危机几乎肯定会发生。■



Planemakers

The eye of the storm

Building a new plane to take on Airbus would be a huge risk for Boeing

BOEING'S factory at Everett, near Seattle, is the largest building in the world, as befits the world's biggest planemaker. From within its cavernous halls a new passenger jet emerges every working day. After an empty fuselage enters at one end of the factory, it can take as little as a month for some models to emerge as a working aircraft at the other end. Still, Boeing's lead in the field of commercial airliners, which looked almost unassailable a decade ago, is under threat from Airbus.

Since 2012 the European firm has won more orders than Boeing, and may eventually outpace it in annual deliveries. For Boeing, which celebrates its centenary this year, staying ahead of a competitor which has been in business for less than half that time is a matter of pride as much as it is a commercial imperative.

One option under consideration at Boeing is to build a new plane for the "middle of the market", to replace its ageing 757. An aircraft that would carry between 220 and 280 passengers on routes up to 5,000 miles would plug a gap in its fleet, between short-haul narrow-body jets and wide-bodied planes for long-haul travel. But Boeing should be wary of the risks involved. Airbus has outclimbed its American counterpart largely because Boeing made such a mess of developing another new plane, the 787 Dreamliner, a long-haul jet that entered service in 2011.

The Dreamliner programme, announced in 2003, was supposed to cost \$6 billion and see the plane take to the air in 2008. The final bill was closer to \$32 billion; and the 787 arrived three years late, the result of a combination of technical failures and supply-chain snafus. With engineers, designers

and other resources diverted into getting the Dreamliner aloft, plans for the rest of its fleet were delayed.

That gave Airbus an opportunity to take a lead in narrow-bodied jets. Boeing's 737 and Airbus's A320 family of planes typically carry 120-200 passengers on shorter hops of up to 3,000 miles. These planes are the biggest sellers at both firms. Two-thirds of the planes delivered by Boeing last year and nearly four-fifths of Airbus's were narrow-bodies.

In 2010 Airbus took Boeing by surprise with the announcement that it would update its A320 with new engines and tweaks to its design, making it 20% more fuel-efficient than previous models. Preoccupied with the 787, Boeing was slow to respond with its own revamp, the 737MAX. Airbus now has 5,479 orders for its family of A320neo planes, the first of which entered service this year. Boeing has just over 3,000 orders for its new plane, the 737MAX, which is not destined for first delivery until next year.

Boeing's troubles with the 787 also helped Airbus in the market for wide-bodied jets. Boeing remains ahead of Airbus, with 1,357 orders for its fleet compared with 1,267 for Airbus's range. Although the pair sell far fewer of them, wide-bodied planes bring handsome rewards. Some 80% of Boeing's revenues came from wide-bodies in 2014, though they account for just a third of production by number of planes. The delays and cost overruns of the Dreamliner programme mean that, although it is selling well, it is not profitable and a write-down is likely. There have been knock-on effects: a new variant of Boeing's 777, the 777X, is not due until 2020, giving Airbus's A350 time to win orders.

Analysts think Boeing's engineers have enough to do until 2020 revamping the 737 and 777 successfully, without other distractions, says Jason Gursky of Citi, a bank. And the damage inflicted by the 787 will make Boeing think twice about designing a new plane to sit between its long- and short-haul

models. Airbus's experience with the A380 superjumbo, developed at huge expense but not yet with enough orders to justify its existence, offers another warning. It is also unclear that the market will be big enough to justify a new plane: some airlines are already ordering long-range versions of Airbus's A321neo or smaller versions of the A330 to plug the gap. (Putting a new engine on the plane, a much less risky option, is impossible with the 757, because the airframe is too old to accommodate new fuel-efficient engines.)

| *Cutting aside*

Other routes to boosting Boeing's market share lie open. Cost reduction is one. Airbus out-competes Boeing by using a fifth fewer employees to build each plane. So Boeing is slimming. In March the firm said it would cut the workforce in its commercial-jet division by 10%—a loss of 8,000 jobs—and investors are demanding more. Machines are replacing manpower: robots rather than humans now rivet together and seal the wings for the 737 and 777.

Changing working practices will improve productivity too, says Walter Odisho, Boeing's vice-president for manufacturing. Moving production lines of the sort seen in car factories are being rolled out by the planemaker in Seattle. And to save time workers spend walking round the factory floor, employees are being given hand-held computers and automated trollies, so they can communicate with their managers and get the tools they need without stepping off the production line.

The planemaker says that it is unlikely for several years to take a firm decision on whether to proceed with a new plane. But Boeing has two overriding instincts: developing new planes and beating Airbus. It will need to resist the first for a while in order to do the second. ■



飞机制造商

风暴眼

为对抗空客打造新飞机，对于波音来说可能是个巨大的风险

位于西雅图附近埃弗雷特（Everett）的波音工厂是世界上最大的建筑，正配得上世界上最大的飞机制造商。每个工作日，宽敞的车间里都会出现一架新客机。当空机身从工厂一端进入后，有的机型仅需一个月就可以功能齐备地从另一端出厂。不过，波音在商业客机领域的领先地位在十年前看来还稳如泰山，如今却受到空客的威胁。

自2012年起，这家欧洲公司赢得的订单比波音更多，而且在每年交付量上可能最终会超过波音。波音今年将迎来百年华诞，对于它而言，领先于一个经营时间不足自己一半的竞争对手事关尊严，在商业上也不容有失。

波音正在考虑的一个做法是为中端市场制造一款新机型，替代日渐老化的757。这款能够承载220名至280名乘客、最大航程5000英里的飞机，将填补波音产品线在短程窄体客机和远程宽体客机之间的缺口。但波音应当时刻提防其中的风险。空客之所以能超越它的美国对手，很大原因是波音在研发另一款新机型——2011年投入使用的远程喷气式客机波音787“梦想飞机”时弄得一团糟。

“梦想飞机”项目于2003年宣告启动，原预计投入60亿美元并于2008年实现首飞。但最终耗资近320亿美元，延迟3年才下线。其原因既有技术上的失败，也有供应链的混乱。由于工程师、设计师和其他资源当时都投入到“梦想飞机”的建造上，波音其他机型的计划均被推迟。

这给了空客在窄体客机上领先的机会。波音737和空客A320系列机型通常可搭乘120至200名乘客，用于最多3000英里的短途飞行。这些飞机对于两家公司而言都是最畅销的机型。窄体客机在波音去年交付的飞机中占三分之二，对空客而言更是占到了近五分之四。

2010年空客给了波音出奇一击，宣布将为A320升级新引擎，并对设计进行微调，使其油耗相比之前的机型降低20%。波音当时一心专注于787，很久以后才推出改进机型737MAX作为回应。目前空客有5497架A320neo系列机型的订单，首架此款飞机去年已投入使用。波音的新机型737MAX仅有3000架订单，首批要到明年才能交付。

波音在787上的麻烦也在宽体客机市场上帮了空客的忙。波音的订单为1357架，仍然领先于空客的1267架。尽管两家公司出售的宽体客机在数量上要少得多，但回报却颇为丰厚。2014年，虽然波音生产的宽体客机数量仅占总产量三分之一，却贡献了约80%的收入。“梦想飞机”项目的多次延期和成本超支意味着尽管它很畅销，但并不赚钱，而且还可能要减记损失。这一项目已经产生了连锁反应：波音777的新衍生机型777X要到2020年才能交付，给了空客A350赢得订单的时间。

分析人士认为，若要在2020年前成功改进737和777，波音的工程师需要全力以赴，排除其他干扰，花旗银行的杰森·古尔斯基（Jason Gursky）说。787造成的损失会让波音在设计介于远程和短程机型之间的新机型时三思而行。空客在A380巨无霸上的教训也给出了另一个警示，其研发耗费巨资，但至今尚未收到足够订单证明它存在的合理性。目前也不清楚市场是否足以容纳一款新机型：有的航空公司已经准备订购空客A321neo的远程机型或A330的较小机型以填补空缺。（更换新引擎这种方案虽然风险要小多，却对757行不通，因为其机身太老无法适应高燃油效率的新引擎。）

| 另行削减

提升波音的市场份额尚有其他途径。削减成本就是其中之一。空客有一点胜过波音，它制造每架飞机需要的员工人数比波音少五分之一。因此波音正在瘦身。今年3月，公司宣布将在商用飞机部门裁员10%，即8000名员工，而投资者则要求更大幅度的裁员。机器正在取代人力：现在为737和777铆接机翼并将其固定在机身上的是机器人而非工人。

波音分管制造的副总裁沃尔特·奥迪斯（Walter Odisho）认为，改变工作

方式也能提高生产率。这家总部位于西雅图的飞机制造商正在推行汽车生产厂采用的移动生产线。此外，为了节约员工在工厂车间行走的时间，公司给员工配备了掌上电脑和自动手推车，以便他们和经理沟通，并且无需走下生产线就能拿到需要的工具。

波音表示，公司在几年内都不大可能完全确定是否推进新机型。但它有两大高于一切的本能——开发新飞机和打败空客。波音必须暂时放下第一件事才能做好第二件。■



The music industry

Scales dropped

More people are paying to stream music, but the industry is still wobbly

ONCE upon a time record-industry executives could all but weigh their profits on scales. Each pallet of compact discs (CDs) they sold translated into predictable quantities of cash for them and, second, for singers and songwriters. In 1999, the year the music-sharing service Napster was founded, wholesale revenues in the industry peaked at \$23.7 billion. Then they began a slide that has since continued almost without interruption.

Until now. Growth in the digital streaming of music helped industry revenues to expand by 3.2%, to \$15 billion, last year. That was the fastest rate since 1998, according to IFPI, a trade body (revenues also increased by a smidgen in 2012; see chart). The largest piece of the market was digital, with 45% of the total, whereas demand for those CDs continued to fall: physical goods accounted for just 39% of sales. Subscription-based streaming services like Spotify, Deezer and Apple Music proved especially successful, as the fastest-growing category: last year revenues from these rose by 59%, to more than \$2.3 billion. Digital downloads on services like iTunes (which slice up albums into 99-cent individual tracks) accounted for \$3 billion of sales, though that represented a decline of 10.5% on the year before. The music industry looks increasingly likely to be defined by services like Spotify, weightless but not cashless.

So much for the good news. The gloom for music bosses and artists, however, remains far greater than any cheer. The total market remains 36% smaller than it was at its pre-Napster peak. Nor has a perennial problem with piracy abated. Illegal downloads have declined, at least in America, but piracy takes various forms, such as when people rip music from digital sources. Smartphone apps make this easy. MusicWatch, a market-research

company, estimates that in America the number of “streamrippers”—those who copy music from streaming services, including YouTube—rose by half to about 20m, between the end of 2013 and early last year.

Another big concern for the industry is how easy it is to access free music legally. Watching online music videos is the most popular way to get music for nothing. Licensed clips often come bundled with an advert, but their popularity does not yet produce big revenues. IFPI estimates that 900m people got music from ad-supported user-upload services like YouTube, but that these generated only \$634m in revenues globally—barely 4% of the total.

That is largely because much of the music streamed on YouTube and similar sites is not properly licensed. In a report IFPI argues that songs and videos uploaded by users let YouTube and similar services “build their business without fairly remunerating rights holders”. In America the Digital Millennium Copyright Act protects the sites from prosecution over unlicensed content uploaded by users, as long as they comply with takedown requests.

YouTube has made fortunes for a few performers who got started on the platform, and the site’s defenders say there is great potential for established artists to earn more. But Peter Mensch, manager of Metallica, Red Hot Chili Peppers and Foals, says, “I don’t know anybody who is getting rich off YouTube spins.”

The IFPI report shows that there are still far fewer users who pay directly for digital music than who listen to it for nothing, but the paying portion is at least growing rapidly. Streaming services had 68m paid subscribers in 2015, up from 41m a year earlier. Spotify has 30m paying customers. Perhaps, given time, revenues from such subscribers and from advertisers will grow sufficiently to let more bands and firms prosper, even in an era of digital

music. Mr Mensch reckons that his clients will do “fine” from Spotify. But none of them will earn two dollars a record, as in the days when music could be sold by the pallet. ■



音乐产业

辉煌不再

付费收听流媒体音乐的人多了，但整个产业仍不安稳

放在以前，唱片公司的高管们拿到的利润可谓是车载斗量。每卖出一货架CD都代表着一定量的现金落进他们的口袋，歌手以及歌曲作者们也获利颇丰。1999年，也就是音乐分享服务Napster成立的那一年，行业的批发收入达到了237亿美元的巅峰。自那之后，整个产业的下滑就几乎从未中断。

这一趋势直到近来才终止。去年，数字音乐流媒体的增长使整个产业的收入提高了3.2%，达到了150亿美元。根据行业组织国际唱片业协会（IFPI）的报告，这是自1998年以来增长最快的一年（2012年产业收入略有提高，见图）。市场份额中占45%的最大一块被数字音乐占据了，而CD的市场需求则持续下降：实体产品只占有所有销售的39%。Spotify、Deezer以及Apple Music等依靠用户订阅的流媒体服务尤为成功，成为增长最快的一类——去年，这几家的收益增长了59%，超过23亿美元。iTunes等服务的数字下载（将整张专辑分割成单价99美分的独立曲目）取得了30亿美元的销售额，但同比下降了10.5%。看起来，音乐产业越来越成为Spotify这种服务的天下了：无形，却是真金白银。

好消息先说到这儿。对音乐产业的老板和艺人们来说，要担忧的事远比要高兴的多得多。与Napster出现前的巅峰时期相比，如今整个市场已萎缩了36%。长期以来的盗版问题也未见改善。非法下载确实减少了，至少在美国是这样；但盗版的形式多种多样，例如人们会直接从数字源把音乐抓下来，智能手机上的应用让这变得更为简单。据市场调查公司MusicWatch估算，从2013年年底到去年初，美国这种从流媒体服务商（包括YouTube）上复制音乐的“流媒体扒手”数量增长了一半，达到了约两千万人。

音乐产业面临的另一严峻问题是，如今合法地获取免费音乐也非常容易。

在线观看音乐视频成为无费分文获取音乐最普遍的方法。获得上传许可的短片往往与广告捆绑，但它们受到的追捧尚未转化为丰厚的收益。据国际唱片业协会估算，9亿人从YouTube这样依靠广告支持和用户上传内容的服务商那里获取音乐，但这在全球范围内只带来6.34亿美元的收入，仅占整个产业收入的4%。

这主要是因为，YouTube和同类网站上播放的音乐大部分未经完整授权。国际唱片业协会在一份报告中指出，用户自己上传的音乐和视频让YouTube和类似服务“发展了业务，却没有给权利所有人公平的报酬”。在美国，根据《数字千年版权法》（Digital Millennium Copyright Act），只要网站按要求撤下用户上传的未经授权的内容，便可不被起诉。

YouTube让一些在该平台上起家的艺人赚到不少钱，该网站的拥护者声称知名艺人也完全可以借助它赚得更多。但金属乐队（Metallica）、红辣椒乐队（Red Hot Chili Peppers）和小马驹乐队（Foals）的经纪人彼得·门施（Peter Mensch）表示，“我还没听说有谁是靠着YouTube赚了大钱的。”

国际唱片业协会的报告显示，直接付费收听数字音乐的用户还是比不花钱听音乐的用户少得多，但至少付费用户的比例在快速增长。2015年，流媒体服务的订阅用户已经从前一年的4100万增长到了6800万。Spotify有3000万付费用户。也许假以时日，来自订阅用户和广告商获得的利润能够大幅增长，令更多的乐队和企业即使在数字音乐时代也能繁荣发展。门施认为他的客户应该能从Spotify获得“还行”的收益。但没有谁能再像CD时代时那样，一张唱片赚两美元了。 ■



Spotify

These boots are made for walking

An aspiring tech giant threatens to turn its back on Stockholm

ON MAY 14th Stockholm hosts the final of the Eurovision song contest: a camp, televised crooning event that draws nearly 200m television viewers. Bands competing for votes and fame relish exposure; the host city gets to promote itself for tourists and businesses. And a big selling point for the Swedish capital is its status as home to a string of successful digital firms, exemplified by a large music-streaming business, Spotify.

Tech and Stockholm have long thrived together. “Programming is the single most common occupation in Stockholm today,” says Mikael Damberg, Sweden’s minister of enterprise. An estimate, by the city itself, suggests the tech sector employs 18% of workers—far above the 10% said to be typical in most European capitals.

A digital boom is one reason why the Swedish capital region has one of Europe’s fastest-growing populations (2.3m people, up by 10% since 2010). It also explains why the city’s economy as a whole is rattling along at about 5% annualised growth; the city claims to be the fastest-growing in Europe. Stockholm can boast not only about its hordes of clever startups—Paris, Berlin and others brag about these too—but also of fully fledged firms. Torbjorn Bengtsson, of the city’s business-development council, says that since 2003 it ranks as the fifth city, globally, in nurturing unicorns, private firms valued over \$1 billion. It got one-fifth of all European investments in “fin tech” firms between 2010 and 2014, he says. One, Klarna, an online-payments firm, was valued at more than \$2 billion last year and is expanding in America.

Games firms do well, too. Microsoft bought Mojang (creator of Minecraft)

for \$2.5 billion, two years ago. In February Activision Blizzard, a Californian firm, snaffled up King Digital (maker of Candy Crush and other mind-numbing games) for \$5.9 billion. Communication is another strength. Microsoft bought Skype for \$8.5 billion, five years ago. Now Truecaller, a digital contacts book and personal organiser, is going great guns. It says it doubled global users to zoom in the past year, notably in South Asia and the Middle East.

The biggest of the lot, however, is Spotify, which streams music, sells advertising and has persuaded 30m users—at the latest count—to pay for tracks. Last year it was valued at \$8.4 billion. In March it raised \$1 billion, in consolidated debt, from a single round of financing. Visit its offices and you find vinyl records stacked in crates and rooms crammed with trendy-looking staff in their 20s.

Spotify is in “a hyper growth stage”, says an employee. It has 1,000 staff at its operational headquarters in central Stockholm, though the firm is legally incorporated in Luxembourg. A team of 53 exists to recruit “super talent” globally; the firm expects to double the number of employees at its main offices by, or soon after, the turn of the decade. By then, it might count as Europe’s first real example of a new tech giant. (SAP, an older software goliath in Germany, is worth some \$83 billion.) “Spotify wants to grow, they are competing with Apple; I would love Spotify to challenge some of the big platform companies in the world,” says Mr Damberg.

As the industry leader in music-streaming, Spotify will expand as long as most musicians continue to co-operate with it. Taylor Swift and certain other artists refuse to do so, but they are exceptions. More in doubt is whether Spotify will grow in Stockholm or shift elsewhere.

Last month its co-founders, Daniel Ek and Martin Lorentzon, wrote a public letter about Sweden’s business climate. The men raised three concerns.

Employees who get stock options face whopping tax bills. Renting a home in central Stockholm has become eye-poppingly expensive. Both problems worry foreigners especially. Third, too few Swedish schoolchildren are learning to code: needlework and carpentry are compulsory, not programming. Unless politicians act, say Messrs Ek and Lorentzon, the firm could choose to grow somewhere else—Silicon Valley, perhaps.

That sounds a mite ungrateful. Stockholm has long promoted tech, and all but pampered those who exploit it. Subsidies have helped to get personal computers and the internet into almost every household, however poor. 3G licences were given out free, as long as firms got as many people as possible online and mobile. The metro has Wi-Fi. The city built a network to connect 98% of homes, and all commercial property, with fibre-optic cables (firms operate the services). Finance, notably venture capital, is easier to access in Stockholm than in many European cities.

A policy of welcoming foreigners also helps tech firms: Mr Bengtsson reckons as many as one-third of city startups are launched by first- or second-generation migrants. Each year an estimated 2,500 Indian software programmers apply for visas to work in Stockholm. Every tech job, in turn, creates 4.3 other jobs, often low-paid, according to a report by an advocacy group for American tech firms. Carl Bildt, an opposition politician, says “an open attitude to people coming from wherever to work” is hugely beneficial, as Sweden relies on imported talent. He wants the 100,000-odd refugees who arrived last year to be taught coding, so they can respond “to a huge demand for that sort of talent”.

Spotify’s complaints are not just self-interested, they are also carefully timed. Sweden is now debating a proposed legislative change to let employees in companies with fewer than 50 workers for a time enjoy lower taxes on stock options. Spotify and others are miffed that the reform would exclude bigger firms. Talk of growing elsewhere is obviously intended to

spur a rethink. Mr Damberg says the government will listen and consider a bolder reform, but says Sweden has fostered lots of big, non-tech firms before, such as Volvo or IKEA, without dropping its egalitarian, high-tax approach.

Tackling pricey housing in Stockholm is harder. A banker with a young family, looking to buy, laments that prices have doubled in five years and properties sell in a frenzy of bidding. Regulated rental markets mean tenants at times resort to paying landlords under the table. Politicians in power talk a lot but do little to help.

As for schools, more teaching in tech is bound to come—the question is how fast. This month a pilot scheme of compulsory coding lessons is due to start in some Stockholm schools. One goal is to get more young women to take it up: Spotify says its Saturday camps for pre-teen programmers often have more girls than boys who attend; but by college age, male coders vastly outnumber female ones.

Even if it got all its wishes, Spotify might end up growing faster abroad in any case. What really matters, says Jessica Stark, who leads SUP46, a lobby for Swedish tech firms, is the broader signal to many other start-ups as they grow—who voice the same complaints as the music-streaming company. “Stockholm should definitely not aspire to be Silicon Valley, but that doesn’t mean we can’t compete with it,” she says. In at least one area, however, the Swedish capital will always have the upper hand: Silicon Valley will never get to host Eurovision. ■



Spotify

远行之靴

目标远大的科技巨人威胁将离弃斯德哥尔摩

5月14日，在斯德哥尔摩举办了欧洲电视网（Eurovision）歌唱大赛的决赛：这一矫揉造作的比赛现场直播，吸引了全球近两亿电视观众收看。争夺投票和名望的乐队非常享受出镜的机会，主办城市也借机推广自身，吸引游客和企业。瑞典首都的一大卖点在于它是一系列成功数字公司的家乡，其中的典范就是大型流媒体音乐平台Spotify。

长期以来，技术都和斯德哥尔摩共同繁荣发展。瑞典企业与创新大臣米卡尔·达姆伯格（Mikael Damberg）说：“编程如今是斯德哥尔摩最常见的职业。”据该市估计，科技业雇佣人数占有所有劳动力的18%，远远超过大多数欧洲国家首都据称10%的常见比重。

瑞典首都圈是欧洲人口增长最快的地区之一（人口230万，2010年以来增长了10%），数字产业繁荣是原因之一。这也解释了斯德哥尔摩的整体经济为何能以令人瞩目的年均5%的增速发展，该市因此自称为欧洲发展最快的城市。斯德哥尔摩不仅可以夸耀其大批锐意创新的科技创业公司——巴黎、柏林和其他欧洲首都城市也以此自夸——还能以其发展成熟的企业为傲。斯德哥尔摩企业发展委员会的托比昂·本特松（Torbjorn Bengtsson）说，自2003年以来，斯德哥尔摩在培育独角兽公司（估值超过10亿美元的私营企业）方面位列全球第五。2010年至2014年，它吸引了欧洲对“金融科技”公司投资总额的五分之一。其中一家在线支付公司Klarna去年估值超过20亿美元，如今正在美国扩展业务。

游戏公司的发展势头同样不错。两年前微软以25亿美元收购了Mojang（Minecraft的开发商）。今年二月，加州公司动视暴雪（Activision Blizzard）以59亿美元吞并了King Digital（开发了“糖果粉碎”[Candy Crush]和其他不用动脑的小游戏）。通讯是斯德哥尔摩的另一个强项。五年前微软斥资85亿美元收购了Skype。如今数字通讯录和个

人记事簿软件Truecaller势头正猛，据称去年其全球用户人数翻番达到2亿，在南亚和中东的发展尤其迅猛。

然而Spotify才是个中翘楚。它提供流媒体音乐，销售广告，并成功吸引了3000万用户（最新数字）付费收听音乐。公司去年估值84亿美元，今年三月又通过发行可转换债券，单轮融资10亿美元。如果去它的办公室看看，你会发现成堆的木箱里装着黑胶唱片，房间里挤满了二十来岁打扮时尚的员工。

Spotify的一名员工说公司正处在“极速发展阶段”。尽管公司在卢森堡注册，位于斯德哥尔摩市中心的运营总部却拥有1000名员工。一个53人的团队负责在全球招募“超级人才”，公司预期在2020年前后将主要办公地点的员工人数翻番。届时，Spotify有可能成为欧洲首个真实崛起的新技术巨头（资历更老的德国软件巨人SAP市值约830亿美元）。达姆伯格说：“Spotify想要发展，它在和苹果竞争。我非常想让Spotify挑战全球顶尖的大型平台公司。”

作为流媒体音乐的业界领袖，只要大部分音乐家继续与其合作，Spotify就会不断扩张。泰勒·斯威夫特（Taylor Swift）和其他一些艺术家拒绝合作，但他们只是少数例外。更大的疑问在于，Spotify是会继续在斯德哥尔摩发展，还是另寻他处。

上个月，Spotify的联合创始人丹尼尔·埃克（Daniel Ek）和马丁·诺兰森（Martin Lorentzon）就瑞典的商业环境写了一封公开信，提出了三个担忧。获得股票期权的员工面临重税；斯德哥尔摩市中心的住房租金之高令人咋舌——这两个问题尤其令外国人担心；第三个担忧是瑞典没有几个学童会去学习编程——缝纫和木工是必修课，而编程不是。埃克和诺兰森说，除非政客们有所作为，公司有可能转向其他地方发展——也许会去硅谷。

这听起来有点忘恩负义。斯德哥尔摩历来大力推动技术发展，对科技企业几乎有求必应。政府补贴帮助个人电脑和互联网进入了几乎每一个家庭，

无论多贫穷的家庭都不例外。3G牌照免费发放，只要企业能让尽可能多的人使用网络和移动设备。地铁也有Wi-Fi。该市打造的光纤网络覆盖98%的家庭和所有商业地产（由公司提供网络服务）。比起其他欧洲城市，在斯德哥尔摩也更容易拿到资金，尤其是风险资本。

欢迎外国人的政策也对科技公司有利：本特松估计斯德哥尔摩多达三分之一的创业公司都是由第一或第二代移民建立的。每年估计有2500名印度软件程序员申请签证来此工作。一家宣传美国科技公司的团体给出的报告显示，每一个技术岗位随之又能带来4.3个其他岗位——大多是低薪岗位。反对党政客卡尔·比尔特（Carl Bildt）说，“对来工作的人保持开放态度而不论出处”让瑞典受益匪浅，因为瑞典的发展依赖引进人才。他想让去年到来的约10万名难民都去学编程，以满足“对此类人才的巨大需求”。

Spotify的抱怨并非仅是出于一己之私，也是伺机而发的。瑞典正在讨论一项立法改革提案，对于雇员少于50人的企业，员工可以在一定时间内就股票期权享受更低的税负。此项改革将大企业排除在外，令Spotify和其他公司非常不满。另寻他处发展的言论很明显是意在提醒立法机构三思而行。达姆伯格说政府会倾听企业所想，并考虑实施更为大胆的改革，但又表示瑞典以前没有放弃其一视同仁的高税收政策，也培育了很多大型非科技企业，如沃尔沃和宜家。

斯德哥尔摩的高价住房问题更难处理。一位银行业者带着妻子和年幼的孩子有意买房，哀叹房屋价格五年内已经翻番，售房时买主更疯狂竞价。房屋租赁市场受到管制，意味着租客有时不得不私下里给房东塞钱。而掌权的政客们则说得多做得少。

至于学校，技术方面的课程一定会增加，问题在于有多快。本月，必修编程课程将在斯德哥尔摩的一些学校试点，目标之一是让更多的年轻女性从事这一行业——Spotify说，在为十岁左右孩子开办的小程序员周六训练营中，女孩的人数往往多于男孩；然而到大学阶段，编程专业的男生人数则远多于女生。

就算Spotify所有的愿望都能实现，它仍有可能最终会到国外去获得更快的发展。瑞典科技公司的游说团体SUP46的负责人杰西卡·斯塔克（Jessica Stark）说，真正的关键在于这会给很多其他成长中的创业公司传递更广泛的信号，而这些创业公司与Spotify有着同样的抱怨。斯塔克说：“斯德哥尔摩绝对不应该追求成为硅谷，但这并不意味着我们不能与其竞争。”但至少在一个领域，瑞典首都永远都会占上风——硅谷永远不能举办欧洲电视网歌唱大赛。 ■



Free exchange

When life gives you lemons

The economics of digital music favour streaming. Artists are learning to adapt

THE release of Beyoncé's newest album (a genre-jumping tour de force entitled "Lemonade") was carried out with the precision of a military operation. Manoeuvres began in February, with the release of a single and a performance at the Super Bowl. Phase two commenced in April, when the complete album was rolled out across various platforms in stages, alongside a short film and the launch of a worldwide promotional tour. Beyoncé's campaign is about more than showmanship. Like other artists, she is attempting to work out the answer to a difficult question: how to maximise the money made selling digital files that many listeners can easily (if not always legally) obtain free of charge.

Money earned by selling music has declined steadily from a peak in the late 1990s, the salad days of the compact disc, to the early 2000s. Though Apple used the popularity of the iPod to reaccustom people to paying for music, in the form of low prices for digital downloads, sales of physical recordings have fallen faster than digital ones have grown. The era of digital downloads in any case proved short: in 2015, for the first time, more money was spent on paid subscriptions to music-streaming services.

The economics of digital music seem to favour streaming. A typical user values the music of a few favoured artists highly—highly enough to pay for their albums (and perhaps also for concert tickets and merchandise). That user may also enjoy songs by other performers, but not enough to shell out the \$1.29 it costs to download the music legally. Rather than reduce the money earned on each sale by cutting the typical song price, the music industry has instead chosen to lose sales, often to piracy.

Streaming offers a way to pick up those pennies from the pavement. By bundling thousands of songs together and offering access to them on demand, streaming services like Spotify have created an appealing product. Many services provide free, ad-supported streaming while also offering premium subscription packages; both Tidal's standard service and Spotify's ad-free premium service cost \$10 per month—less than the \$17.99 it costs to buy “Lemonade” as a digital download. IFPI, an international recording-industry trade group, estimates that there are now 41m fee-paying subscribers worldwide, up from 8m in 2010. Streaming services add value in other ways, as well. Tidal offers a more expensive service providing high-fidelity audio, and all services compete for users by seeking to build the best algorithms, which tailor playlists to users' tastes.

Each time a user listens to a song, the artist earns a small fee: about \$0.007 on average at Spotify, for instance. This income pales in comparison with the windfalls that sales of physical albums used to generate. In 2013 Thom Yorke, Radiohead's lead singer, declared streaming services to be “the last desperate fart of a dying corpse”. Yet recent research suggests that streaming is not in itself diminishing artists' earnings. Although it does displace some digital sales, the shift of other listeners from illegal downloading to streaming more than makes up for the loss.

As streaming grows, artists are pursuing several broad strategies to boost what they earn. Most rely on cross-selling: streaming helps build demand for live performances, for instance, which provide nearly all the money earned by artists just starting out and as much as half of the income for big acts like Beyoncé.

Other artists focus on boosting album sales. Some, like Adele, eschew streaming, relying instead on older fans who are still happy to buy CDs. Artists occasionally market their album as an artistic whole (rather than as a collection of tracks that can be slotted into streaming-service playlists);

most of the songs on “Views”, a new album by Drake, a Canadian rapper, cannot be purchased as individual tracks. Adding bells and whistles to the album can help, too. Many come with digital books or videos; those who purchase “Lemonade” can also download the accompanying film. Artists are also selling old-fashioned records, which appeal both to nostalgic baby-boomers and to young hipsters who see some cachet in vinyl. Last year the industry earned more selling vinyl records than it did from ad-supported streaming services.

| *Against the current*

The most marketable artists increasingly follow a third strategy, of deeper involvement with streaming services themselves. Tidal was set up by musicians, including Beyoncé and her husband Jay-Z, a rapper; part of the service’s pitch to users is that it pays out a bigger share of its earnings to musicians than rivals.

Popular acts are also learning to play online music outlets off against each other by auctioning off the exclusive right to stream or sell their music, a practice called “windowing”. Beyoncé’s last album, released in 2013, was available only on Apple’s iTunes for a week after its debut; “Lemonade” was exclusive to Tidal for a day. In 2014 Taylor Swift pulled her music from Spotify and gave exclusive streaming rights to Apple; Prince did something similar with Tidal, which saw sales jump when he died on April 21st.

Although windowing provides artists with a way to capture more of the money made selling their music, it complicates life for consumers. When services compete on the basis of catalogues, that dispels the dream of having all of the world’s music available in one place; users must instead decide whether to sign up for multiple services or miss out on some artists. Consumers may ultimately gravitate to one dominant service, with which all musicians feel compelled to do business; or competing services could co-operate to share artist catalogues. Yet while that might satisfy users,

artists might balk at the concentration of market power in streamers' hands (and regulators might take an interest). More likely still, technology will strike the next blow, delivering new ways for users to access digital music—and leaving artists and record companies scrambling to adapt once again. ■



自由交流

当生活给你柠檬

数字音乐经济青睐流媒体，艺人们正努力适应

碧昂斯（Beyoncé）最新专辑的发布（一张风格多样的杰作，名叫《柠檬水》（Lemonade））精准得像一场军事行动。2月行动开始，先发布了一首单曲，再借“超级碗”之机表演。4月开始第二期行动，整张专辑分阶段在各大平台推出，同时还推出一部短片，并启动了全球宣传巡演。碧昂斯此举的意义远远不止演艺本身。像其他艺人一样，她试图找到一个难题的答案：在很多听众都能轻松免费（并不总是合法）获得资源的情况下，怎样卖数字音乐赚得最多。

音乐销售收入从上世纪90年代末（CD初出江湖时）到21世纪初达到顶峰，之后便不断下跌。尽管借助iPod的流行，苹果让人们重新习惯了以低价下载数字版本为音乐付费，但实体专辑销售额的下跌速度比数字专辑的增长更快。无论如何，数字下载的时代实际上很短暂：2015年，人们在订购音乐流媒体服务上的花费首次超过下载。

数字音乐经济似乎偏爱流媒体。一位典型用户会非常欣赏几位他所喜爱艺人的音乐——欣赏到愿意付钱购买他们的专辑（可能还会买演唱会门票及周边商品）。这位用户可能也喜欢其他艺人的歌，但还没有到花1.29美元合法下载音乐的程度。音乐产业没有选择通过降低歌曲的普遍售价来降低每次销售的收入，而是选择了损失销量。这些损失通常是缘于盗版。

流媒体提供了一种方式，把这些散落在路上的硬币都捡了起来。通过把成千上万首歌打包在一起提供点播，Spotify等流媒体服务创造出了令人心动的产品。很多服务都提供了依靠广告收入的免费流媒体，也提供付费订阅包；Tidal的标准服务和Spotify的免广告高级服务都需要每月支付10美元——比《柠檬水》数字下载版17.99美元的售价还要便宜。唱片业行业组织国际唱片业协会（IFPI）估算目前全球有4100万付费订户，而2010年时仅有800万。流媒体还有其他增值服务。Tidal提供更昂贵的高保真音频服

务，所有服务都力求创建能根据用户口味打造播放列表的最佳算法，以此争夺用户。

每当用户听一首歌，艺人都会得到一点费用：比方说在Spotify上平均是约0.007美元。比起实体专辑销售获得的暴利，这点收入相当可怜。2013年电台司令（Radiohead）的主唱汤姆·约克（Thom Yorke）宣布流媒体服务是“垂死之躯最后一个绝望的屁”。但是最新研究显示，流媒体本身并没让艺人的收入缩水。尽管它的确取代了一些数字版本的销售，可其他听众从非法下载转向流媒体不但弥补了这一损失，甚至还有增长。

随着流媒体业务的增长，艺人们努力尝试多种广泛的策略以提升收入。大部分人依靠交叉销售：例如，流媒体有助于建立对现场表演的需求，对于刚出道的艺人来说，这几乎是他们的所有进项。即使对于碧昂斯这样的巨星来说，这也能占到她收入的一半。

其他艺人则专注于提升专辑销量。有的艺人如阿黛尔（Adele）避开流媒体，依靠仍愿意购买CD的年龄较大的粉丝。有时艺人则会将他们的专辑作为一个艺术整体推向市场（而不是可以插入到流媒体服务播放列表中一组歌曲）：加拿大说唱歌手德雷克（Drake）的新专辑《观点》（Views）里的大部分歌曲都不能单独购买。为专辑加上些点缀也有帮助。很多专辑附有电子书或视频；购买《柠檬水》专辑的人还可以下载附送的电影。艺人们也销售老式唱片，既可吸引怀旧的婴儿潮一代，也能吸引那些觉得听黑胶唱片更有品位的年轻潮人。去年唱片业在黑胶唱片上的销售所得超过了带广告的流媒体服务的收入。

| 逆流而上

销量最好的艺人越来越追捧第三种策略，即更深入地参与到流媒体服务中。Tidal是音乐家创立的，其中包括碧昂斯和她的丈夫、说唱歌手Jay-Z；该服务吸引用户的部分卖点，是它收入中付给音乐家的比例比起竞争对手更高。

流行艺人也学着将流媒体或音乐销售的专营权竞卖，让各大在线音乐商店

竞争，这种做法被称作“扩窗”（windowing）。2013年，碧昂斯的上一张专辑发布后第一周仅在苹果的iTunes有售，《柠檬水》则在Tidal上独家上架一天。2014年泰勒·斯威夫特（Taylor Swift）将她的音乐从Spotify撤出，将流媒体专营权授予苹果；普林斯（Prince）也和Tidal有过类似协议，他于4月21日去世时，Tidal上的销量暴涨。

尽管扩窗为艺人提供了一种在销售音乐时赚更多钱的方法，但此举让消费者很麻烦。如果服务竞争是基于曲库，那么将全世界音乐汇集在一处的梦想就破灭了。用户必须决定是订阅多个服务还是错过一些艺人。消费者可能最终会被吸引到某个主导市场的服务，而所有音乐家都感到不得不与之合作；或者相互竞争的服务会合作共享艺人曲库。但是尽管这么做可能让用户满意，面对市场权力集中在流媒体手中的情形，艺人们可能踌躇不前（监管部门可能也会感兴趣）。更有可能的是，技术发展会再次给出有力一击，为用户访问数字音乐提供新的途径，也让艺人和唱片公司再度手忙脚乱。 ■



Office communication

The Slack generation

How workplace messaging could replace other missives

STEWART BUTTERFIELD, the boss of Slack, a messaging company, has been wonderfully unlucky in certain ventures. In 2002 he and a band of colleagues created an online-video game called “Game Neverending”. It never took off, but the tools they used to design it turned into Flickr, the web’s first popular photo-sharing website. Yahoo bought it in 2005 for a reported \$35m.

Four years later Mr Butterfield tried to create another online game, called Glitch. It flopped as well. But Mr Butterfield and his team developed an internal messaging system to collaborate on it, which became the basis for Slack. In Silicon Valley, such a change in strategy is called a “pivot”; anywhere else it is called good fortune. Today Slack is one of the fastest-rising startups around, with \$540m in funding and a valuation of around \$3.8 billion. “I guess the lesson should be, pursue your dream and hope it fails, so you can do something else,” says Cal Henderson, Slack’s chief technology officer.

It is rare for business software to arouse emotion besides annoyance. But some positively gush about how Slack has simplified office communication. Instead of individual e-mails arriving in a central inbox and requiring attention, Slack structures textual conversations within threads (called “channels”) where groups within firms can update each other in real time. It is casual and reflects how people actually communicate, eschewing e-mail’s outdated formalities, says Chris Becherer of Pandora, an online-music firm that uses Slack.

Its other selling-point is efficiency. A survey of users, admittedly conducted

by the firm itself, suggests that team productivity increases by around a third when they start using the software, primarily by reducing internal e-mail and meetings. Slack has decided to open itself up to other apps, becoming a platform by which employees can log into and use other software tools. Today it has 2.7m daily active users, up from 1m last June. Around 800,000 of them are paying subscribers; their firms pay around \$80 or more a year for each employee using the service. The firm has \$75m in annual recurring revenue and is breaking even, says Mr Butterfield.

Slack's rise points to three important changes in the workplace. First, people are completing work across different devices from wherever they are, so they need software that can work seamlessly on mobile devices. Messaging naturally lends itself to this format. Second, communication is becoming more open. Just as offices went from closed, hived-off rooms to open-plan, Slack is the virtual equivalent, fostering a collaborative work environment, says Venkatesh Rao of Ribbonfarm, a consultancy. Slack's default setting is to make conversations public within a firm.

Third, software firms are trying to automate functions that used to be done by people in order to make employees more productive. Slack has made a big push into "bots", algorithms that can automate menial tasks which used to be done by humans. Slack offers bots that compile lunch orders and projects' progress reports, or generate analytics on demand. In the future employees will be able to chat with software agents to get more done, working alongside bots as well as their peers.

Mr Butterfield is not the typical leader of a striving startup. Called "Dharma" by his hippie parents, he spent his early years on a commune with no running water or electricity; he changed his name to Daniel Stewart when he was 12. A self-professed introvert, which is fitting for a company that sells itself on textual communication, he values efficiency and candour. After Yahoo bought Flickr, he worked there for a few years. "Everything was

horrible, ugly, slow, difficult to use and confusing,” he says, frankly.

| *Dharma chameleon*

In retrospect, Flickr was sold too soon. The sale marked the beginning of the technology industry’s resurgence after its crash in the early 2000s. Now Mr Butterfield has a second chance. Investors do not want to see him sell Slack too early. Earlier this year there were reports that Microsoft considered bidding around \$8 billion for the company. Mr Butterfield says that Slack has never received a formal offer from anyone and is planning to go public. Last year it started submitting itself to voluntary audits, in what appears to be preparation for a public debut. But it seems even more likely that a large tech giant will see the strategic value of Slack and try to snap it up first for an even splashier sum.

Mr Butterfield says that Slack could achieve \$10 billion in revenue if it signs up 100m knowledge workers, of which there are around 850m worldwide. That is far easier said than done. For one thing, Slack still needs to woo larger companies outside the technology world. Currently it holds particular appeal among workers at firms in the internet, media and advertising industries, and among teams of software developers within larger firms. Conquering traditional businesses may prove harder. Slack’s yearly minimum of \$80 per employee is steep for companies with tens of thousands of workers.

For another, Slack has rising competition to fend off. Already, rival products are taking aim at the market for workplace collaboration, including one, Atlassian, from an Australian software company, which is called HipChat, and bundled with its other services. There is also Symphony, a rival startup backed by several banks that specialises in highly regulated industries such as financial services, which require more compliance controls. Tech giants such as Microsoft, Oracle and Facebook have collaborative work apps, but these are only modestly successful.

Slack's greatest challenge may be people's own habits. To some, its endless stream of chatter may be worse even than e-mail, because the barriers to commenting rapidly are lower. The introverted Mr Butterfield should welcome the chance to appeal to people who do not want constant interaction, even when it comes in textual form. ■



办公通讯

Slack一代

职场通讯工具如何取代其他沟通形式

通讯工具公司Slack的老板斯图尔特·巴特菲尔德（Stewart Butterfield）在一些创业经历中上可谓因祸得福。2002年，他和一群同事创办了名为“游戏无止境”（Game Neverending）的网络视频游戏。该产品并未成功，但他们用来设计游戏的工具后来却发展成为互联网首个广受欢迎的照片分享网站Flickr，后于2005年被雅虎收购，据称出价达3500万美元。

四年后，巴特菲尔德试图创办另一款名为Glitch的网络游戏，同样以失败告终。但巴特菲尔德和他的团队在创业过程中开发了一个内部通讯系统用于协作，奠定了Slack的基础。在硅谷，这种战略上的转变被称为“转型”，要是放在其他任何地方都会被称为运气。今天，Slack已成为上升最快的创业公司之一，融资5.4亿美元，估值约为38亿美元。“我想这给我们的经验是，追逐梦想，希望梦想失败，这样你就可以做点儿别的了。”Slack的首席技术官卡尔·亨德森（Cal Henderson）说道。

办公软件很少能唤起什么情绪，除了厌烦之外。但有人对Slack赞不绝口，称其简化了办公通讯。Slack不是把电子邮件都堆在一个收件箱里让人处理，而是按话题（称为“频道”）组织文本对话，便于公司中的团队实时沟通。这种形式较为随意，反映出人们的实际沟通方式，并且避免了电子邮件那套过时的形式，在线音乐公司潘多拉（Pandora）的克里斯·贝赫勒（Chris Becherer）说道，该公司就使用Slack进行办公通讯。

它的另一个卖点是效率。Slack自己做的用户调查显示，在使用该软件后，团队效率提升近三分之一，主要是由于内部邮件及会议的减少。Slack已决定向其他应用开放，成为企业员工可以登陆并使用其他软件工具的平台。去年六月时，该软件的日活跃用户为100万，目前已上升至270万，其中约有80万是付费用户，公司为每位使用服务的员工支付至少80美元的年费。巴特菲尔德表示，Slack的年度经常性收入为7500万美元，公

司正逐渐实现收支平衡。

Slack的崛起昭示着职场的三个重要变化。首先，人们现在会在不同地点，通过各种设备来完成工作，所以他们需要能在移动设备上无缝运作的软件。发送消息天生适合这种形式。第二，通讯正变得越来越开放。正如办公室从封闭小隔间变为开放式空间一样，Slack在虚拟领域引领着同样的变革，打造协同工作环境，咨询公司Ribbonfarm的文卡泰什·拉奥（Venkatesh Rao）说道。Slack的默认设置就是让员工在公司内公开对话。

第三，软件公司正尝试把以往需要人工处理的职能自动化，借此提高员工的工作效率。Slack已大量运用“机器人”，这些算法可以自动完成以往需要人工处理的低级工作。Slack提供的机器人服务包括确定午餐订单，编写项目进度报告，以及按需生成分析等。未来，员工将可与“软件员工”对话，与这些机器人和同事并肩工作，取得更多成果。

巴特菲尔德不是那种典型的拼搏型创业企业领袖。被嬉皮士父母称为“达摩”的他，早年生活在一个没有自来水或电力的公社中；12岁的时候他把自己的名字改为丹尼尔·斯图尔特（Daniel Stewart）。他自称性格内向——这恰恰适合靠文本通讯谋生的公司——并且珍视效率和坦诚。雅虎收购Flickr之后，他在那里工作了几年。“一切都很可怕、丑陋、缓慢、难用、混乱。”他毫不掩饰地说道。

| 达摩变色龙

回想起来，当年卖Flickr卖得太早了。那一次并购标志着科技产业在经历21世纪初崩溃后的复苏。如今巴特菲尔德有了第二次机会。投资者不愿意看到他过早卖掉Slack。今年早些时候有报道称，微软考虑出价80亿美元收购该公司。巴特菲尔德则表示从未收到任何人的正式报价，而公司正计划上市。去年，公司做了一次外部审计，似乎是为公开上市准备。但貌似可能性更大的是某家科技巨头会意识到Slack的战略价值，以更高的出价抢先将其收归麾下。

巴特菲尔德表示，假如全球约8.5亿的知识型劳动者中有一亿成为Slack的付费用户，那么公司的年收入将达到100亿美元。这说起来容易，实际难度却大得多。一方面，Slack还须博取非科技业大公司的青睐。目前，Slack特别受互联网、媒体、广告公司员工的欢迎，大公司内部软件开发团队的员工也很爱用。但征服传统公司可能会更难。Slack每人80美元的最低年费对拥有数以万计员工的企业来说是一项不菲的开支。

另一方面，Slack还要抵御不断加剧的竞争。已有不少竞争产品瞄准办公协作的市场，其中包括澳大利亚软件公司Atlassian推出的HipChat，该产品还捆绑提供公司的其他服务。另一对手是拥有多家银行支持的创业企业Symphony，其产品专门针对金融服务等受高度监管的行业而设，这些行业要求更多的合规控制。微软、甲骨文和Facebook等科技巨头也有协同工作应用，但都成绩有限。

Slack面临的最大挑战可能是人们自身的习惯。一些人认为，这种没完没了地唠叨也许比电子邮件还要糟糕，因为不假思索地大发议论的屏障降低了。内向的巴特菲尔德也该考虑怎样吸引那些不喜欢持续互动的人，即便是以文本形式互动。 ■



Biotechnology

Seedy business

It's eat or be eaten for the firms that make seeds and chemicals for farmers

WHEN DuPont and Dow Chemical agreed to merge in December, the \$130 billion deal seemed to be a prime example of American managers' ruthless pursuit of shareholder value and dedication to building monopoly positions. The two chemicals firms, with a combined 300-odd years under their belts, had both been beaten up by activist investors in the 20 months or so leading up to the deal.

Partly in response, the companies said they would combine and then split into three new firms, focused on agriculture, speciality products (used, for example, in electronics), and materials (used in plastics). Huge cost cuts are planned when the deal closes, supposedly later this year. The unspoken message to investors is that the three new firms, with higher market shares, will also be able to raise prices.

What has become clearer since then is that Dow-DuPont is also part of a global trend: a wave of consolidation in the agricultural seeds and chemicals industry. In February ChemChina, a state-owned Chinese firm that has been on a buying spree, agreed to pay \$43 billion for Syngenta, a big Swiss firm that specialises in selling chemicals to farmers. In May Monsanto, an American seeds firm valued at \$42 billion, confirmed that it had received an unsolicited takeover approach from Bayer, a pharmaceuticals and chemicals concern that is one of Germany's biggest firms by market value. Monsanto has gone from hunter to hunted, having tried and failed to buy Syngenta a year ago. Overall, the deal-making could exceed \$200 billion: it is the stuff of investment bankers' dreams.

Three trends explain the surge in activity. First, a slump in sales: the

agricultural-product industry's top line, growing at 2% in 2014, fell by 10% in 2015. With crop prices low, farmers are spending less. Second, bosses think that selling bundles of products to farmers will be more profitable in the long run. Monsanto talks of having a footprint of millions of acres around the world upon which seeds, bug-killers and nutrients can be used, helped by better mapping and data-crunching. The third trend is specific to Syngenta: China's government wants to modernise its farms and to own the intellectual property involved, for example seed patents.

Merger waves have struck many other industries—think of oil in the 1990s or steel in the early 2000s. Often the grand themes used to justify deals make some sense, but the numbers don't add up. The present binge already looks alarming. ChemChina will borrow a cool \$35 billion to buy Syngenta which, based on its 2015 profits, will make its new Chinese owner a hopeless 3% return on capital. Were Bayer to try to buy Monsanto with cash, the combined firm would have net debt of a queasy four times its gross operating profits, and the purchase would generate a roughly 6% return on capital, using 2015 figures. The lavish cost savings promised by Dow and DuPont have failed to excite, with both firms' shares trading roughly in line with the stockmarket since the deal was launched.

One explanation is that investors worry that antitrust regulators will block the all-American combination, or impose tough conditions on it. Competition concerns could yet scupper the entire wave of dealmaking. The ChemChina deal, meanwhile, could attract attention from spooks. Europe has been relaxed about Chinese takeovers. Last year ChemChina bought Pirelli, a fading Italian industrial champion. But Syngenta makes 27% of its sales in North America, so its purchase will be vetted in America by a national-security committee known as CFIUS. This has a track record of protectionist behaviour towards Chinese firms. Syngenta's shares trade at a hefty discount to the Chinese offer, because of fears that the deal may be blocked.

All the proposed deals could be squashed or end in acrimony, allowing other combinations to be attempted. Firms on the sidelines, most notably Germany's BASF, could be tempted to pile in. So for bosses there is still everything to play for. Investors may not like it much, but in the obscure world of chemicals times like this happen only once in a generation. ■



生物技术

种子生意

农用种子及化学品公司要么吃掉对手，要么被对手吃掉

去年12月杜邦和陶氏化学达成合并协议时，这项价值1300亿美元的交易似乎是印证美国经理人无情追逐股东价值及致力打造垄断地位的绝佳案例。这两家化学品公司的历史加起来有三百多年，在合并前约20个月的时间里均遭到维权投资者的猛烈抨击。

作为部分回应，两家公司表示将在合并后分拆为三家新公司，分别专注于农用化学品、特种化学品（譬如用于电子产品）及材料（用于塑料）。交易预计在今年稍晚时完成，届时将推出计划大幅削减成本。对投资者不言而喻的信息是，这三家新公司有了更高的市场份额，将可以提高价格。

至此我们能够更清晰地看到，“陶氏—杜邦”的合并代表着一种遍布全球的趋势：农用种子及化学品工业的合并潮。今年二月，之前已在大举收购的中国国企中国化工集团公司同意支付430亿美元，收购专营农用化学品的大型瑞士企业先正达（Syngenta）。五月，估值达420亿美元的美国种子公司孟山都（Monsanto）证实，公司已收到德国市值数一数二的制药及化工品企业拜耳（Bayer）主动提出的收购要约。孟山都一年前曾尝试收购先正达，但以失败告终，如今从猎人变成了猎物。总体而言，这类合并交易的价值可能超过2000亿美元：这正是投资银行家们梦寐以求的。

并购活动激增，三个趋势可以作为解释。首先是销售暴跌：农用产品行业的收入在2014年上升了2%，在2015年则下降了10%。农作物价格低廉，农民因而减少支出。第二，老板们认为向农民销售捆绑产品长远看来更有利可图。借助测绘及数据处理的进步，孟山都大谈在全球数百万英亩的土地上推广使用种子、杀虫剂和营养素。第三个趋势则是先正达所特有的：中国政府希望实现农业现代化，并获取种子专利等相关知识产权。

并购浪潮已经席卷其他许多行业，想想上世纪90年代的石油业或者本世纪

初的钢铁业就知道了。支撑这些收购交易的宏大主题往往有一定合理性，但在数字上却说不通。目前这股收购狂潮已到了令人瞠目的程度。中国化工集团需要贷款足足350亿美元来收购先正达，而按其2015年的利润计算，先正达给中国新东家带来的资本回报将仅为可怜的3%。假如拜耳以现金收购孟山都，合并后公司的净债务将达到其经营毛利的四倍，简直令人难以接受；如果按2015年的数字计算，此次并购的资本回报率约为6%。尽管陶氏和杜邦都承诺削减巨额成本，却并未激发追捧。并购启动以来，两家公司的股票走势大致与大市持平。

一个解释是，投资者担忧反垄断监管机构将阻止美国公司相互并购，或对此实施更严厉的限制条款。竞争问题仍然可能破坏整个并购浪潮。同时，中国化工集团公司的收购案可能引来情报机构的关注。欧洲对待中国的收购一向宽松。去年，中国化工集团收购了意大利正在走下坡路的行业龙头企业倍耐力（Pirelli）。但先正达有27%的销售在北美市场，所以其收购案将受到美国外国投资委员会（CFIUS）这一国家安全组织的审核。该机构对中国企业一向秉持贸易保护主义态度。由于投资者担忧收购会受阻，先正达股价相比中国化工的收购价出现大幅折让。

所有这些收购提案都可能被压制或者以争吵收场，使得其他并购成为可能。一些旁观的公司也可能跃跃欲试，最明显的是德国的巴斯夫公司（BASF）。所以对老板们来说还是大有可为的。投资者也许不怎么喜欢，但在晦暗隐秘的化工行业中，这是数十年一遇的良机。■



Entertainment

Parks of recreation

Why media giants are betting big on the future of theme parks

WHEN Disney opens its newest theme park in Shanghai in June, one of the first sights to greet visitors will be the Enchanted Storybook Castle. Its gold finials and blue spires will tower 60 metres above the centre of the park, making the castle the largest in any of Disney's six such domains. A translucent canopy will house a twisting rollercoaster based on the "Tron" science-fiction franchise; robotic boats will voyage through the lair of Davy Jones, a buccaneering villain from the "Pirates of the Caribbean" film franchise.

Marvels like these are why Bob Iger, the head of Disney, has promised this will be the company's "most technologically innovative park". With a \$5.5 billion price tag it will also be the most expensive. But Shanghai Disneyland represents just a fraction of the investments the firm has been making in its theme parks. Over the past five years alone, it has ploughed \$14 billion into its parks division. There have been major upgrades to all of its existing parks and many additional wonders are already being built in them.

Disney is not alone. Major media companies are clamouring to open new theme parks or expand their existing offerings. Universal Studios, which is owned by Comcast, has its own Chinese park in the works, a \$3.3 billion project slated to open in Beijing in 2019. Viacom-owned Paramount Pictures has plans for a similarly pricey development outside London. And in Dubai, Sony Pictures and Lionsgate are among the studios collaborating with local developers on a huge complex of parks that is set to open later this year.

This global boom in investment might seem tough to reconcile with the

challenges of the theme-park business. Delighting both ten-year-olds and their parents is a magical feat in itself. And as anyone who has heard the gruesome tale of Euro Disney knows, parks are costly to build and expensive to maintain.

Newfound enthusiasm for them partly reflects upheaval in the media industry. As it has become harder to reap riches in television and film, companies are eager to spin gold from both their vast content libraries and to attract attention to their new offerings. Disney and Comcast have enjoyed considerable success doing this through their parks businesses, which have chugged along as reliable profit engines. Universal Studios has contributed more to Comcast's profits over the past five years than either the broadcast network NBC or the Universal Pictures film studio, its corporate siblings. At Disney, the company's theme-park division has generated a better return on assets than its film studio in four of the past five years.

Media companies also see theme parks as a good way to cash in on demographic and economic shifts. Thanks to rapid growth in emerging markets, nearly three billion people over the next two decades will attain middle-class purchasing power; flush with disposable income, this tide of consumers is expected to generate huge new demand for recreational travel. Already, theme-park attendance numbers in Asia are growing at the fastest clip of any market in the world; if that trend continues, the Themed Entertainment Association, an industry group, predicts the market there could eclipse that of North and South America within four years. The scene outside Shanghai Disneyland suggests why: although the park does not open for more than a month, thousands flock to its tarp-covered gates each day in the hope of peeking in.

It helps that media companies need not assume as much risk as they did in past decades of park investments. Many simply license their characters,

stories and other intellectual property to local developers in exchange for a cut of gross revenues or other fees. That ensures a relatively steady stream of income regardless of whether the park is making money, thereby minimising the risks to licensors. Such deals typically give licensors less control over the final product and limit the potential return from a park project. But for firms such as Paramount and Sony which are just beginning to explore such ventures, this model has nevertheless proved popular.

Companies with more theme-park experience prefer to take on more risk for the greater control and returns that a joint venture provides. In these deals, firms supply the intellectual property, design, management expertise and some cash in exchange for equity and fees. But they cede ownership of the park assets to a majority-shareholding local developer who then fronts much of the construction costs. Shanghai Disneyland, for example, depends upon one such arrangement.

Even if theme parks have many media companies spellbound, there are hazards. Measly economic growth can make finance for new construction harder to obtain. And as parks tend to draw the majority of their visitors from close by, attendance figures rise and fall with local incomes. A full-blown recession could do even more damage; profits from parks tumbled at many big firms, including Disney, during the depths of the global recession in 2009. Companies must make certain that their soaring hopes for theme parks, unlike the towers and turrets within them, do not rise too high. ■



娱乐

游乐园

为什么媒体巨头们为主题公园的未来押下重注

迪士尼最新的主题公园六月在上海开张时，首先迎接游客的景点之一将是“奇幻童话城堡”。这座城堡矗立于公园正中央，金色的顶尖和蓝色的尖塔高达60米，是迪士尼六个园区里最大的一座。在一座半透明的穹顶下，有以《创》（Tron）系列科幻电影为主题的扭转过山车；自动船将穿越《加勒比海盗》系列电影中里深海阎王戴维·琼斯（Davy Jones）的巢穴。

正是因为这样的奇迹，迪士尼的老板鲍勃·艾格（Bob Iger）承诺这将是该公司“技术上最为创新的主题公园”。它也将是最昂贵的一座——花费达55亿美元。然而，上海迪士尼乐园只是该公司主题公园投资中的一小部分。单在过去五年中，公司就对主题公园部门投入了140亿美元。所有已建公园都进行了很大的升级改造，许多增设的新奇景点已经开工。

这样做的还不止迪士尼一家。各大媒体公司都吵着要开办新主题公园或者扩建其现有的公园。康卡斯特（Comcast）旗下的环球影城正在建设中国园区，这个33亿美元的项目计划2019年在北京开幕。维亚康姆（Viacom）下属的派拉蒙影业（Paramount Pictures）计划在伦敦城外开发一个同样昂贵的项目。在迪拜，索尼电影娱乐公司（Sony Pictures）和狮门电影公司（Lionsgate）等电影制片企业正与当地开发商合作开发一个巨型公园群落，定于今年晚些时候开放。

这个全球投资热潮似乎与主题公园业务的挑战并不合拍。让十岁的孩子和他们的父母都开心，这本身就是一个奇迹。任何一个听说过欧洲迪士尼可怕故事的人都明白，主题公园不仅建设花费不菲，维护费用也很高昂。

对主题公园的新一轮热情，在一定程度上反映了媒体业的动荡。从电视和电影中赚钱变得越来越难，公司急于通过庞大的内容库和吸引人们关注其新公园来两方面获利。迪士尼和维亚康姆在这方面相当成功，它们的主题

公园业务已成为可靠的利润引擎。过去五年里，环球影城贡献给康卡斯特的利润超过了美国全国广播公司（NBC），也超过了它自己的兄弟企业环球影业（Universal Pictures），而迪士尼的主题公园部门有四年的资产回报率高于其电影制片公司。

媒体公司也把主题公园看做是从人口结构和经济转变中获利的好方法。得益于新兴市场的快速增长，未来20年里，近30亿人将具备中产阶级的购买力；随着可支配收入的井喷，这一波消费者有望对休闲旅游产生巨大的新需求。目前，亚洲主题公园的游客人数在世界所有市场中增长最快；行业组织“主题娱乐协会”（Themed Entertainment Association）预测，如果这种趋势继续下去，亚洲市场有望在四年之内超越北美和南美。上海迪士尼乐园外的场景说明了原因：虽然距离公园开放还有一个多月，但每天都有成千上万的人聚集到它的被油布覆盖的各个门口，希望能窥探一二。

有帮助的是，媒体公司不必像它们过去几十年里投资主题公园那样承担那么多的风险。许多公司干脆把它们的角色、故事和其他知识产权授权给当地开发商，以换取总收入的一部分或者其他费用收入。无论公园是否赚钱，这确保了相对稳定的收入流，从而最大限度地减少了授权人的风险。这种交易通常会削弱授权人对最终产品的控制，并限制公园项目的潜在回报。但对于派拉蒙和索尼等刚开始探索这一业务的公司，这种模式确实颇为流行。

主题公园经验更为丰富的公司愿意承担更大的风险，以取得更多控制权并从合资企业中获取更多回报。在这些交易中，公司提供知识产权、设计、管理专业知识和一些资金，以换取股权和费用收入。但是，它们把公园资产的所有权让予当地一家多数控股的开发商，由其承担大部分建设费用。例如，上海迪士尼乐园就是基于这样的安排。

即使主题公园使许多媒体公司着迷，危险同样存在。经济增长低迷，让新的建设项目难以获得融资。由于公园主要依靠吸引周边游客，游客人数会随着当地收入而起伏。一场全面的衰退可能会造成更大的损失：在2009年全球经济深陷衰退之时，包括迪士尼在内的许多大公司的公园业务利润暴

跌。公司必须确保它们对主题公园高涨的希望不会像其高塔和角楼那样升得太高。 ■



The Wallenberg group

A Nordic pyramid

The lessons from 100 years of a family's industrial empire

SWEDEN is a progressive place. Women participate fully in the workforce. Companies are transparent, generally uncorrupt and often globally minded. Enthusiasm for technology helps Stockholm flourish as a lively startup centre for gaming, music and fintech firms. Business leaders earnestly talk of the benefits of going green, caring for workers and being ethical. In politics, Sweden is egalitarian, redistributing wealth through high taxes. So it is a puzzle that Swedish capitalism appears so strikingly unequal, with a small number of individuals owning and running large chunks of the economy.

Credit Suisse, in its annual report on global wealth in October, pointed to findings that the richest 1% of Swedish households control 24% of the population's total wealth, making it only a bit less unequal than India (25.7%). In contrast, Spain's 1% control 16.5% of the wealth, and Japan's only 4.3%. As in many countries, family-controlled businesses are the norm in Sweden. But as Randall Morck of the University of Alberta in Canada has noted, Sweden is an extreme case among rich countries in that one particular family, the Wallenbergs, holds such sway in business.

The foundations were laid for the dynasty's fortunes 160 years ago when André Oscar Wallenberg, the globe-trotting son of a Lutheran bishop, returned from America with a book on how to set up a bank, and founded Skandinaviska Enskilda Banken (SEB). The bank flourished, and began buying chunks of distressed industrial firms, leading the family to set up a holding company, Investor, 100 years ago.

At the height of the Wallenbergs' pre-eminence, in the 1970s, their various

firms together employed 40% of Sweden's industrial workforce and represented 40% of the total worth of the Stockholm stockmarket. Like most modern manufacturers, the industrial firms in their portfolio, including ABB and Atlas Copco (engineering), AstraZeneca (drugs) and Electrolux (appliances), are no longer huge employers. But Investor, plus SEB and the other listed firms in Investor's portfolio, still account for about a third of the stockmarket's value. And they generally do better than the rest: in the past decade, Investor's shares have doubled, whereas the OMX Stockholm 30 Index rose by just 40%.

Swedes often talk about the collection of companies as *Wallenbergsfaren*, "the Wallenberg sphere", and to its smaller local rivals as "systems". One of the largest systems is Industrivarden, whose portfolio includes Handelsbanken and the maker of Volvo Trucks. It has passed through several hands down the years, including those of Ingvar Kamprad, the founder of the IKEA furniture stores; its leading investor nowadays is Fredrik Lundberg, the son of a construction magnate. The Wallenbergs and Industrivarden both have large stakes in Ericsson, a maker of telecoms equipment.

Many Wallenberg firms have roots in the 19th century, before Investor was founded. But they have generally flourished under the active ownership and close managerial oversight of the family. The sphere is now overseen by a genial triad of middle-aged men, two brothers and a cousin: Jacob, Peter and Marcus Wallenberg (pictured). A transition to a sixth generation of the family is looming, with the next set of leaders to be drawn from a pool of around 30 relatives in their 30s or younger. A hitherto male-dominated empire is then likely to have some Wallenberg women right at the top. Already, Caroline Ankarcróna, younger sister to Marcus Wallenberg and in her late 40s, has been running the main family foundation, KAW, for four years.

“Sphere” is one way of describing the Wallenberg holdings. A more pointed term (literally as well as figuratively) is the one Mr Morck uses: a pyramid. The Wallenbergs are thought to have combined personal wealth of just \$1 billion or so, but they control, or have strong influence over, businesses worth hundreds of times as much.

They do so through a number of foundations. KAW, the largest, is named after two ancestors who provided the largest endowment, 99 years ago. KAW has 50.1% of voting rights in Investor, chaired by Jacob Wallenberg. It in turn holds stakes—and often outsized voting rights—in their main, listed firms, at which family members often take leadership roles. (Through a division called Patricia Industries, Investor holds majority stakes in financial, telecoms and other firms, and is also a founder-investor in a private-equity fund, EQT.)

| *Fear of tunnelling*

These successive layers let the Wallenbergs multiply their clout. Investor has beaten the Stockholm market handsomely, but its listed businesses often trade at a discount to their global peers, points out Thomas Zellweger, who directs a centre studying business families in St Gallen, Switzerland. Outside investors may be discounting the shares out of fear of “tunnelling”, in which a controlling family uses one firm to prop up another—though Mr Morck notes that there is scant evidence of this.

Shareholders may also fear a controlling family pursuing its private obsessions, while neglecting the business: an early Wallenberg, for instance, campaigned assiduously for a single global currency, based on gold and the French franc. They may also worry that the next generation of Wallenberg bosses are chosen for internal family reasons rather than on merit. The Wallenbergs have managed their successions well over the years, but there is no guarantee this will always be so.

The Wallenberg empire might in theory be threatened if, as in other countries, there were moves towards curbing the use of the dual-class shares that let the family exercise such sway over its firms. In Ericsson, for example, Investor has just 5.3% of total stock, but controls 21.5% of votes. In Electrolux, Investor has 15.5% of the stock, but 30% of voting rights. Family firms often use such dual shares (The Economist Group, largely owned by European business families, uses them too), but prevalence does not mean popularity. However, the family has long enjoyed good political connections: for all its support for free trade and open markets abroad, until the 1990s it had decades of help from protectionist policies that kept foreign predators at bay.

That the KAW and other foundations get the Wallenbergs' share of profits helps shield them from Sweden's top income-tax rate, of 62%. The foundations' beneficence also helps shield them from criticism: the KAW, for instance, makes \$250m of grants a year, notably to fund basic research and education.

| *Nordic, not Anglo-Saxon*

Discuss their set-up with the Wallenbergs and they say "Anglo-Saxons", schooled in British and American ideas that companies are best owned by masses of small investors (or pension funds), are wilfully blind to the benefits of family-dominated firms. The family argues that ownership models need not be "black and white", that theirs has proved it can deliver a "nice track record" for more than a century-and-a-half. Well-run family firms can ensure modern virtues—transparency, professional management, clear communication, agility—as easily as those Anglo-Saxons.

Tour the headquarters of Ericsson, and its CEO, Hans Vestberg, offers a similar argument: a stolid company, founded in 1876 (and part-owned by the Wallenbergs since 1950), can be nimble, even ruthless. Ericsson

frittered away the strong position it once had as a maker of mobile handsets. But Mr Vestberg talks optimistically of how it will prosper from the coming launch of fifth-generation (5G) wireless telecoms and the “internet of things”. Ericsson, with a \$5 billion annual research-and-development budget, files 4,000 patents a year, he says. In less than two years it has hired 30,000 staff, but also let go 28,000, to make possible a shift from a company that sells products to one more focused on services.

Gunnar Wetterberg, author of a book on the Wallenberg family, argues that having most of its wealth locked up in the foundations best explains its long-term success: family feuds are discouraged when no relative can dream of running off to Bahamas with all the loot. “There are no family fights,” says one Wallenberg. “No one understands how it works, but it works well.”

Other observers prefer explanations that focus on the personality and skills of a mostly self-effacing, hard-working and polyglot clan. Their spells working in the companies make them better owners. Carina Beckerman, who has just written a book on culture and leadership in Wallenberg companies, lauds two qualities that help encourage success. One is doggedness: the Wallenbergs found few firms, but they stick with existing ones, seek new markets and try ways to make them flourish. She notes that Atlas Copco had to be rescued from near-bankruptcy three times in its first 27 years, but now flourishes.

The second quality, says Ms Beckerman, is a near-obsession with getting the right managers in place: it is often the top item on the agenda whenever the Wallenberg leaders gather. They typically favour loyal insiders, not show-offs who promise dramatic change.

Not everything the family touches turns to gold. Efforts to go digital, just over a decade ago, by investing in a pair of online firms, Spray Networks

and Bredbandsbolaget, had disappointing outcomes. Scania, a lorry-maker that has flourished since being bought by Volkswagen in 2000, was sold too cheaply, says Ms Beckerman.

But the sphere's more recent efforts to expand its medical interests have been more successful—witness its investments in Sobi, which specialises in treatments for haemophilia and other rare diseases, and in Mölnlycke Health Care, which makes products for use in surgery and treating wounds. Even if its dominance of the Swedish business scene has diminished in recent decades, the Wallenberg sphere looks set to go on prospering in the hands of its sixth generation.

That makes them mere parvenus compared with the Lovenskiold family across the border in Norway: now led by its 13th generation, it claims a 360-year history and runs successful timber and furniture firms. But there may be a shared recipe for such longevity. “The majority of the really successful, long-lasting families are, like the Wallenbergs, convivial, modest, see the hard work needed and do it quietly,” says a close observer. If they were a bunch of work-shy show-offs, Swedes would surely have noticed the inequality by now. ■



瓦伦堡集团

北欧金字塔

一个家族产业帝国的百年经验

瑞典是一个进步的国度。女性充分参与劳动力市场。公司经营透明，普遍廉洁守法，往往具有全球视野。对科技的热衷帮助斯德哥尔摩发展成为游戏、音乐及金融科技创业公司聚集的中心，生机勃勃。商界领袖诚恳地倡导节能环保、关怀员工及道德营商。在政治上，瑞典讲求平等，通过高税收对财富进行再分配。然而，让人困惑的是，为何瑞典资本主义似乎存在惊人的不平等现象，少数人拥有并经营着大片经济版图。

瑞士信贷（Credit Suisse）在去年10月的全球财富年度报告中指出，瑞典最富有的1%家庭控制着全国总财富的24%，不平等程度仅稍低于印度（25.7%）。相比之下，西班牙最富有的1%家庭控制了社会总财富的16.5%，而日本仅为4.3%。与许多国家的情况一样，家族企业在瑞典是常态。但正如加拿大阿尔伯塔大学（University of Alberta）的兰德尔·莫克（Randall Morck）指出的，瑞典是富裕国家中的极端例子，瓦伦堡这一家族在瑞典商界拥有令人咋舌的份量。

早在160年前，这一家族王朝便奠定了发展根基，安德烈·奥斯卡·瓦伦堡（André Oscar Wallenberg）的父亲是路德主教，自己则跑遍了全世界。他从美国带回一本关于如何设立银行的书，随后创立了瑞典北欧斯安银行（Skandinaviska Enskilda Banken，以下简称SEB）。该银行蓬勃发展，开始购入大量亏损的工业企业，家族于100年前继而成立了控股公司“银瑞达集团”（Investor）。

在上世纪70年代瓦伦堡家族的全盛时期，旗下各类公司占斯德哥尔摩股市总市值的40%，所雇用的员工占瑞典工业劳动力的40%。如今，该家族旗下的ABB、阿特拉斯科普柯集团（Atlas Copco，工程）、阿斯利康（AstraZeneca，制药）和伊莱克斯（Electrolux，电器）等工业公司与大多数现代制造商一样已不再是大型雇主。但银瑞达集团、SEB及银瑞达持

股的其他上市公司加起来仍占了斯德哥尔摩股市总市值的三分之一。而且其业绩总体跑赢大市：过去十年，银瑞达集团的股价翻了一倍，而OMX斯德哥尔摩30指数仅上涨了40%。

瑞典人一般称这一系列企业为“瓦伦堡圈”（Wallenbergfaren），而把其较小规模的本土对手称为“系统”（systems）。最大的一个系统是瑞典工业投资集团Industrivarden，其资产组合包括了瑞典商业银行

（Handelsbanken）和沃尔沃卡车。这些年来，该集团几经易手，一度为宜家创始人英瓦尔·坎普拉德（Ingvar Kamprad）的家族所有；目前该集团的大股东为建筑大亨之子弗雷德里克·伦德伯格（Fredrik Lundberg）。瓦伦堡家族及Industrivarden均持有电信设备制造商爱立信的大量股份。

瓦伦堡家族的许多公司可以溯源至银瑞达集团成立前的19世纪。但往往是得益于瓦伦堡家族的积极持股及严密管理，这些公司才得以蓬勃发展。

“瓦伦堡圈”目前由三位慈眉善目的中年男子掌舵，他们是雅各布·瓦伦堡（Jacob Wallenberg）和彼得·瓦伦堡（Peter Wallenberg）两兄弟及其堂兄弟马库斯·瓦伦堡（Marcus Wallenberg）（见照片）。第六代接棒在即，下一代领导人将从家族内约30位三十多岁或更年轻的成员中诞生。这一历来由男性主导的家族帝国很可能有某些女性成员登上权力之巅。马库斯·瓦伦堡的妹妹，接近50岁的卡罗琳·安卡克罗纳（Caroline Ankarcrona）管理家族的主要基金会“克纳特及爱丽丝·瓦伦堡基金会”（Knut and Alice Wallenberg Foundation，以下简称“KAW”）已有四年时间。

“圈”是描述瓦伦堡家族控股集团的一种说法，而莫克则以更尖锐的（包含字面和象征意义）一个词来形容：金字塔。据估计，瓦伦堡家族总共仅拥有约10亿美元的个人财富，但他们掌控或强势影响的企业价值数百倍于此。

他们通过多个基金会来实现这一点。其中最大的是KAW基金会，以99年前捐资最多的两位先人名字命名。KAW拥有银瑞达集团50.1%的投票权，后

者由雅各布·瓦伦堡任董事长。银瑞达集团又持股（且往往拥有大于持股份额的投票权）通常由家族成员任管理者的主要上市公司。通过名为“帕特里夏产业公司”（Patricia Industries）的分支机构，银瑞达集团持有金融、电信及其他公司的多数股权，而且是私募股权基金EQT的创始人及投资者。

| “掏空”之恐

这些层层相继的持股令瓦伦堡家族的影响力倍增。银瑞达已干净利落地征服了斯德哥尔摩市场，但其上市企业的股价往往低于全球同类企业，瑞士圣加仑（St Gallen）一个家族企业研究中心的负责人托马斯·泽尔韦格（Thomas Zellweger）指出。外部投资者对股价估值偏低也许是害怕发生“掏空”之举，即控股家族用旗下一家公司来撑起另一家公司，但莫克表示，目前没有什么证据显示有这样的行径。

股东们也会害怕控股家族会沉迷一己追求而忽视公司业务：比如瓦伦堡家族早期有一位成员曾积极倡议全球使用基于黄金和法国法郎的单一货币。股东们也可能担心瓦伦堡家族在选择下一代接班人时只考虑家族内部因素，而非基于才干能力。在权力继承的问题上，虽然多年来瓦伦堡家族处理得当，但也不能保证永远如此。

假如像其他国家那样，瑞典开始限制运用双重股权结构这一有利于家族企业操控持股公司的手段，理论上瓦伦堡帝国将受到威胁。例如，银瑞达对爱立信持股比例仅为5.3%，却拥有21.5%的投票权。银瑞达对伊莱克斯持股15.5%，投票权却达30%。家族企业往往运用到这种双重股权机制（经济学人集团主要由欧洲商业家族拥有，亦循此道），但广为利用并不意味着受欢迎。然而，瓦伦堡家族长期与政界保持着良好的关系：尽管家族主张自由贸易和对海外开放市场，至上世纪90年代前，家族一直得益于政府的保护主义政策，几十年来免受外国大鳄的侵袭。

因为KAW及其他基金会拥有瓦伦堡家族的盈利，这让他们无须按瑞典的最高所得税率62%纳税。这些基金会的善行也助其免受非议：例如，KAW每年捐款2.5亿美元，主要用于资助基础研究和教育事业。

| 北欧，而非盎格鲁-撒克逊

与瓦伦堡家族讨论其公司架构，他们会说“盎格鲁-撒克逊”模式，受“公司最好由大量小投资者（或养老基金）持股拥有”的英美理念熏陶，故意无视家族主导企业的好处。瓦伦堡家族认为，所有权模式不必“非黑即白”，他们的模式历经超过150年，“表现良好”。经营有道的家族企业可以像“盎格鲁-撒克逊”式公司那样，确保实现透明、专业人士管理、清晰沟通、灵活等这些现代企业的优点。

到爱立信的总部参观，其首席执行官卫翰思（Hans Vestberg）也有类似的说法：成立于1876年（自1950年后由瓦伦堡家族部分持股）的一家迟钝的公司也可以变得灵活机敏，甚至残酷无情。爱立信作为手机制造商的强势地位已经虚耗无存。但卫翰思乐观地表示，公司将得益于即将面世的第五代（5G）无线通信技术及“物联网”而兴旺发展。他说，爱立信的年度研发经费为50亿美元，每年申请4000项专利。不到两年时间，公司已新聘30000名员工，也辞退了28000人，为的是从销售产品向更侧重服务转型。

曾写书介绍瓦伦堡家族的贡纳尔·沃德利（Gunnar Wetterberg）认为，该家族的长期成功主要依赖于以各基金会锁定家族的大部分财富：家族里任何人都无法抢夺财产然后跑到巴哈马去，也就不会催生家族内耗。“我们家族没有内讧纷争。”瓦伦堡家族一位成员说道。“没人知道到底是如何运转的，但一切运转良好。”

其他分析师更倾向认为，家族内成员大多谦逊、勤奋，且精通多国语言，这些品格及能力才是成功秘诀。他们在公司里展现的魅力使其成为更佳的企业主。卡琳娜·贝克曼（Carina Beckerman）就瓦伦堡企业文化及领导力刚完成了一本著作，她对两种素质称许有加，认为有助达致成功。一是顽强专注：瓦伦堡家族创立的公司不多，但坚守现有的企业，为其寻求新市场，尝试新方式令其蓬勃发展。她指出，阿特拉斯科普柯集团在最初的27年间，曾三度被瓦伦堡家族从破产边缘挽救回来，如今业务蒸蒸日上。

第二种素质，贝克曼表示，是对寻觅最佳管理人员那份近乎痴迷的执着：

每当瓦伦堡领导者聚首，这往往是头号议程。他们一般偏爱忠心耿耿的内部人士，而不喜欢承诺带来巨变的浮夸派。

这一家族也不是万事都能点石成金。十多年前为求进军数字行业，他们投资Spray Networks及Bredbandsbolaget两家网络公司，但结果令人失望。贝克曼又举例说，瓦伦堡在2000年以极低的价格出售了卡车制造公司斯堪尼亚（Scania），而该公司被大众收购后业绩一路飙升。

不过“瓦伦堡圈”近期在医疗领域的扩展更为成功，投资对象包括专门研制治疗血友病及其他罕见疾病药物的Sobi公司，还有制造外科手术及伤口处理用品的墨尼克医疗用品公司（Mölnlycke Health Care）。尽管近几十年来瓦伦堡家族在瑞典商界的霸主地位有所减弱，在第六代成员手上，“瓦伦堡圈”似乎仍将继续繁荣发展。

相比邻国挪威的勒芬舍尔德家族（Lovenskiold），瓦伦堡家族只不过是暴发户：勒芬舍尔德家族已有360年历史，如今由第13代子孙掌舵，成功经营木材及家具企业。但家业长青或许有共通秘诀。“像瓦伦堡这样真正长盛不衰的家族，成员大多拥有快乐、谦虚的性格，他们视辛勤工作为必然，而且会安安静静地努力工作，”一位与之关系密切的观察者表示。如果他们是一群浮华的懒散之徒，瑞典人肯定早就留意到这样的贫富不均了。■



Schumpeter

Reluctant heirs

Getting children to take over the family business can be hard

FAMILY firms are fashionable. Management thinkers like them because they are reckoned to take a longer-term view than other firms. Politicians like them because they provide lots of relatively secure jobs. And the public like them because they think such firms are more in touch with local communities than ones owned by anonymous shareholders.

This chorus of praise has some notable absentees, however: the next-generation family members who are supposed to inherit these businesses. Whenever the heads of family businesses gather, they complain about the difficulty of getting their children to take over from them. A recent survey by Peking University found that 80% of potential Chinese heirs were reluctant to follow in their fathers' footsteps.

There are some good reasons for the younger generation to be hesitant. A successful patriarch or matriarch can be a hard act to follow—and may be a bothersome back-seat driver long after relinquishing the steering-wheel. Even an heir who lifts the business to new heights may still suffer sniping that he got where he is simply by belonging to the “lucky sperm club”, as Warren Buffett calls it. In other cases the heirs may genuinely not be right for the job: they may be more extensively and expensively educated than their parents, but lack the managerial skills to command a big organisation. Joachim Schwass of IMD, a Swiss business school, argues that the most common characteristic of failed successions is that the family marks out the eldest son for the top job from an early age, and hands it to him regardless of ability.

The list of companies that have ended up being sold, or handed over to

professional managers, for want of a suitable family member willing or able to take over, include two of the world's biggest hotel chains, Hilton and Marriott; and one of its biggest toymakers, Lego. To avoid this fate, and increase the chances of producing a strong successor, business families need to grasp two things. The first is that inheritance is a process, not an event. That process involves giving potential heirs a chance to prove their worth. Bernard Arnault, the boss of LVMH, and Rupert Murdoch, the boss of News Corp, have both given their children bits of their empires to run. Samsung created the role of "chief customer officer" for Jay Lee, the son of its boss, Lee Kun-hee, to give him experience in handling all-important partnerships with other tech firms, such as Apple. Another Lee family, which owns Lee Kum Kee, a Hong Kong-based maker of sauces, have created a "family learning and development centre" to prepare the next generation to take over.

Another way to ensure that heirs are ready for the jobs they inherit is to make them prove themselves outside the family firm. This can broaden their experience, boost their self-confidence and prove to doubters that they are more than just daddy's pet. George Stalk of the Boston Consulting Group says he knows of one company that refuses to interview members of its founding family unless they have earned a master's degree in business or engineering and have won two promotions within five years while working for a non-family firm. In the meantime a firm could hire a CEO from outside the family but still keep open the option of some day going back to having a family member run the show—as seems possible, for example, at Pictet, a Swiss bank. An alternative is to have a non-family CEO and give the chosen heir the job of chairman. This is Mr Buffett's plan for Berkshire Hathaway when he eventually retires.

The second thing that business founders must grasp is that behind a successful family firm lies a successful family. A striking proportion of businesses spring from minorities which have had to rely on strong and

cohesive families to survive in a sometimes unfriendly climate: the Jews in Europe; the Parsis in India; the Chinese in South-East Asia. Successful business dynasties work hard at reinforcing family ties. They hold regular gatherings; and they prepare for disagreements by creating family constitutions, including such things as guidelines on when and how family members may be hired by the firm. Business families need to persuade the younger generation that taking over the company is an opportunity, not a burden. Mr Schwass notes that successful families tend to have “informal curriculums” which are designed to teach younger members not just about how the family firm works but about why it matters.

| *Sticky batons*

No amount of sugar-coating will work unless the retirement problem is solved. A striking number of patriarchs suffer from “sticky-baton syndrome”. Melvin Gordon, boss of Tootsie Roll, an American confectioner, died in office in January, aged 95. Serge Dassault, boss of Dassault Group, a French conglomerate, is 90. Viacom, a media conglomerate, is floundering in part because Sumner Redstone, aged 92 and in poor health, has resisted handing over to his daughter, Shari. Christophe Bernard of KPMG, a consulting firm, says families need to devote as much thought to getting the former boss to move on as they do to training his successor. One “golden rule”, he says, is to give the retiring patriarch something big to fill his days, such as running a family charity.

There are signs that business families are getting better at all this. More of them are drawing up formal family constitutions. More of them are seeking outside advice on managing a generational transition. There is now quite an industry of providing family firms’ heirs with training and networking opportunities. IMD has a course that mixes members of European family dynasties with Chinese princelings. Loyola University in Chicago has a Next Generation Leadership Institute. Family capitalists like to proclaim

that “A family business is not a business you inherit from your parents, it is a business you borrow from your children”. But making a reality of this charming adage requires hard work, careful planning and a willingness to let go. ■



熊彼特

不愿继承

家族企业难求子女接管

家族企业正当其时。管理学家喜欢它们，认为相比其他公司，家族企业的目光更为长远。政客喜欢它们，因为它们提供大量相对稳定的职位。大众也喜欢它们，因为他们感觉比起由不知名股东拥有的大企业，家族企业与当地社群的关系更加紧密。

但是，在赞赏的人群中还是有一些显眼的缺席者：本应继承这些企业的下一代家族成员。家族企业的老板们每逢聚首都会抱怨难以说服孩子接管自家公司。北京大学最近的一份调查发现，在中国，80%的潜在继承人都不愿追随父辈的足迹。

年轻一代之所以踌躇不前，有其合理原因。业绩显赫的大家长可能让人望尘莫及，而且退位之后仍可能长期幕后插手。即使继承人把企业推向另一高峰，仍难免遭人非议，认为那纯粹是因为他出身于巴菲特所谓的“幸运精子俱乐部”。其他情况下，继承人也许的确不适合接手这份工作：比起父辈，他们可能接受过更广泛、更昂贵的教育，但却缺乏掌控大型机构所需的管理技巧。商学院瑞士国际管理发展学院（IMD）的约阿希姆·舒瓦兹（Joachim Schwass）认为，传承失败的案例中，最常见的特点是家族早早就把长子定为接班人，日后不论其能力如何照样让他接班。

由于没有合适的家族成员愿意或有能力接管公司，一些家族企业最终被出售或交由职业经理人管理，其中包括世界两大连锁酒店集团——希尔顿和万豪，还有世界最大玩具制造商之一的乐高集团。为避免落入这样的命运、增加产生有能力的接班人的机会，企业家族需要理解两点。首先，继承是一个过程，而非一个事件。在这一过程中，要给候选继承人机会来证明其价值。路易威登集团（LVMH）的老板贝尔纳·阿尔诺（Bernard Arnault）及新闻集团（News Corp）的老板鲁伯特·默多克（Rupert Murdoch）均已把其企业帝国的一小部分交由子女管理。三星集团则为老

板李健熙的儿子李在镕创设了“首席客户官”一职，让其处理与其他科技公司（如苹果）的重要伙伴关系。另一李氏家族企业，总部在香港的酱料制造商李锦记，也创设了“家族学习与发展中心”，让下一代为接班做准备。

确保继承人有足够能耐接掌家族业务的另一途径是让他们在家族企业之外证明自己的实力。这不但能拓宽其经验，提升其自信，还能向怀疑者证明他们并非温室花朵。波士顿咨询集团的乔治·斯托克（George Stalk）表示，他知道有一家公司对其创始家族成员的求职申请设下门槛，要求他们必须拥有商科或工程学硕士学位，并在非家族所属企业工作的五年内获得过两次晋升，否则不予面试。同时，企业可从家族以外聘请CEO，但仍保留日后让家族成员接管的可能性，瑞士百达银行（Pictet）就是一例。另一方法是聘请非家族成员担任CEO，而让选定的家族继承人当董事长。这正是巴菲特为伯克希尔·哈撒韦公司（Berkshire Hathaway）在自己最终退休时所做的打算。

企业创始人必须明白的第二点是每一个成功的家族企业背后都有一个成功的家庭。少数族裔背景的家族企业比例惊人，它们必须在有时并不友善的环境中求存，不得不依赖强大而紧密的家族联系，比如欧洲的犹太人、印度的帕西人和东南亚的华人。成功的商业王朝努力加固家族纽带。他们定期聚会，并为可能出现的分歧订立家族宪章，包括规定家族成员何时及经由怎样的程序获聘进入家族企业工作。企业家族需说服年轻一代相信接管公司是机遇而非负担。舒瓦兹指出，成功的家族一般有一套“非正式课程”，不但指导其年轻成员了解家族企业的运作，而且让他们认识到这一切的重要性。

| 交棒困难

除非退休交接的问题得到解决，不然再多表面的粉饰也是徒劳。患有“交棒困难症”的家族领袖数目多得惊人。美国糖果商Tootsie Roll的老板梅尔文·戈登（Melvin Gordon）今年1月在任内去世，终年95岁。法国达索集团（Dassault Group）的老板塞尔日·达索（Serge Dassault）如今已90岁。媒体集团维亚康姆（Viacom）目前处境艰难，原因之一是身体欠佳的92岁总裁萨默·雷石东（Sumner Redstone）拒绝让女儿莎丽（Shari）

接掌大权。咨询公司毕马威的克里斯托夫·伯纳德（Christophe Bernard）认为，企业家族除了用心培养继承人之外，还需要同样努力说服退休的老板放手向前。他说，“黄金法则”之一是让卸任长辈干些大事来充实其生活，比如管理家族慈善机构。

有迹象表明，企业家族在这一切问题的处理上已日渐进步。越来越多的家族纷纷订立正式的家族宪章，以及就管理代际传承寻求外部建议。为家族企业继承人提供培训和拓展人脉的机会俨然已成为一项产业。IMD设立的一门课程让欧洲家族王朝的成员与中国的富二代打成一片。芝加哥洛约拉大学（Loyola University）设有“新世代领导力学院”（Next Generation Leadership Institute）。家族企业资本家喜欢宣称“家族企业不是从父母那里继承而来，而是从子孙手上暂借过来”。但是，要践行这句动听的格言，需要辛勤耕耘、精心策划，并愿意放手。■



Additive manufacturing

Alloy angels

3D printing produces a curious lightweight motorcycle

ONE of the great advantages of 3D printing is being able to escape the constraints of traditional production processes, and to make things with unique shapes. The powerful computer-aided design programs that are used to run 3D printers help engineers achieve this. Algorithms calculate the most efficient structure required to achieve the lightest weight and yet still handle all the loads and stresses that will be placed upon the object. Often the result is rather like something that nature might come up with—which is hardly surprising as nature has had millions of years of practice in creating highly efficient structures.

The latest example of this bionic design trend is the Light Rider, which is claimed to be the world's first 3D-printed motorcycle. The substantial part of its structure was printed by APWorks, a company based near Munich, using a proprietary material called Scalmalloy, an aluminium-magnesium-scandium alloy that was specially developed for 3D printing by Airbus, a European aerospace group that owns APWorks.

The motorcycle is driven by a 6kW electric motor and battery. It reaches a top speed of 80kph and hits 45kph in three seconds. That will not exactly excite serious bikers, but its 3D-printed frame could get their attention. It weighs just 6kg, which makes the Light Rider some 30% lighter than conventionally manufactured electric motorcycles.

Then there is the frame's shape, which looks like an organic exoskeleton. This complex and hollow structure could not have been made with anything other than a 3D printer, says Joachim Zettler, APWorks' boss. The process involved using a laser to melt together thousands of individual

layers of the powdered alloy, each layer only some 60 microns (millionths of a metre) thick. The company is offering a limited production run of just 50 Light Riders. At some €50,000 each, it is not just the bike that is exotic but also the price. ■



增材制造

合金天使

3D打印制造出奇特的轻量摩托车

3D打印的优点之一，就是它能够摆脱传统生产工艺的制约，制造出形状独特的物品。强大的计算机辅助设计软件会驱动3D打印机，帮助工程师实现这一目标。算法会计算出最为高效的结构使其重量最轻，却仍然能够承受对其施加的所有载荷和应力。其结果往往和大自然的造化相当类似——这完全不足为奇，毕竟大自然对于创造高效率的结构有几百万年的实践。

这种仿生设计潮流的最新实例是Light Rider——它号称是世界上首款3D打印的摩托车，其主要结构部分由总部位于德国慕尼黑附近的APWorks公司打印生产。它使用一种名为Scalmalloy的专有材料，这种材料是铝镁钪合金，由拥有APWorks的欧洲航空集团空中客车公司专为3D打印而开发。

这款摩托车由6千瓦电动马达和电池驱动，速度最高可达每小时80公里，并可在三秒钟内加速至每小时45公里。这也许还不足以使正规车手激动万分，但3D打印的框架可能会让他们眼前一亮。它的重量只有6公斤，这让Light Rider比常规的电动摩托车轻了约30%。

再有就是框架的形状，它看起来是像一副有机的外骨骼。APWorks的老板约阿希姆·赛特勒（Joachim Zettler）说，除了用3D打印机，任何其他手段都造不出这种复杂的中空结构。该工艺使用激光把数千层合金粉末熔融在一起，每一层大约只有60微米厚。该公司仅生产50辆限量版Light Rider，每辆车价格在五万欧元左右。看来不光是车本身，价格也一样夺人眼球呢。■



Clinical trials

Better with bitcoin

Blockchain technology could improve the reliability of medical trials

CLINICAL trials are a murky old world. The pharmaceutical industry is keen to get new drugs to market and researchers are just as keen to report positive results. This can produce some rather unpleasant side-effects. Selective reporting of data from trials is rife. In one infamous example, a 2001 study reported that paroxetine, an antidepressant, was safe and effective for treating the illness in teenagers. It later emerged, however, that this was based on new measures of the drug's effectiveness, introduced only after the drug had failed to show any significant improvement in the outcomes that had been specified when the trial was first drawn up. Later studies showed that the drug increased the risk of suicidal behaviour in children.

How to guard against such things got Greg Irving, a family doctor and a researcher at the University of Cambridge, thinking. He came up with a way to improve the reporting of clinical trials with the blockchain technology underlying bitcoin, a digital currency. The blockchain is a database that acts as a public ledger of all transactions with the currency, and is thought to be almost completely tamper-proof because it is validated and stored independently on thousands of different computers worldwide. This provides a way, Dr Irving reckons, to check that results have not been fudged.

Since 2007 America's drugs regulator has required that all clinical trials are registered in ClinicalTrials.gov, a publicly accessible database. So, Dr Irving used a recent example to demonstrate how his idea might work. He saved a copy of the study protocol, including the planned analysis and clinical outcomes it was supposed to test, to a text file. He then fed that file into an

algorithm called an SHA256, which boils the data down into a unique string of characters known in cryptography as a “hash”. Even a small change to the original file, such as the addition of a full stop, would result in a completely different hash. (Conversely, it is impossible to use the code to reconstruct the contents of the original file.) Such strings are also used in bitcoin transactions.

To add a record of the codified protocol to bitcoin’s public ledger, its hash must be used in a bitcoin transaction. To do that Dr Irving used the hash generated from the trial protocol as a “private key”—essentially a password that allows someone to spend bitcoins in his online wallet. Bitcoin users usually randomly generate a hash for the same purpose. He then transferred a small sum of money from his bitcoin wallet to a second bitcoin wallet. The transaction created a “public key”—a second string of characters that is time-stamped and entered in the blockchain’s ledger.

Anyone with a copy of the trial protocol should be able to reproduce the above steps to check if they resulted in the same public key. This would prove that the copy of the protocol matched the original. To show that this was the case, Dr Irving gave his protocol to John Holden, also a general practitioner, who used it successfully. Though the process might seem to be convoluted, Dr Irving and Dr Holden say it took less than five minutes.

Dr Irving believes the method could prevent “hidden outcome switching”, the egregious and statistically flawed practice of secretly changing the focus of a clinical trial to fit the results. A study last year of 137 trials found 60 reported on outcomes they were not looking for, according to their original protocol. The COMPare project, which monitors clinical trials, found only nine out of 67 studies it has so far looked at had reported their results properly.

With about 20,000 studies registered each year on ClinicalTrials.gov alone,

such problems are likely to be the tip of a very large iceberg, Dr Irving contends. Public keys for protocols should be uploaded to trial registries, he argues, and included in research papers. Researchers and medical journals could speedily check whether the right results were being reported. Ultimately, the process could be automated.

Another benefit, paradoxically, is that the protocol for studies could be hidden until completed. This might be useful for commercially sensitive trials of new therapies. As long as the public key was uploaded to a registry when the trial began, the protocol could be verified later without the worry that it had been changed during the study. Dr Irving would now like to test his ideas on a small number of trials. And, of course, to report the results properly. ■



临床试验

比特币妙用

区块链技术或可提高医疗试验的可靠性

临床试验可谓是一个黑暗的旧世界。医药行业渴望让新药上市，研究者也同样期盼着积极的结果，然而这可能会产生一些相当不好的副作用。选择性报告试验数据的现象十分猖獗。有一个臭名昭著的例子是2001年的一份研究报告，它指出抗抑郁药帕罗西汀可以安全而有效地用于青少年的治疗。然而后来发现，这一结论是根据新的药效测量结果得出的，但这些测量是在最初规定的试验结果未能体现任何显著改善后才进行的。后来的研究表明，该药物加大了儿童自杀行为的风险。

如何防范类似的事情发生？这引发了家庭医生兼剑桥大学研究员格雷格·欧文（Greg Irving）的思考。他想出了一种运用比特币背后的区块链技术来改进临床试验报告的方法。区块链是一个数据库，也是记录了比特币所有交易的公共总账，而且人们认为它几乎可以完全防止篡改，因为它是由分布在世界各地的成千上万台计算机独立校验和存储的。欧文认为，这提供了一种检查结果是否作伪的方法。

自2007年以来，美国的药品监管机构已要求所有的临床试验均须在可公开访问的数据库ClinicalTrials.gov中注册。于是，欧文用了一个新近的案例来展示他的想法如何运作。他将研究方案存储到一个文本文件里，包括计划进行的分析和应该测试的临床结果。然后，他把文件送入一种名为SHA256的算法，它会把数据浓缩成一个唯一的字符串，这个字符串在密码学中称为“散列表”。（反过来则无法通过这串代码来重构原始文件的内容。）如果对原始文件做微小的改变，比如增加了一个句号，都会导致得出完全不同的散列值。比特币交易中也用到了这样的字符串。

要把方案的编码添加到比特币的公共总账中，必须有某次比特币交易用到了这个散列值。为此，欧文把由试验方案生成的散列值用作“私钥”——简单来说就是一个密码，可让别人消费他的网上钱包中的比特币。比特币用

户通常会为此随机生成一个散列值。然后他把一小笔钱从自己的比特币钱包转到另一个比特币钱包。这次交易创建了一个“公钥”，也就是另一个字符串，它里面有时间标记，并会录入区块链的总账。

任何拿到试验方案的人都应该可以重复上面的步骤，看看是否能得出相同的公钥，从而证明该方案与原始方案吻合。为了证明明确如他所言，欧文把自己的方案给了另一名全科医生约翰·霍顿（John Holden），后者也成功地完成了它。虽然过程看起来有点绕，欧文和霍顿说一共用了不到五分钟。

欧文认为，该方法可以防止“偷换结果”，这种邪恶而有统计缺陷的做法会偷偷改变临床试验的焦点来适应结果。去年一项针对137项试验的研究发现，其中有60项试验报告的结果不符合原始方案的规定。监测临床试验的COMPare项目发现，它迄今调查的67项研究中，只有9项恰当地报告了结果。

欧文称，每年单单在ClinicalTrials.gov注册的研究就有约2万项，现在发现的问题可能只是庞大冰山的小小一角。他认为，方案的公钥应上传到到试验登记处，并在研究论文中列出。研究人员和医学期刊可以快速核对报告的结果是否正确。最终，这个过程可以自动化完成。

看似矛盾的是，它的另一个好处是研究方案在完成之前可以隐藏起来。这对于商业敏感的新疗法试验很有帮助。只要公钥在试验开始时上传到登记处，就可以在日后验证试验方案，而无需担心会在研究过程中有变动。欧文现在希望在一小部分试验上验证他的想法，当然，他也要正确地报告结果。 ■



Robotics

The fantastic voyage

Sending tiny robots into the body to collect foreign objects

ROBOTIC surgery is one thing, but sending a robot inside the body to carry out an operation quite another. It has long been a goal of some researchers to produce tiny robotic devices which are capable of travelling through the body to deliver drugs or to make repairs without the need for a single incision. That possibility has just got a bit closer.

In a presentation in May to the International Conference on Robotics and Automation in Stockholm, Daniela Rus and Shuhei Miyashita of the Massachusetts Institute of Technology described a robot they have developed that can be swallowed and used to collect dangerous objects ingested accidentally. The device is based on foldable robot technology that their team of researchers have been working on for years. The basic idea is to make robots that fold up, a bit like origami, into small structures less than a few millimetres in diameter so that they can be swallowed like tablets. Then, once inside the body, the capsules enclosing the robots dissolve, allowing the devices to unfold, reconfigure themselves and get to work.

To test their latest version, Dr Rus and Dr Miyashita designed a robot as a battery retriever. This might seem to be an odd task, but more than 3,500 people in America alone, most of them children, accidentally swallow the tiny button cells used in small electronic devices every year. Because these batteries contain a charge, they have an unpleasant tendency to burn holes in the stomach. They can be removed surgically, but it is a tricky and unpleasant procedure.

To start with, the researchers created an artificial oesophagus and stomach

made out of silicone. It was closely modelled on that found in a pig and filled with simulated gastric fluid. The robot itself is made from several layers of different materials, including pig intestine, and contains a little magnet. This is folded up and encased in a 10mm x 27mm capsule of ice. Once this reaches the stomach the ice melts and the robot unfolds. It is moved and steered with the use of a magnetic field outside the body.

In their tests, the robot was able to latch onto a button battery with its own magnet. Dragging it along, the robot could then be guided towards the intestines where it would eventually be excreted through the anus. After the robot had done its work, the researchers sent in another robot loaded with medication to deliver it to the site of the battery burn to speed up healing.

The team sent their robots on dozens of missions, each time successfully extracting the offending object. They got pretty good at it too, averaging five minutes to conduct the entire process.

Since the artificial stomach was transparent on one side, the researchers were able to see the batteries and visually guide the robots. The next step will be to try this procedure in pigs. That will require help with guidance from imaging systems such as ultrasound and magnetic resonance imaging. It will be a bit more of a challenge, but Dr Rus and Dr Miyashita are determined to succeed. ■



机器人技术

神奇的旅行

将微型机器人送入人体收集异物

机器人做外科手术是一回事，但是将机器人送入体内实施手术就完全是另一回事了。一些研究人员长期以来都致力于制造出无需切口就可在体内穿梭的微型机器人，以运送药物或进行修复。我们离这一可能性又近了一步。

五月中在斯德哥尔摩举行的国际机器人与自动化大会（ICRA）上，麻省理工学院的丹妮拉·鲁斯（Daniela Rus）和宫下修平（Shuhei Miyashita）做了报告，介绍了他们研发的一款可吞服的机器人，可以用来收集被误食的危险物品。这款设备基于可折叠机器人技术开发，他们的研究团队多年来一直致力于这一技术领域的研究。基本的概念就是让机器人能够折叠成直径不到几毫米的小型结构（有点类似于折纸），以便像药片那样吞服。进入体内后，装有机器人的胶囊就会溶解，让机器人设备展开，重新自我配置后开始工作。

为了测试其最新的版本，鲁斯和宫下设计了一款机器人来取出电池。这项任务看似奇怪，但每年仅在美国就有3500多人误吞了用于小型电子设备的微型纽扣电池，大部分是儿童。因为电池带电，可能灼伤胃部导致穿孔，十分讨厌。电池可以通过外科手术取出，但这一操作十分麻烦且令人不适。

研究人员首先用硅胶造出人工食道和胃部。这一模型严格模拟猪胃，并灌入人工胃液。机器人本身用包括猪肠衣在内的几层不同材料制成，并且带有一小片磁铁。机器人经折叠后被装进一个10毫米×27毫米的冰制胶囊中。进入胃部后，冰会融化，机器人展开，并通过体外磁场控制其移动和转向。

在他们的测试中，机器人能够用自身的磁铁紧紧吸住纽扣电池。然后人们

可以引导机器人拖着电池一起进入肠道，最终通过肛门排出体外。这一机器人完成工作后，研究人员将另一款装有药物的机器人送入体内，把药直接送达电池灼伤的部位，加速伤口愈合。

研究小组让他们的机器人进行了几十次任务，每次都成功取出了异物。他们如今已经非常熟练，完成整个过程平均仅需五分钟。

因为人工胃部有一面是透明的，研究人员能够看到电池并且直观地引导机器人。下一步将在活猪体内试验这一过程，这将需要超声波或磁共振等成像系统的帮助。这会更具挑战，但鲁斯和宫下拥有必胜的决心。■



Crypto-investing

The DAO of accrue

A new, automated investment fund has attracted stacks of digital money

IT SOUNDS like a cult, but it wants to be a venture-capital fund of sorts. As of mid May, the DAO (short for decentralised autonomous organisation) had already raised the equivalent of nearly \$150m to invest in startups. This, say its fans, makes it the biggest crowdfunding effort ever.

To understand the DAO it helps to keep in mind the concept of “smart contracts”. These are business rules encoded in programs that execute themselves automatically under certain conditions: for example, funds are only transferred if the majority of owners have digitally signed off on a transaction. Such contracts can also be combined to form wholly digital firms that are not based anywhere in the real world, but on a “blockchain”, the sort of globally distributed ledger that underpins crypto-currencies such as bitcoin.

The DAO literally lives in the ether, meaning on the blockchain of Ethereum, one of bitcoin’s rival crypto-currencies. Investors send digital coins (called “ether”) to the fund, which allows them to take part in votes on whether to put money in a given project. Candidates for investment put themselves forward, providing not only a business plan, but also smart contracts that define the relationship between them and the DAO. Once a proposal is approved, funds flow automatically: firms get money under the rules specified in the smart contracts.

Schemes of this kind have not done well. The crowd may have wisdom, but not a lot of commitment. Similar but smaller vehicles operated by a firm called BitShares, for instance, are suffering from a lack of participation in votes, in large part because it takes time and energy to consider proposals.

Investors in the DAO can also withdraw money not yet committed to a project at will. This means that the \$150m in ether could quickly vanish into the ether, blue if investors got nervous.

Yet it would be unfair to dismiss the DAO as no more than a public-relations exercise for Ethereum and Slock.it, a maker of electronic locks controlled via the blockchain, which has developed the fund's smart contracts and hopes to be the beneficiary of its first investment. Many of the DAO's investors are believers, and it will provide an interesting test both of how regulators deal with a stateless fund and, in particular, what happens at such outfits when a dispute arises.

Moreover, if you believe that Ethereum is the future, it makes sense to invest in a fund that could increase demand for the currency—in particular if there are not many other ways to spend ether (the DAO, which stops accepting new funds on May 28th, has already attracted nearly 14% of all ether ever issued). In the strange world of crypto-currencies, faith and rationality go together like yin and yang. ■



加密投资

增值之“道”

新的自动化投资基金已经吸引了大把数字货币

它听起来像一个邪教组织，但它希望成为某种风险投资基金。截至五月中，DAO（分布式自治组织 [decentralised autonomous organisation] 的缩写）已经募集了近1.5亿美元，准备投资于初创公司。据其粉丝称，这让它成为了有史以来最大的一次众筹。

要理解DAO，应该记住“智能合同”的概念。这是一些编写在程序中的商业规则，在一定条件下会自动执行。例如，一项交易只有在得到大多数业主的数字签名和批准后，才能进行转账。多个这样的合同也可以结合起来，组建一个全数字化的公司。它不存在于现实世界中的任何地点，而是建立在“区块链”上——这是一个分布在全球的总账，也是比特币等加密货币的基石。

DAO基本上存在于“以太”——即以太坊（Ethereum）的区块链上。以太坊是一种和比特币竞争的加密货币。投资者给基金发送数字硬币（称为“以太”），以便能够参与投票，决定是否把钱投给某个特定项目。备选投资对象则需展现自己，不仅要提供商业计划，还得提供智能合同来规定自己和DAO之间的关系。提案一旦获得批准，资金将自动流入：公司会按照智能合同中指定的规则拿到钱。

此类计划过去表现不佳。一个群体可能有智慧，但却不太能持续投入。比如有一个公司运营了一种与之类似但是规模较小的工具，名叫BitShares。它就苦于投票者寥寥，而这在很大程度上是因为考虑投资提案需要时间和精力。DAO的投资者还可以随时撤出尚未投入项目的钱，这意味着如果投资者一旦陷入焦虑，以太中的1.5亿美元很可能会迅速消失。

然而，如果我们对DAO嗤之以鼻，说它无非是以太坊和Slock.it的一次公关活动，那也不太公平。Slock.it制作了通过区块链控制的电子锁，开发了该

基金的智能合约，并希望成为其第一笔投资的受益人。DAO的许多投资者都是信徒，这将是一个有趣的测试——一方面是监管机构如何处理一个无国籍的基金，更重要的是一旦发生纠纷会怎么样。

此外，如果您认为以太坊是未来，也许应该投资一个会增加货币需求的基金，尤其是在以太并没有很多消费途径的时候（DAO在5月28日停止接受新资金，它已经吸引了有史以来发行的所有以太中的近14%）。在加密货币这个陌生的世界，信仰和理性就像阴和阳一样，共生共存。■



The future of the Nobel prize

Throw caution to the wind?

For everything to stay the same, everything may need to change

FEW events exceed the splendour of the Nobel ceremony and gala dinner held every December in Stockholm. After champagne toasts to Sweden's king, and to the memory of Alfred Nobel, 1,300 guests sitting in the city hall cheer the latest crop of laureates in chemistry, physics, physiology or medicine, literature and economics. (The peace prize is awarded at a separate shindig, in Oslo.) For many of the winners, perhaps more used to sporting white coats than white ties, the occasion is a career-defining moment of glamour. No other prize has anything like the stature of a Nobel. In scientific circles it is known simply as "the trip to Stockholm". But some do whisper the question, "for how much longer?"

Nobel, who made his money by inventing dynamite, set things off with a bang. In 1895 he bequeathed 31m kronor (roughly \$200m at today's values) to create a foundation, the income from which would pay for the prizes. The endowment is now worth 4 billion kronor (some \$500m). That sounds like a lot, but it hardly represents a spectacular return after 120 years.

As a result, the prizes have suffered. Today, an individual award—which can be split up to three ways—is worth 8m kronor in addition to the 18-carat gold medal each recipient receives. A handy sum, but one whose lavishness has fallen as cautious investing has failed to increase the pot as fast as economic growth has increased people's incomes. According to the foundation's boss, Lars Heikensten, who was once governor of Sweden's central bank, when the first prizes were awarded, in 1901, they represented 25 times the annual salary of a professor at a typical university in Europe or America. Now, the ratio is more like ten. Meanwhile rivals, such as the Kavli and Breakthrough prizes, are being endowed by more recent plutocrats.

Many of these (see chart) pay out more than the Nobel Foundation—in the case of the Breakthrough prize, three times as much. The Nobel brand may thus be in danger of erosion, as the foundation itself admits in its most recent annual report. This says that “ensuring the importance of the Nobel prize in the long term continues to pose a significant challenge”.

Mr Heikensten is trying to take matters in hand. He has overseen a big awareness-raising push on social media, and through conferences and debates that carry the Nobel name. And, sometime in the next 12 months, work will start on a Nobel visitor centre and conference venue in the heart of old Stockholm. This controversial cube of glass, costing 1.2 billion kronor, will be paid for by private donors, with much of the money coming from two families of Swedish billionaires, the Wallenbergs and the Perssons. Which is all well and good, but does not really get to the heart of the matter—that the whole Nobel proposition needs dragging into the 21st century.

One ticklish question is whether the prize categories are still relevant. The science prizes—the core of the foundation’s fame—reflect the academic priorities of the founder’s era. Things have changed. Galling though it is to the memory of Nobel, a chemist, pure chemistry is largely worked out as an academic discipline. These days, most of the winners of the chemistry prize could have fitted just as easily into the physics or physiology-or-medicine categories. Meanwhile, biology has hypertrophied. Shoe-horning it into “physiology or medicine” seems bizarre, and excludes important fields such as ecology.

Rivals have prizes for categories such as neuroscience and nanoscience. Changing or adding to the Nobel list, though, has not found favour. Even the economics prize, introduced in 1969, is looked down on by traditionalists as not being a proper Nobel.

Then there is the question of replenishing the coffers. A praiseworthy desire to preserve independence by not taking donations into the endowment has become something of a drawback. This, as much as overcautious investing, is responsible for the prizes' diminished financial value. A more welcoming attitude to donations (even if these are restricted to the personal, rather than the corporate, and perhaps to legacies rather than lifetime gifts that might be seen as involving some quid pro quo) might be sensible, to boost the prizes' value. For reputation is a funny thing. Scandal can destroy it overnight, of course, and the foundation's trustees might fairly argue that their cautious approach has avoided that fate. But reputation can also slip away, unnoticed, as the world's attention shifts elsewhere. ■



诺奖的未来

抛开谨慎？

想让一切照旧，恰恰可能需要样样都变

很少有什么活动的光彩超过每年12月在斯德哥尔摩举办的诺贝尔奖颁奖礼及晚宴。坐在市政厅内的1300名宾客首先打开香槟向瑞典国王祝酒并纪念阿尔弗雷德·诺贝尔（Alfred Nobel），然后祝贺新一届获奖人，包括化学奖、物理学奖、生理学或医学奖、文学奖以及经济学奖的获奖人（和平奖在奥斯陆举办的另一个盛会上单独颁发）。对于大多数获奖人（他们可能更习惯穿白大褂而不是戴白色领带）而言，这是其职业生涯中决定性的光辉时刻。没有什么奖项的声望堪比诺贝尔奖。在科学家的圈子里，人们会说“去斯德哥尔摩”来表示获得诺奖。不过，一些人确实嘀咕着一个问题：“这还会继续多久？”

靠发明炸药致富的诺贝尔一鸣惊人：1895年他立遗嘱捐出3100万克朗（约合如今的2亿美元）创立一个基金会，其收入将用于颁发诺奖奖金。该基金如今价值40亿克朗（约合5亿美元）。听起来似乎是一个大数目，但120年才获得这样的回报实在算不上惊人。

诺贝尔奖因此遭遇困境。今天，一个单项奖——最多可以颁给三个人——价值800万克朗，再加上每个获奖人得到一枚18克拉金奖章。这是一笔可观的数目，但它可供挥霍的程度已经减少，因为谨慎的投资使得基金的扩充没能赶上经济增长提高收入的速度。据基金会老板、曾任瑞典央行行长的拉尔斯·海肯斯滕（Lars Heikensten）说，当1901年诺奖首次颁发时，奖金相当于欧洲或美国普通大学教授一年薪水的25倍，现在则约为十倍。与此同时，诺奖的竞争奖项如卡弗里奖（Kavli）和突破奖

（Breakthrough）是由更近代的富豪们捐赠设立，其中许多奖（见图表）的奖金超过诺贝尔基金会，比如突破奖的奖金是诺奖的三倍。因此诺贝尔这一品牌的光彩可能日渐流失，诺贝尔基金会在其最新年度报告中也承认了这一点。报告称：“要确保诺贝尔奖保持长期的重要性仍是一项重大挑战。”

海肯斯滕正尝试解决这一问题。他领导了一个提升诺奖知名度的大项目，包括在社交媒体上做推广，以及举办各种带有诺奖名字的会议和辩论。此外，未来一年里，在斯德哥尔摩旧城区的中心地带将开始建造一座诺奖游客服务和会展中心。这座引发了争议的透明立方体建筑耗资12亿克朗，将由私人捐赠者出资，其中大部分将来自瑞典两个亿万富豪家族：瓦伦堡（Wallenbergs）和佩尔松（Perssons）。这当然是件好事，但并未触及问题的核心，即如何让整个诺奖的机制适应21世纪。

一个棘手的问题是诺奖的分类是否恰当。科学奖项是诺贝尔基金会声望的核心所在，但它反映的是诺奖初创时期学术上关注的领域。今非昔比。或许会让本身是化学家的诺贝尔愤怒不已的是，纯化学作为一门学术学科在很大程度上气数已尽。如今，化学奖的大部分获奖者完全可以被归入物理学、生理学或医学类别。同时，生物学已经极大发展，将其硬塞进“生理学或医学”类别中看起来很怪，而且还把生态学这样重要的领域排除在外。

诺奖的竞争对手则包含了神经科学和纳米科学这样的类别。不过，改变或增加诺奖类别并不讨好。甚至连1969年推出的经济学奖也被传统派轻视，认为它算不上正规的诺贝尔奖项。

然后就是补充金库的问题了。基金不接纳捐款的做法是为保持诺奖的独立性，这值得称道，但却已变成了一个不利因素。它和过于谨慎的投资一样，都导致了诺奖的财务价值缩水。对于捐赠更为欢迎的态度可能是提升其价值的明智手段（即使这种捐赠仅限个人而不能是企业，或许还仅限遗赠而不能是生前捐赠——后者可能被视为涉及某些交换条件）。这是因为声誉是一个有趣的东西。丑闻当然可以一夜之间就将其摧毁，而基金会的受托人或许可以公平地声称自己审慎的做法避免了这样的命运。但是，随着世界的目光投向别处，声誉同样也可能不被察觉地渐渐消逝。■



Picking the boss

The outside track

Why companies are appointing more outsiders as CEOs

TO MAKE or to buy is perhaps the most basic question in business. In April, a new report from Strategy&, an oddly named consulting division of PWC, an accounting firm, argues that a growing number answer “buy” when it comes to appointing bosses.

Strategy&, formerly Booz & Co, has been studying CEO succession in the world’s 2,500 biggest public companies for the past 17 years. It found that between 2012 and 2015 boards chose outsiders in 22% of planned successions, up from just 14% between 2004 and 2007. Looking at the numbers in a different way, in cases where outsiders were parachuted in, 74% of them joined as part of a succession that was planned in the 2012-15 period (up from 43% in 2004-07). Traditionally boards have turned to outsiders in the last resort—when they have to boot out incumbent CEOs or when the pipeline of internal candidates runs dry. The new statistics suggest that firms increasingly go for outsiders as part of regular succession planning.

Good reasons exist for this. Boards want leaders who can deal with powerful disruptive forces, such as new technologies and radical business models. Industries that have seen a lot of disruption from technological innovation or regulatory change are particularly keen on outsiders. In the 2012-15 period, outsiders made up 38% of incoming CEOs in telecoms, 32% in utilities, 29% in health care, 28% in energy and 26% in financial services. How far outside firms will go varies: in financial services almost all outsiders (92%) came from other financial firms; in utilities 72% of outsiders came from other industries.

Boards are more independent than they used to be, thanks largely to regulatory changes introduced after corporate-governance scandals early last decade. They are more likely to consist of genuine outsiders unencumbered by ties to the CEO and equipped with a wide range of contacts and perspectives. That makes it harder for bosses to anoint heirs apparent. Spencer Stuart, a headhunter, calculates that last year 84% of all board directors of S&P 500 firms were independent and 29% of boards had a truly independent chair. Strategy& says that only 7% of last year's incoming CEOs were also named chairman of the board.

Board independence is reinforced by the rise of activist investors. Institutional investors and hedge funds expect as a matter of course that boards will hold managers to account and sack bosses who badly underperform. SharkWatch, a corporateactivism database, says almost half the companies at which an activist investor gains a board seat replace their boss within 18 months.

A fashion for outsiders is at first glance worrying. It probably helps push up bosses' salaries. Insiders have traditionally fared better: in 2005 retiring insiders had a median tenure of 5.8 years, against 4.8 years for outsiders. And some outsiders have proved to be embarrassing flops. Yahoo hired Scott Thompson from PayPal only to sack him a few months later when it learned he had falsified his academic credentials. J.C. Penney recruited Ron Johnson from Apple but dumped him after its share price fell by half.

But outsiders had a poor record in part because companies used only to turn to them in extremis. Now they choose them in good times: last year companies in the top quartile of performance (as measured by total shareholder returns) hired a larger share of outsiders than did poorly performing companies, and retiring outsiders had a longer tenure than insiders. By insisting on considering outsiders as well as insiders, boards give themselves more options. The more important change is not that they

sometimes decide to buy from outside, but that they are getting better at doing their most basic job—planning CEO succession. About time, too. ■



挑选老板

外部路径

为什么公司任命更多的外部人士做CEO

是创造还是购买，这也许是企业最根本的问题。四月，普华永道会计师事务所下属的一个名称古怪的咨询部门Strategy&发布了一份新的报告称，对于任命老板来说，越来越多的公司的回答是“买”。

Strategy&，即原先的Booz & Co，研究世界上最大的2500家上市公司的CEO已有17年了。研究发现，2012年至2015年间，董事会的接班人计划中有22%选择了外部人士，比2004年至2007年之间的14%有所上升。换个角度看这个数字，如果选择的外部人士是空降的，2012-2015年间，他们当中有74%是因接班人计划而加入的（2004-2007年间只有43%）。传统上，董事会只有在不得已时，比如必须要拿掉现任CEO或是内部候选人不敷使用时才会寻求外部人士。新的统计数据显示，越来越多的企业把外部人士放在正常的接班人计划里。

这样做是有充分理由的。董事会希望领导者能够应对强大的颠覆力量，如新技术和激进的商业模式。经历过技术创新和管理变化带来的剧变的行业都特别热衷于外部人士。2012-2015年间，新上任的CEO是外部人士的情况在电信业占38%，公共事业行业占32%，医疗保健业占29%，能源业占28%，金融服务业占26%。公司寻找外部人士的范围差异颇大：在金融服务业，几乎所有的外部人士（92%）都来自其他金融机构，而在公共事业行业，有72%的外部人士来自其他行业。

董事会比以前更加独立，这在很大程度上要归功于十年前左右，一批公司治理丑闻曝光后监管政策的变化。董事会更可能由真正的外部人士组成，不受CEO关系的羁绊，并拥有更广泛的人脉网络和视角。这样老板就更难以自己指定接班人。据猎头公司史宾沙（Spencer Stuart）计算，去年标准普尔500公司的所有董事会成员中，有84%是独立董事，还有29%的董事会有真正独立的董事会主席。Strategy&说，去年新上任的CEO中，只有

7%同时被任命为董事会主席。

维权投资者的崛起也增强了董事会的独立性。机构投资者和对冲基金理所当然地期望董事会能够追究管理人员的责任，炒掉表现极差的老板。企业积极主义数据库SharkWatch说，对于有维权投资者进入董事会的公司，将近一半都会在18个月内更换老板。

偏爱外部人士的时尚乍看之下令人担忧。这可能会推高老板的工资。内部人士历来表现较好：2005年，内部人士退休时的中位任职时间为5.8年，而外部人士则是4.8年。还有一些外部人士的失败令人难堪。雅虎聘请了来自PayPal的斯科特·汤普森（Scott Thompson），结果几个月后就发现他学历造假而解雇了他。JC Penney公司聘用了来自苹果公司的罗恩·约翰逊（Ron Johnson），但在股价腰斩之后把他炒掉了。

不过，外部人士表现欠佳，一部分原因是公司只有在面临绝境时才会找他们。如今，公司在顺境时也会选择外部人士了：去年，业绩位于前四分之一（按总股东回报率衡量）的公司聘请外部人士的比例比业绩不佳的公司更高，外部人士退休时的任期也比内部人士更长。通过坚持同时考虑外部和内部人士，董事会给了自己更多的选择。更重要的变化不在于董事会有时会决定从外部购买人才，而在于它们越来越善于做自己最基本的任务了——规划CEO的接班人。当然，是该变的时候了。■



Crop storage and the internet of things

Cool beans

Legume-shaped sensor packages may help preserve stored crops

HANDING a farmer a fistful of magic beans with the promise that they will improve his business might sound like something out of a fairy-tale. But, as Arthur C. Clarke put it, any sufficiently advanced technology is indistinguishable from magic. The sensor-filled “beans” developed by Andrew Holland, an electronics engineer from Swaffham Bulbeck, near Cambridge, England, are not only advanced technology. They could also, Mr Holland says, provide an answer to many a farmer’s prayers.

Mixed into the contents of a granary, his beans would report continuously on the temperature and humidity, both of which encourage rotting if they are too high, and on carbon-dioxide levels, which reflect the amount of insect breath exhaled, and thus the level of infestation. At the moment these things have to be measured (if they are measured at all) using hand-held instruments that are plunged into the grain pile at regular intervals by farmhands.

The beans themselves are plastic shells 45mm long and 18mm wide, manufactured by 3D printing. This process is used to encapsulate within each bean a diminutive circuit board containing a low-power Bluetooth radio and sensors that can measure motion, temperature, humidity, air pressure and the concentrations of several gases, including carbon dioxide and carbon monoxide. A bean also contains an electronic compass and a tiny gyroscope that, acting together, sense its orientation. All of these devices are powered by a wirelessly rechargeable battery.

Mr Holland sees potential for his device beyond the monitoring of stored crops. Placed discreetly in a living room or office, he suggests, it could

register intruders via the trembles of its motion sensor. A change in air pressure brought about by blowing on it might let it work as a switch for a room's lights. The gyroscope would permit it to act as the remote control for a television or hi-fi: swiping a bean through the air could turn the device on, while spinning it in a circle could step the volume up or down, depending on whether the spin were clockwise or anticlockwise. For the elderly, a bean carried in a pocket could register a fall and then call for help via its owner's phone. For the suspicious, it could record whether a parcel had been mistreated in transit by being heated up or crushed.

That beans would be better than existing ways of doing these things is not always obvious. But they will be programmable via a phone app, so owners will be able to devise other uses as they see fit.

Grain-monitoring, though, is likely to be the first use. Once placed in and around a heap of grain, a collection of the beans will connect together wirelessly, becoming nodes in a network that gives a clear, three-dimensional picture of what is going on inside that heap. Mr Holland's company, RFMOD, has just started testing beans for this purpose, and he hopes they will be commercially deployed within two years.

One problem is recovering the beans when the granary is emptied. If they became a routine technology this could, no doubt, be done by "pinging" them when a shipment was sorted at the wholesaler, and pulling them out automatically as the grain left a hopper. In the meantime, RFMOD is experimenting with putting them in the plastic insect-trapping containers that farmers already deploy in grain-piles to keep infestations under control.

If the beans do well at monitoring grain, Mr Holland hopes their other applications will make them an important part of the much-discussed "internet of things" which some prophets believe will, in the future, link

many objects not currently connected electronically. If his own wildest dreams are fulfilled, that would make RFMOD a large and successful company. It might also suggest that Swaffham Bulbeck, a tiny village, has its own brand of magic to confer, for it was also once home to another startup, Advanced RISC Machines Ltd. ARM Holdings, as that firm is now known, has grown into one of the world's biggest designers of microprocessors. In Silicon Valley, they do it in garages. In the English fens, it seems, old barns are just as good. ■



作物贮藏和物联网

酷豆

豆荚形传感设备或许有助于贮藏作物保鲜

递给一个农民一把魔豆，向他承诺它们会改善他的生计，这听起来可能像童话中的情节。但是，正如亚瑟·C·克拉克（Arthur C. Clarke）所言，任何足够先进的技术与魔法无异。来自英国剑桥附近的斯瓦汗姆布尔别克村（Swaffham Bulbeck）的电子工程师安德鲁·霍兰德（Andrew Holland）研发了装载传感器的“豆子”，它们不只是先进的技术。据他说，它们也会回应广大农民的祈祷。

他的豆子被混进粮仓内的作物中后，会持续地记录温度、湿度以及二氧化碳水平。温度或湿度过高都会导致作物腐坏，而二氧化碳水平则反映了昆虫呼出气体的量，从而反映出虫害状况。目前，这些数据只能靠农场工人每隔一段时间将手持设备插入谷物堆中测量获得（如果真有人做这些测量的话）。

这些豆子有着3D打印制造的塑料壳，长45毫米，宽18毫米。制造过程中，一块微型电路板被放进每颗豆荚内，它包括一套低功率的蓝牙无线电和多个传感器，可以测量运动、温度、湿度、气压，以及二氧化碳和一氧化碳等几种气体的浓度。这颗豆子还包含了电子指南针和微型陀螺仪，它们一起运作来测量豆子的朝向。所有这些设备都由一套无线充电电池供电。

霍兰德相信自己的设备除了监测贮藏的作物外还会有其他用途。他说，如果把它悄悄放进一间起居室或办公室，它能够通过运动传感器的颤动探测到入侵者。向它吹气所引起的气压变化也可以让它充当房间的电灯开关。陀螺仪让它能够充当电视机或音箱的遥控器：把它往空中一挥就可以启动设备，而让它顺时针或逆时针旋转则可以调高或降低音量。放在老年人口袋里的豆子可以探测到老人跌倒，然后通过主人的手机呼救。对那些多疑的人，观察豆子是否变热或被碾压可以检测一个包裹在途中是否处理得当。

在发挥这类功能时，豆子不一定总比现有的方法强。不过，它们可以通过手机应用来编程，这样其主人便能自行设计其他合适的用途。

不过，监测谷物应该会成为这些豆子的首要用途。一旦被放到一堆谷物的内部或周围，这些豆子会相互实现无线连接，变成一个网络中的节点，为谷堆内部发生的情况提供一个清晰的三维图像。荷兰德的公司RFMOD刚刚开始测试豆子的这种用途，他希望两年内能实现商业化。

有一个问题是当谷堆被清空时要如何回收豆子。如果它们成为一项常规技术，那么毫无疑问批发商可以在给一批货物做分类时给它们做好“标记”，之后从储料器撤空谷物时它们就会自动分离出来。与此同时，RFMOD正在实验把它们放进塑料的捕虫器中，农民已经在谷堆中使用这类容器来控制虫害。

如果豆子在监测谷物方面干得不错，霍兰德希望它们在其他方面的用途将使其成为“物联网”的重要组成。一些预言家相信，这种人们津津乐道的网络未来将把许多目前尚未实现电子连接的事物连接起来。如果他最疯狂的梦想得以实现，那么RFMOD会成为一家成功的大公司。这也可能意味着斯瓦汗姆布尔别克这个小村庄确有它的一套魔法——因为它也是另一家创业公司“先进精简指令集机器有限公司”（Advanced RISC Machines Ltd）的诞生地。这家公司现在名为“ARM公司”（ARM Holdings），已成为全球最大的微处理器设计商。在硅谷，人们在车库里创新。看起来，在英国乡村，旧粮仓也同样是个好地方。■



Welding and forming

Getting the pulse racing

A cleaner, sharper way to weld and shape metals

DURING the first world war it was observed that when armour plating was hit by shrapnel some of the bits not only embedded themselves into the metal but ended up welded to it, a process that normally takes a great deal of heat. Laboratory tests later showed that if one material is accelerated fast enough into another they become plastic at the point of contact and fuse together, even at room temperature. This led to a process called explosive welding which, as its name suggests, uses chemical explosives spread over the top of a sheet of one material to blast it into a sheet below.

Explosive welding, for obvious reasons, is usually carried out in tunnels under mountains or in remote deserts. It is often employed to cover steel plate with a more expensive anti-corrosion layer of stainless steel or nickel alloy. This clad plate is typically used in chemical plants. Now the same idea, minus the explosives, is beginning to be used inside factories to make products ranging from white goods to aircraft and cars.

The process, known as magnetic-pulse welding, works a bit like the Large Hadron Collider near Geneva, accelerating materials into each other with extremely powerful magnetic forces, but on a less grand scale and with components rather than atomic particles. Bmax, based in Toulouse, France, has been developing the technology to produce machines that both weld components and shape them.

To do this two tubes, for example, are fitted together and placed inside one of the firm's machines, where a coil generates an intense electromagnetic pulse in one of the tubes. This propels it into the other, over a distance of only a millimetre or so but in just a matter of microseconds (millionths of a

second). When the two materials are forced together at such intensity, the atoms at the point of contact start sharing electrons, which fuses the components together. As no heat or melting is involved, dissimilar and difficult-to-weld materials can be joined, such as aluminium to copper and nickel to titanium. The same process can be used to shape materials, slamming down a sheet of metal onto a mould to make, say, the crease lines in the skin of a car door. Normally this is done with giant and noisy stamping presses.

A combination of factors has stimulated interest in the technology, says Rani Plaut, Bmax's chief executive. Because the process operates at room temperature without clouds of welding sparks and fumes, it is cleaner and saves energy. It also produces stronger joins as conventional welds can be prone to corrosion. There is aesthetic value too, he adds: fused welds look much tidier than blobs of molten weld. And in shaping panels, lines can be made sharper than with conventional pressing. A process with roots in the noise and chaos of war may make the factory of the future a much quieter and cleaner place. ■



焊接与成型

让脉冲加速

一种更清洁、更精细的金属焊接和成型工艺

第一次世界大战期间，人们发现击中装甲板的弹片有些不但嵌入了金属之中，而且最终与金属焊接在了一起——这一过程通常需要大量的热能。之后的实验室测试表明，如果把一种材料向着另一种材料运动的速度加到足够快，在接触时它们会变为塑性并熔合在一起，即便是在室温下也是如此。这一发现催生了“爆炸焊接”的工艺。正如其名所示，它在一层材料上方铺满化学炸药并引爆，使其与下层的材料接合起来。

出于显而易见的原因，爆炸焊接通常在山中隧洞或偏远荒漠中进行。它常被用来在钢板上覆上一层更昂贵的不锈钢或镍合金防腐蚀层，这种复合板材通常用于化工厂。如今除去炸药，工厂里也开始使用同样的理念，生产从家用电器到飞机汽车等各种产品。

这种被称作磁脉冲焊接的工艺有点像日内瓦附近的大型强子对撞机。它使用极强的磁力使材料加速撞向彼此，但比强子对撞机规模小一些，作用对象也是部件而非原子级粒子。位于法国图卢兹的Bmax公司一直在研发这项技术，来生产用于部件焊接和成型的机器。

比如要接合两根管子，就把它们拼在一起并放进工厂的一台机器里，由线圈在其中一根管子内产生强烈的电磁脉冲，从而将这根管子在仅仅几微秒（一微秒为百万分之一秒）的时间里推向只有约一毫米之隔的另一根管子。当两种材料以如此高的速度挤压在一起时，位于接触点的原子开始共享电子，从而将材料焊接起来。由于整个过程无需加热或熔化，它可以接合不相似以及难以焊接的材料，如铝和铜、镍和钛。同样的工艺可以用于材料成型，比如把金属板撞向模具来制造车门面板上的折线。通常这是由既庞大又吵闹的冲压机完成的。

Bmax的总经理拉尼·普劳特（Rani Plaut）说，多种因素的共同作用激发

了人们对这一技术的兴趣。这种工艺可以在室温下进行，并且不会产生焊接火花和滚滚烟尘，因此更加清洁并可节省能源。此外，它的接合也更为牢固，因为传统焊接的焊点容易锈蚀。他又补充道，这一技术还更加美观，焊接处看起来比熔融焊接那一团团的焊点整齐多了。在板材成型时，线条可以比传统冲压做得更加精致。这种工艺源自喧嚣混乱的战争，如今有望让未来的工厂变得更为安静和清洁。■



Federal Reserve

The right kind of reform

America's next president should modernise the Federal Reserve system

PERHAPS it was inevitable in the aftermath of the worst financial crisis in almost a century, but America is boiling over with schemes to remake the Federal Reserve. Some Republicans want the central bank's monetary-policy decisions to be "audited" by the Government Accountability Office, an arm of Congress. Others wish to use a formula to put monetary policy on autopilot and to haul the chairman in front of Congress every time the Fed steps in. The most extreme sceptics peddle conspiracy theories about how the Fed "debases" the dollar. They propose abolishing the central bank entirely.

Any of these schemes would be disastrous—either because they would jeopardise the central bank's independence, or because they would cast monetary policy adrift.

Fortunately, the likely presidential candidates have no desire to "end the Fed". Donald Trump says he might replace Janet Yellen, the Fed's chairman, with a Republican when her term ends. That would be unwise, but hardly revolutionary. Hillary Clinton wants to change the rules about who sits on the boards of the 12 powerful regional banks in the Fed system.

She is right. The Fed is not broken, but it is anachronistic. The system of regional Feds gives commercial banks influence over their regulators and dishes out public money to their private shareholders. The next president and Congress should give it a thorough overhaul.

The Federal Reserve system, created in 1913, owes a lot to the efforts of Carter Glass, who gave his name to the more famous Glass-Steagall Act,

which separated investment banking from the duller retail kind. Thanks to his efforts, the country has not one monetary authority but a network of regional banks overseen by a board of governors in Washington, DC.

Glass's aim when founding the Fed was to avoid giving too much economic power to Washington bureaucrats. The regional banks would be like the states, while the board of governors would be like Congress. To placate bankers who wanted the government to stay out of their business, banks would themselves capitalise each regional Fed and appoint two-thirds of its directors. The directors would, in turn, elect a president who, on a rotating basis, would assume one of five voting seats on the FOMC, the committee that sets interest rates for the whole country. Such sops were necessary in part because, until 1980, membership of the Fed system was voluntary.

The sops are still being dished out today. The system provides sweetheart deals to banks, most of which earn a risk-free 6% annual dividend on their compulsory investments in the regional Feds. This is more than three times what the government currently pays for capital on the ten-year debt market. Although the dividend was recently cut for the 70 largest banks, roughly 1,900 smaller banks in the Fed system, which also own part of the regional Feds' stock, continue to benefit. Banks holding shares issued before 1942 receive their dividends tax-free.

The most important job of a regional Fed is to oversee the banks in its district. As a result, Glass's system comes perilously close to letting bankers serve as their own regulators—not so much a revolving door between Wall Street and government, as a shared executive suite. The bankers who sit on the boards of regional Feds are not directly responsible for regulation and they no longer vote for a regional Fed's president, but banks appoint outside directors who do. And bankers can take part in a vote to dismiss a regional-Fed president.

This is all the more worrying since political gridlock has given the regional Feds growing representation on the FOMC. The system is designed so that the Washington board of governors, which is appointed by the president and confirmed by the Senate, has a majority. But the White House has filled vacancies slowly, in part because of an unco-operative Senate—which in 2010, for instance, decided that Peter Diamond, a Nobel-prize-winning economist, was unqualified for the job. Hence, for most of Barack Obama's presidency, regional Feds have matched governors in voting power. This matters because banks tend to profit from higher interest rates. Regional-Fed presidents tend to be the most hawkish members of the FOMC, as their dissenting opinions suggest (see chart).

| *Amend the Fed*

The next president can put this right by taking Mrs Clinton's proposal—and then going further. The private sector should be kicked out of the Fed entirely, the reserve banks capitalised with public money and the central bank's profit kept for taxpayers. The Fed would not want for expertise without bankers on its regional boards: it already hires plenty of ex-bankers and can always consult the firms it regulates.

Some fear that any reform attempts would provide an opening for all those other barmy ideas. That is not an idle worry. But private-sector involvement in the Fed arms the critics and conspiracy theorists. It reinforces the corrosive notion that self-serving elites write economic policy. In the long run, reform would protect the Fed from undesirable meddling. ■



美联储

正确的改革

美国下任总统应推动美联储体系的现代化进程

在近百年来最严重金融危机的余波中，美国也许免不了要为改革美联储的计划闹得沸沸扬扬。部分共和党人希望国会下属的政府问责局

（Government Accountability Office）“审核”美联储的货币政策决定。有些人希望搞出一个公式让货币政策自行调整，而每当美联储干预时，其主席必须到国会进行解释。最极端的怀疑论者则大谈美联储如何“贬低”美元的阴谋论观点，建议干脆撤销美联储。

所有这些方案都将是灾难性的，因为它们不是危及到美联储的独立性就是令货币政策飘摇不定。

幸运的是，热门总统候选人无意“撤销美联储”。唐纳德·特朗普（Donald Trump）表示，可能在美联储主席珍妮特·耶伦（Janet Yellen）任期结束后让共和党人取而代之。这不怎么明智，但谈不上是革命性的改变。希拉里则打算改变美联储体系中12家强势的地区联储银行的董事人选规则。

她是对的。美联储并非运作失灵，只是落伍了。地区联储银行体系令商业银行对监管者拥有影响力，并把公共资金分发给私人股东。下一任美国总统和国会应彻底改变这一点。

美国联邦储备体系创立于1913年，很大程度上归功于卡特·格拉斯（Carter Glass），更为著名的“格拉斯-斯蒂格尔法案”（Glass-Steagall Act）便是以其名字命名。该法案把投资银行与较为普通的零售银行区分开来。在格拉斯的努力下，并非由单个管理机构来制定美国的货币政策，而是交由一个地区联储银行体系来负责，由位于华盛顿的联邦储备委员会进行监管。

格拉斯创立美联储时的目标是为避免华盛顿官员掌握过大的经济权力。地

区联储银行就像是美国各个州，而联邦储备委员会就像是美国国会。为安抚不希望政府干预业务的银行家，各地商业银行向地区联储银行注资，并委任其三分之二的董事。这些董事继而选举出一名行长。这些行长将轮流出任联邦公开市场委员会（FOMC）的五个投票席位，而该委员会则负责设定全国利率。这样的小恩小惠是必须的，原因之一是直至1980年，银行加入美联储系统仍属自愿性质。

这些小恩惠至今仍时有抛出。美联储体系对银行不无私相授受——银行必须向地区联储银行投资，每年可毫无风险地赚取6%的红利。相比政府目前在十年期债券市场支付的利息，这一回报要高出三倍多。虽然最近美联储削减了对70家最大银行的分红，但美联储体系内约1900家持有地区联储银行股份的较小型银行仍继续受益。对于持有发行于1942年之前股份的银行，其所获分红均免税。

地区联储银行最重要的工作是监督区内银行。结果，格拉斯的体系已接近让“银行自己监管自己”的险境——还不至于像是华尔街与政府之间那样的“旋转门”，而更像是共用的行政套房。地区联储银行董事会里的银行家不直接负责监管，也不再参与地区联储银行行长的投票，但银行可以委任外部董事来负责上述事宜。而且这些银行家们可投票罢免地区联储银行行长。

政治僵局让地区联储银行在联邦公开市场委员会中的势力越来越大，这就更令人担忧了。美联储体系的设计本意是让华盛顿的联邦储备委员会拥有多数投票权，其成员由总统提名并须经参议院批准。但白宫在填补空缺上行动缓慢，部分是因为参议院不合作，比如2010年，参议院认为曾获诺贝尔奖的经济学家彼得·戴蒙德（Peter Diamond）不能胜任此职位。因此，在奥巴马的大部分任期内，地区联储银行与联邦储备委员会的投票权旗鼓相当。这一点很重要，因为银行总是想通过更高的利率来获利。地区联储银行的行长们一般是公开市场委员会中最强硬的鹰派成员，从其高唱的反调可见一斑（见图表）。

| 修正美联储

要改正这一情况，下一任总统可先采用希拉里的提议，然后再进一步改革。应把私营部门从美联储体系中彻底踢出去，联储银行由公共资金注资，并将联储利润留给纳税人。就算地区联储银行的董事里没有银行家，美联储也不缺专才：它已雇用大量前任银行家，也可随时咨询所监管的银行。

有人担心，任何改革尝试都将为其他疯狂的想法打开闸门。这并非杞人忧天。但把私营部门保留在美联储之内为批评家及阴谋论者提供了弹药，并会强化“利己精英制定经济政策”这一破坏性论调。长远来看，改革将可保护美联储免受不良干预。 ■



Free exchange

Murder most foul

When periods of economic growth come to an end, old age is rarely to blame

IN JUNE America's economic expansion will be seven years old. That is practically geriatric: only three previous ones lasted longer. The record boom of the 1990s survived only ten years.

It is tempting to look at that ten-year mark as something like the maximum lifespan of an expansion in America, and to worry, correspondingly, that the current expansion's days are running short. But are they? At a press conference in December Janet Yellen, chairman of America's Federal Reserve, declared: "I think it's a myth that expansions die of old age." Yet die they do. Either Ms Yellen is wrong, or someone is bumping off otherwise healthy expansions before their time.

Like death, recessions (commonly defined as two consecutive quarters of falling GDP) are a part of life. Supply shocks occasionally prompt them: soaring oil prices in 1973 hit consumers in rich economies like an enormous tax rise, for instance, diminishing their purchasing power and thus prompting GDP to fall. More often, weak demand is to blame. Financial-market wobbles or rising interest rates cause people to cling tighter to their cash. Fear proves contagious, leading to a spiral of self-fulfilling pessimism.

But not all expansions are as short-lived as America's (see chart). The Netherlands holds the record: its longest, which ended in 2008, lasted nearly 26 years. Australia may surpass that early next year: its continuing expansion dates back to 1991. If expansions have a natural lifespan, it is longer than a decade.

Earlier this year Glenn Rudebusch of the Federal Reserve Bank of San Francisco constructed an actuarial table for America's historical expansions, much as a life-insurance company would for people. In rich countries the probability of a person's death rises gradually from middle age until the mid-80s, then quite steeply thereafter. Expansions, however, do not seem to become more vulnerable with age. There have been only 12 American expansions since the end of the second world war; the universe of people who have lived and died is somewhat larger. But the data available suggest that there was a time when cycles aged like people. Before the second world war, Mr Rudebusch notes, the odds of tipping into recession rose as an expansion got older. Yet since the 1940s age has not withered them: an expansion in its 40th month is just as vulnerable, statistically, as one in its 80th (each has about a 75% chance of surviving the next year).

The notion of ageless recoveries is counter-intuitive. Finite business cycles seem to make sense: an economy just coming out of recession should have plenty of opportunities for investment, for example, which, once exhausted, make the onset of a new downturn more likely. Yet economists reckon cycles need not unfold like that; instead, it is possible for the composition of growth to change even as expansion continues. A booming tech sector might siphon off capital that would otherwise flow to infrastructure or housing. Those industries, in turn, could power growth once the tech boom runs its course. If all domestic investment opportunities are used up, capital should flow towards foreign investments, reducing the value of the currency and so helping exporters to spur the economy forward. As long as the end of a boom in one sector does not engender self-fulfilling pessimism in the rest of economy, the show should go on.

Why, then, should an economy ever find itself in recession? In the pre-war era, when age mattered more, governments and central banks played a

much smaller part in stabilising the economy. Economic shocks (from earthquakes to financial crises) come along every so often; the longer an expansion goes on, the greater the chance that a really nasty mishap will occur, pushing the economy into a downturn.

Yet after the Depression, governments took on the job of countering pessimism. Bigger welfare states provided bigger “automatic stabilisers”, meaning spending on things like unemployment benefits, which pump more money into an economy as growth weakens. Central banks began manipulating interest rates more vigorously to keep growth on track, and eventually adopted targets to help instil the expectation of steady growth.

| *Ms Yellen, in the ballroom, with the premature rate rise*

Post-war expansions are longer (and recessions shorter) than was once the case, but business-cycle immortality remains elusive. The end of some expansions is clearly the result of foul play. In the early 1980s, for instance, both America and Britain suffered recessions that were deliberately induced in order to bring down raging inflation.

In other cases the culprit is human error. As central bankers freely admit, their control over the economy is imperfect. Policy works on a delay. Since not every shock can be anticipated, a bad blow may start a recession before a central bank can adequately respond. Or an inflation-averse central bank may discover, after it is too late to adjust course, that it raised interest rates once too often. What’s more, with interest rates in many economies near zero, central bankers find themselves increasingly reliant on unconventional tools, for which the margin of error is larger.

But there is a difference between misfortune and recklessness. Central banks that worry more about high inflation than low will tend to err on the hawkish side, and will find themselves steering into recession with some regularity. The Reserve Bank of Australia, which targets an inflation rate of

between 2% and 3%, has given itself a floor to defend as well as a ceiling. That seems to help it from sinking into recession by mistake. The Fed, which has begun raising interest rates even as its preferred inflation measure remains below its target, has not absorbed this lesson—and Ms Yellen’s comments about the natural life of expansions should not be considered an alibi. ■



自由交流

辣手摧发

当经济增长期走到尽头，很少是因为年头过长

六月，美国经济扩张将迎来第七个年头，这可算得上高寿了：此前只有三次经济扩张的延续时间长过这次。上世纪九十年代那次持续时间最长的繁荣期也只有十年。

人们不禁会将这十年的纪录看做是美国一轮经济扩张的最长寿命，也就相应地会担心当前的这轮扩张时日无多了。果真如此吗？在去年12月举行的一次新闻发布会上，美联储主席珍妮特·耶伦（Janet Yellen）宣称：“我认为经济扩张的时间长了就该结束的说法是一种误区。”然而扩张终有结束之时。要么是耶伦错了，要么是有人提前扼杀了健康的经济扩张。

正如死亡一样，经济衰退（一般定义为连续两个季度GDP下降）也是生命的一部分。供给冲击偶尔会促发衰退：例如，1973年的油价飙升好比大幅增税一样打击了富裕国家的消费者，削弱了他们的购买力，由此造成GDP下降。而更多时候，衰退的出现要归咎于需求疲软。金融市场波动或利率上涨使人们把钱包抓得更紧。事实证明恐慌是会传染的，并最终让人们在悲观情绪中越陷越深。

但并非所有的经济扩张都如美国的一样短命（见图表）。扩张期的纪录由荷兰保持：其最长一次经济扩张止于2008年，延续了近26年。澳大利亚明年年初有可能会超越这一纪录：其当前一轮扩张始于1991年。如果经济扩张有自然寿命，那么也不止十年。

今年早些时候，旧金山联邦储备银行的格伦·鲁迪布什（Glenn Rudebusch）为美国历次经济扩张制作了一张精算生命表，很像人寿保险公司为人做的生命表。在富裕国家，一个人的死亡概率从中年开始逐渐上升，到80多岁后则陡然上升。然而经济扩张看起来并不会随年头递增而变得脆弱。二战结束后美国只经历过12轮经济扩张，而人口生死的样本总归

要多一些。但现有数据表明经济周期的衰亡曾一度和人的衰老过程一样。鲁迪布什注意到，在二战之前，经济陷入衰退的可能性会随着经济扩张年头的增加而上升。然而上世纪四十年代以来，年头长短似乎并没有什么影响：从统计数字来看，处于第40个月的扩张和处于第80个月的扩张同样脆弱（能撑过来年的概率都是75%）。

无休止的经济复苏似乎有违直觉。有限的经济周期看起来比较有道理：比如刚刚摆脱衰退的经济应该有很多投资机会，一旦用尽，就更有可能引发一轮新的衰退。然而经济学家认为经济周期未必一定如此展开；相反，即使经济扩张仍在继续，增长的构成也有可能发生改变。蓬勃发展的科技行业有可能吸走本会流向基建或房地产的资金，而后面这些行业反之在科技发展式微后可以继续推动增长。如果所有国内的投资机会都已用尽，资金应该流向海外投资，降低本币的价值，从而帮助出口商刺激经济继续向前。只要某个行业繁荣的终结不会让其他经济领域陷入越来越深的悲观情绪，那么经济应该还会继续发展下去。

既然如此，为什么经济还会陷入衰退呢？在战前时代，经济已经扩张的时间长短影响更大，而各国政府和央行在稳定经济方面发挥的作用则要小得多。经济冲击（从地震到金融危机）经常发生；经济扩张持续时间越长，出现严重灾难的可能性就越大，从而将经济推向衰退。

然而在大萧条之后，政府开始着手抗击悲观情绪。越大的福利国家，提供的“自动稳定机制”也越多，即政府在失业补贴等项目上投入更多，而这在增长乏力时可为本国经济注入更多资金。央行开始更积极地调控利率来维持经济增长，并最终制定一系列目标来给市场灌输稳定增长的预期。

| 耶伦宣布加息，但为时过早

战后经济扩张期要比以前更长（衰退期也更短），但永续的商业周期依然难以实现。有些扩张期的结束显然是人为造成的。比如上世纪八十年代初，美国和英国都遭遇了经济衰退，而这些都是蓄意诱发的，旨在降低严重的通货膨胀。

而另外几次衰退的元凶则是人为错误。央行行长们坦言他们对经济的调控并非完美。政策作用也会滞后。由于并非每一次经济冲击都可以预见，央行还来不及做出充分的反应，严重的冲击就可能引发衰退。或者，一个厌恶通胀的央行可能会发现先前加息太过频繁，想要扭转却为时已晚。此外，在很多国家利率已经趋近于零的情况下，央行行长们发现自己越来越依赖非常规工具，而这些工具出错的可能性会更大。

但不幸与蛮干还是有差别的。更担心高通胀率而非低通胀率的央行更有可能犯鹰派的错误，而且它们造成衰退的情况还有些规律可循。澳洲储备银行将通胀目标设定在2%到3%之间，在通胀的上下限两头作战，这似乎有助其避免误入衰退期。美联储并没有汲取这个经验，尽管其偏好的通胀指标低于目标，却已经着手加息。耶伦对经济扩张自然寿命的看法可不能拿来当借口啊。■



The future of carmakers

Upward mobility

Making vehicles may prove easier than selling services

CAR companies have long talked a good game when it comes to harnessing technology that threatens to undermine the business of making and selling vehicles. In the 1990s, as the dotcom boom was in full swing, Jac Nasser, then boss of Ford, said that the new business models the internet would enable meant that his firm would outsource the dull task of assembling cars and reinvent itself as a mobility company, selling transport as a service. Mr Nasser was too early with this insight. Only now are most big carmakers teaming up with tech firms that offer transport services, on the road to becoming mobility providers. But they in turn may have left it too late.

In the scramble to reinvent themselves, conventional carmakers have turned their attention of late to ride-hailing apps. These services allow people to use smartphone apps to summon a car and driver to ferry them to their next destination. On May 24th both Toyota and Volkswagen announced tie-ups with taxi-hailing apps. The Japanese firm has made a small, undisclosed investment in Uber, the world's biggest ride-hailing firm, with operations in over 70 countries. VW announced an investment of \$300m in Gett, an Israeli firm that is popular in Europe. Matthias Müller, VW's boss, has much bigger aspirations. He declared that the German carmaker aims to be a world-leading mobility provider by 2025.

VW will not lack for company. In January General Motors invested \$500m in Lyft, Uber's closest rival in America, partly to embrace ride-hailing and partly to share in the development of self-driving robotaxis. Last year Mark Fields, the boss of Ford, perhaps forgetting Mr Nasser's earlier pronouncement, said that henceforth his firm would be a mobility

company as well as a carmaker. Rumours abound that Ford is planning its own ride-hailing app and a vehicle to go with it—perhaps an on-demand minibus service.

Though the latest battleground is ride-hailing, car companies have their eyes on other ways of making money from mobility. People who might hitherto have wanted to own a car may no longer do so, preferring to pay to drive when they need to. Young city-dwellers are turning their backs on owning a costly asset that sits largely unused while losing value. Membership of car clubs, which let people book vehicles by app for short periods, is growing fast. ZipCar, the world's largest, is owned by Avis Budget, a car-hire firm. More carmakers are copying Daimler's Car2Go and BMW's Drive Now apps. Ford, for example, is testing car-sharing services in America, Britain, Germany and India.

Car-sharing and ride-hailing schemes may eventually make carmakers money. For mass-market firms, used to slim margins, it might even prove a boon, though premium carmakers, used to fatter profits, may not agree. Carmakers will not only take a cut of the fares but will jostle to supply vehicles. Indeed Toyota's deal includes a financing scheme for Uber drivers to acquire its cars. GM offers a similar scheme to help Lyft's drivers get on the road.

But their chances of profiting from usership rather than ownership depend on two things. First, carmakers need to change how they operate. Mastering the complicated business of manufacturing cars has kept new competitors largely at bay. But simultaneously running a service business that depends on constant engagement with customers and crunching large quantities of data is a far cry from designing a new SUV. Indeed the flurry of investments by carmakers has been driven as much by the desire to learn how these new businesses work as for immediate profits.

Second, big tech firms, adept at handling data and selling services, cannot get too far ahead. Google leads the field in self-driving vehicles. Apple is rumoured to be planning to build its own car and recently invested in Didi Chuxing, China's answer to Uber. A host of startups are plotting ways to profit from offering services that will move customers from A to B.

Instead of owning a car, the future could include a monthly subscription to an app that combines car-sharing, taxis, buses, trains, bicycles and anything else on wheels, including on single journeys where multiple modes of transport are the quickest or cheapest option. More efficient use of public transport, more car-sharing and more ride-hailing will mean that people who might have bought a car may no longer do so, stifling the growth in vehicle sales that was expected as the middle classes take to the roads in developing countries. Carmakers face selling fewer vehicles while freewheeling competitors, unencumbered by a vast manufacturing business, mop up the profits from selling transport to customers on the move. ■



汽车厂商的未来

挣扎上行

制造车辆或许比销售服务更容易

说到如何驾驭可能会侵蚀常规汽车制造及销售业务的新技术，汽车公司早有一番高论。在上世纪90年代互联网热潮如火如荼之时，福特汽车当时的总裁雅克·纳赛尔（Jac Nasser）表示，互联网造就的新型商业模式意味着福特可把组装汽车这种枯燥的任务外包出去，把自身重塑为“出行”公司，把交通运输作为一种服务来销售。纳赛尔的预言在当时过于超前了。大多数大型车企直到现在才刚刚开始与提供运输服务的高科技公司联手，变身为出行服务供应商，但这也也许为时已晚。

传统汽车制造商匆忙转型，最近纷纷把目光投向叫车应用上。这类服务可让人们通过智能手机应用呼叫汽车及司机，把自己送到下一个目的地。5月24日，丰田和大众分别宣布与叫车应用结盟。优步是世界最大的叫车服务公司，业务覆盖70多个国家。日本汽车公司丰田对其做了小规模投资，具体金额未披露。大众则宣布向在欧洲广受欢迎的以色列公司Gett投资三亿美元。大众的总裁马蒂亚斯·穆勒（Matthias Müller）的志向还远不止于此。他宣称这家德国汽车制造商要在2025年前成为世界领先的出行服务供应商。

大众不愁没有同行者。今年一月，通用汽车向优步在美国的最大竞争对手Lyft投资五亿美元，一方面是投入叫车服务，另一方面也是为了分享自动驾驶出租车（robotaxi）的发展成果。去年，福特的总裁马克·菲尔茨（Mark Fields）表示其公司从此既是汽车制造商也将是出行服务公司（也许是忘了纳赛尔早先的宣言）。坊间传言，福特正在规划自己的叫车应用及配套车辆——可能会按需提供小巴服务。

虽然最新的战场是叫车领域，汽车公司还希望在出行服务上找到更多的获利方式。现在还想买车的人们以后也许会打消这个念头，而是在需要时租车使用。年轻的城市居民越来越不愿意购入一件基本闲置又会贬值的昂贵

资产。让人们可通过应用短期租车的汽车俱乐部会员制增长迅速。安飞士巴吉租车公司（Avis Budget）旗下的ZipCar是世界最大的汽车俱乐部。更多汽车制造商正仿效戴姆勒的Car2Go及宝马的Drive Now来开发类似的应用。例如，福特正在美国、英国、德国和印度测试汽车共享服务。

汽车共享和叫车业务最终也许能让汽车厂商获利。对于向来利润微薄的大众市场车企，这甚至可能是件好事，但利润较为丰厚的豪华汽车厂商或许不会认同。汽车制造商不但将从车资中分成，还将争相提供服务车辆。事实上，丰田与优步的交易中也包含让优步司机购买丰田汽车的融资方案。通用汽车也为Lyft司机提供类似方案，助其上路运营。

但能否通过出售使用权而非所有权盈利取决于两方面。首先，汽车制造商需要改变其运作方式。老牌厂商掌握着复杂的汽车制造业务，基本让新对手敬而远之。但要提供与顾客时刻互动的服务并同时处理大量数据，这就和设计一辆新SUV相去甚远了。实际上，汽车厂商的这股投资热潮既是为追求眼前利润，也是为了探究新业务如何运作。

其次，擅长处理数据和销售服务的大型科技公司也没办法取得太大优势。谷歌在自动驾驶汽车领域一马当先。苹果传闻正计划打造自己的汽车，最近又投资了优步在中国的对手滴滴出行。一群创业公司正在谋划向客户提供从A地移动至B地的各种服务及相应的获利模式。

在未来，人们也许无须拥有自己的汽车，而是每月付费使用综合了汽车共享、出租车、公共汽车、火车、自行车及任何有轮子的交通工具的应用，在某些行程中则可能要使用多种交通工具来实现最快抵达或花费最少。发展中国家中产阶层开始驾车上路，本应带来汽车销量增长，但公共交通工具的使用效率提高，加上汽车共享及叫车变得更普遍，意味着本来要买车的人也许会放弃购车，预期的增长即被扼杀。汽车制造商面临销量下跌，而轻装上阵的竞争对手没有庞大制造业务牵绊，通过向顾客销售交通服务而获利丰厚。 ■



China's currency

Bending, not breaking

As the Fed mulls a rate rise, the yuan comes under pressure again

AS CASH poured out of China at the start of this year, hedge funds lined up to bet against the yuan. Many thought it only a matter of time before the government ran down its foreign-exchange reserves, forcing a big depreciation. Publicly, Chinese officials scoffed. “Declare currency war against China? Tee hee,” was the front-page headline in a Communist Party newspaper. Privately, they took the threat more seriously. They fought back on multiple fronts, intervening both at home and abroad to prop up the yuan, while tightening capital controls. The battles have gone China’s way so far: it has slowed the outflow of cash and the yuan is right where it found itself in early January.

Yet the Chinese authorities’ apparent success prompts two questions. The first, of immediate concern, is whether the stability will endure when the Federal Reserve raises interest rates again. For all China’s forceful actions to prop up the yuan, the biggest factor in its favour was arguably external, as the Fed turned dovish. At the beginning of the year investors were braced for a succession of rate rises in America, believing these would drive the dollar, already strong, even higher. But volatile markets and a patch of weaker data stayed the Fed’s hand. That restraint halted the dollar’s ascent and restored the lure of other currencies. The yuan was one obvious beneficiary, gaining 2% against the dollar from mid-January to mid-March.

This reprieve will soon be over. Janet Yellen, the Fed’s chairman, said late May that a rate rise is probable in the coming months. The dollar has started to climb higher against just about every currency, including the yuan. From May 30th to June 1st, the Chinese central bank set the yuan’s opening rate at its weakest level against the dollar in more than five years.

That may be a good thing for China's exporters, but the worry is that depreciation will trigger a resumption of the capital outflows that the bank has worked to curtail.

Yet China is in a better position than half a year ago to resist the pressure. Extensive capital controls remain intact, limiting speculators' room for manoeuvre. The Chinese economy is itself stronger, thanks to a revival of the property market. And even if the Fed raises rates in June or July, it is expected to proceed cautiously thereafter, suggesting that any dollar rally will only go so far. Against this backdrop, the yuan will probably soften but is unlikely to tumble, says Zhang Lu of CEBM, an advisory firm.

The second question about China's defence of the yuan is a more fundamental one: has it given up its goal of reforming the currency? For years it pegged the yuan to the dollar and intervened to limit its fluctuations. Last August the central bank introduced a new "exchange-rate mechanism". It still sets a daily level against the dollar around which the yuan can move up or down by no more than 2%, but that is now based on two factors: the previous day's closing rate and the value of a basket of currencies, not just the dollar. If implemented in full, the new system would give market forces a bigger role.

In practice, the central bank has retained considerable power. It can influence the yuan's closing rate against the dollar by intervening directly or instructing state-owned banks to do so. In setting the daily rate it can also choose whether to focus on the dollar or on the basket, as suits its purposes. That is indeed how it has steered the yuan since January. When the dollar has been weak, the central bank has tethered the yuan to it, thereby allowing depreciation against the basket of currencies. When the dollar has strengthened, as in recent weeks, it has let the yuan creep down against it, thereby limiting its appreciation against the basket.

In other words, the central bank has hardly ceded control of the exchange rate to the market. That is not to say that its reforms are meaningless. The yuan's daily exchange rate against the dollar has indeed been much more closely bound to the previous day's closing level than in the past: the average difference between the two has been 0.009 yuan since August, compared with 0.06 yuan over the two years leading up to that (see chart). What is more, against the basket of currencies, the yuan has been broadly stable: its level today is almost exactly the same as at the start of 2015. Taken together, the revamped exchange-rate system has started to earn credibility in the eyes of some analysts and traders. It is certainly true that China has only gone part-way in freeing the yuan. But that is all it ever promised to do. ■



中国货币

弯而未折

美联储有意加息，人民币再度承压

今年年初大量现金涌出中国时，对冲基金成群结队地赌人民币跌。当时许多人认为，政府的外汇储备缩水，迫使人民币大幅贬值只是时间问题。在公开场合，中国官员对此嗤之以鼻。一份党报发表头版文章，题为《向中国货币宣战？“呵呵”》。不过私下里，他们还是认真对待威胁的。中国在多条战线上展开反击，同时在国内和国外进行干预以支撑人民币，并收紧资本管制。这场战斗到目前为止还是中国占优：现金流出已经放缓，人民币汇率也回到了一月初时的水平。

不过，中国政府表面上的成功提出了两个问题。第一个是眼前的担心，即美联储再次升息时能否继续保持稳定。对于中国支撑人民币的所有强力行动而言，其最大的有利因素应该说是外部的，即美联储转为温和。年初时投资者已做好美国连续加息的准备，并相信这将把本已相当强势的美元推至更高。但市场波动和一些疲软的数据让美联储收了手。这种克制刹住了美元的升值，让其他货币又变得诱人起来。人民币是一个明显的受益者，2月中旬至3月中旬对美元升值了2%。

喘息之机很快就会结束。美联储主席珍妮特·耶伦（Janet Yellen）五月底表示，很有可能在未来几个月内加息。美元已经开始对包括人民币在内的几乎所有货币升值。从5月30日至6月1日，中国央行设定的人民币兑美元开盘汇率是五年多以来最低的。这对中国的出口可能是件好事，然而有人担忧贬值将重新触发中国央行一直努力遏制的资本外流。

然而中国比半年前更能够抵抗压力了。普遍的资本管制并未解除，压缩了投机者的回旋余地。中国经济本身也更强劲，这得益于房地产市场的复苏。而且，即使美联储在六月或七月升息，人们预计它在此后会谨慎行事，这意味着美元的升值也就到此为止了。咨询公司莫尼塔（CEBM）的张璐说，在这一背景下，人民币可能会走软，但不太可能暴跌。

针对中国的人民币保卫战还有一个更为根本的问题——中国是不是放弃了货币改革的目标？多年来，中国让人民币盯住美元，并施加干预限制其波动。去年八月，央行出台了新的“汇率制度”，它仍然设置每天人民币兑美元的价格浮动幅度不可超过2%的限制。但现在制定汇率基于两个因素：前一天的收盘汇率，以及一篮子货币而不仅仅是美元的价值。如果全面落实，新制度将让市场力量发挥更大的作用。

在实践中，中国央行依然保留了相当大的权力，它可以通过直接干预或要求国有银行出手来影响人民币兑美元的收盘汇率。在设定每天的汇率时，还可以根据自己的目的来选择是盯住美元还是一篮子货币。自一月以来它确实就是这样引导人民币的——当美元疲软时，央行就把人民币和它拴在一起，从而允许对一篮子货币贬值。而比如最近几周美元走强时，它就让人民币悄悄对其贬值，从而限制其对一篮子货币的升值。

换句话说，央行几乎并未把对汇率的控制权交给市场。这并不是说它的改革没有意义，美元兑人民币的每日汇率贴近前日收盘价的程度确实比过去好多了——去年八月以来，两者之间的平均差异是0.009元，而在这之前的两年是0.06元（见图）。更重要的是，人民币对一篮子货币基本稳定：今天的水平和2015年初时几乎完全一样。综合来看，调整后的汇率制度已经开始赢得一些分析师和交易商的信任。当然，中国确实并未给人民币全面松绑，但它自始至终也就答应做了这么多。 ■



Global warming

In the red

The end of El Niño sees temperatures soar across the world

CONDITIONS in India are road-meltingly hot: on May 19th residents of Phalodi, a city in the north of the country, had to cope with temperatures of 51°C—the highest since records there began. Records are tumbling elsewhere, too. According to the latest data from America's National Oceanic and Atmospheric Administration, 13 of the 15 highest monthly temperature anomalies have occurred since February 2015. The average temperature over land and ocean surfaces in April was 1.10°C above last century's average (see map). The current year will almost certainly be the warmest on record, and probably by the largest margin to date.

A Pacific-wide climatic phenomenon known as El Niño (“The Boy” in Spanish) helps explain the heat. In non-Niño years, trade winds blow warm water to the west, where it pools in the western tropical Pacific. Cooler water is drawn up from the depths to the surface in the Pacific's east as a result, in a process known as upwelling. Every two to seven years, the pool of warm water sloshes back eastwards when the trade winds weaken or even reverse; this is El Niño in action. The interaction of the Pacific Ocean and the atmosphere is part of a cycle called El Niño Southern Oscillation (ENSO).

This spilling of the warm pool across the tropical Pacific pushes up global surface temperatures. The consequent increase in atmospheric heat and moisture brings deluges to south-eastern South America and western North America, and drought to India, Australia, Indonesia and southern Africa. Niño-like conditions first began in mid-2014, but the full event did not emerge for another year. It then proved one of the strongest ever recorded.

On May 24th Australia's Bureau of Meteorology (BOM) declared El Niño finished, as surface temperatures across the tropical Pacific have cooled over the past two weeks. What follows? Temperature peaks typically occur towards the end of El Niño, according to Kevin Trenberth from the National Centre for Atmospheric Research in Boulder, Colorado. BOM says that there is a 50% chance that La Niña, another phase of ENSO and one associated with unusually low surface temperatures in the eastern Pacific, will form this year. Cooler weather for south-eastern Asia and western South America could accompany it.

But each event has its own quirks. And future Niños may hold greater surprises, thanks to increasing concentrations of heat-trapping gases in the atmosphere. Resultant ocean warming means the barrier to extreme Niños "is now lower", says Eric Guilyardi, a meteorologist at the University of Reading in Britain. Between 1999 and 2012, 69 zettajoules of heat (a vast quantity of energy) have been sequestered in the oceans between 300 metres and 1,500 metres down, according to a 2014 study in *Science*. Still warmer oceans in years to come will probably mean that the weather events unleashed by strong Niños will intensify.

Blaming climate change for particular storms remains tenuous. But America's National Academies of Science, Engineering and Medicine released a report in March laying out where scientists can more confidently attribute the probability or severity of weird weather to climate change. It says the most dependable attribution findings are for events related to an aspect of temperature; a warmer climate means that unusually hot days become more likely while unusually cold ones become less so. India's scorching temperatures may reflect such trends. Limiting global warming to less than 2°C above pre-industrial temperatures, agreed at UN climate talks last year, appears impossible.

| *The way we live now*

The sweltering temperatures in recent months may help settle debates over a supposed “pause” in global warming that occurred between 1998 and 2013. During that period the Earth’s surface temperature rose at a rate of 0.04°C a decade, rather than the 0.18°C increase of the 1990s.

Fluctuating solar output, atmospheric pollution, incomplete data and volcanic activity were all posited as possible factors. Some saw the stasis as evidence that previous temperature rises were thanks to natural cycles, not man-made warming. Others later argued that the hiatus never happened at all: inconsistent methods of measuring ocean surface temperature or inadequate statistical analysis were to blame.

The complexity of climate systems means temperature variations cannot be explained by a single cause. But those who pinned the pause on the ocean’s heat-storing may have known best. ■



全球变暖

红色高温

厄尔尼诺的结束伴随全球温度飙升

印度热得连马路都要融化了：5月19日，印度北部城市帕洛迪（Phalodi）的居民不得不忍受 51°C 的高温——这是当地有记录以来的最高温度。其他地区的最高温纪录也摇摇欲坠。美国国家海洋和大气管理局的最新数据显示，15次最高月度温度异常中，有13次发生于2015年二月以后。今年四月的地表和海洋表面平均温度比上世纪平均值高出 1.10°C （见地图）。今年几乎可以肯定将成为有记录以来最热的一年，而且其打破纪录的幅度也很可能是有史以来最大的。

一种名为“厄尔尼诺”（西班牙语“小男孩”的意思）的现象影响整个太平洋地区，有助于解释这种高温现象。在没有厄尔尼诺影响的年份里，信风将温暖的海水向西吹，并积聚在西太平洋热带海域，使得东太平洋深处温度较低的海水上涌，这一过程称为上升流。每隔两到七年，当信风减弱或甚至风向逆转时，积聚在西太平洋的温暖海水又向东流去，这就是厄尔尼诺现象在起作用了。太平洋和大气之间的相互作用是厄尔尼诺南方涛动（ENSO）循环的一部分。

太平洋热带海域温暖海水的外溢推高了全球的表面温度，气温和湿度随之升高，导致南美东南部和北美西部洪水泛滥，而印度、澳大利亚、印度尼西亚和南非则出现大范围的旱情。最早在2014年年中时便有了一些类似厄尔尼诺的迹象，但严重的厄尔尼诺灾害直到一年后才出现，并成为有记录以来威力最大的一次。

5月24日，澳大利亚气象局（BOM）宣布本次厄尔尼诺现象结束，因为在此之前的两周里，整个太平洋热带海域的海洋表面温度一直在下降。接下来会如何呢？位于美国科罗拉多州博尔德（Boulder）的美国国家大气研究中心（National Centre for Atmospheric Research）的凯文·特伦博思（Kevin Trenberth）表示，厄尔尼诺现象结束之前一般会出现温度高峰。

澳大利亚气象局认为今年有50%的可能会出现拉尼娜现象。这是南方涛动的另一个阶段，与东太平洋表面异常低温有关，并可能为东南亚和南美西部带来凉爽的天气。

但这两种现象都有些难以捉摸的地方。未来的厄尔尼诺现象也许会愈出人意料，这是由于大气中吸热气体浓度增加，由此造成的海水升温意味着发生极端厄尔尼诺现象的门槛“现在更低了”，英国雷丁大学的气象学家埃里克·吉利阿德（Eric Guilyardi）说道。2014年《科学》（Science）杂志刊登的一项研究显示，1999年至2012年间，有69千万亿焦耳（超大量的能量）的热能封存于海洋深处300至1500米之间。未来数年间，更加温暖的海洋很可能意味着由强厄尔尼诺引发的极端天气现象将会加剧。

将某次暴风雨归咎于气候变化尚属牵强，但美国国家学三月发布了一份报告，列出在哪些情况下科学家们可以更确定地将极端天气的发生概率或严重程度归咎于气候变化。报告指出，最可靠的因果关系是针对那些与温度有某些关联的现象——气候更温暖意味着异常酷热天气会可能更常见，而异常寒冷天气会更少见。印度的酷暑可能正印证了这样的趋势。去年联合国气候峰会达成的将气候变暖幅度控制在不超过工业化前水平 2°C 的目标看来已无可能。

| 我们现在的生活方式

最近数月的高温可能有助于平息一个争议——1998年至2013年间全球变暖看似“暂停”。在这一时期内，地球地表温度以每十年 0.04°C 的速度上升，而上世纪90年代时则是每十年上升 0.18°C 。

太阳辐射不稳定、大气污染、数据不完整及火山活动都被列为可能的因素。有些人认为这种放缓证明以前的气温升高是自然周期的结果，而非人为造成的。另一些人后来则辩称全球变暖的脚步从未停止——测量海洋表面温度的方法不一致或统计分析不足才是背后的原因。

气候系统纷繁复杂，意味着温度变化无法由单一原因来解释，不过也许那些声称海洋储热暂停的人特别了解吧。■



Insurance in China

Safe or sorry?

Regulators try to tame the unruly parts of an important industry

EVEN for a country used to rapid growth, the expansion of China's insurance industry has been something to behold. Assets managed by insurers have doubled in less than four years to 13.9 trillion yuan (\$2.1 trillion). Their revenues from selling policies have accelerated, climbing 42% year-on-year in the first quarter of 2016 (see chart). Most remarkable has been the increase in their workforce. Over the past six months alone, they have added 2m to their sales force. They now employ some 7.2m people, up 120% since the start of last year. Put another way, roughly one in every 50 workers in Chinese cities is selling insurance products.

Fast growth is, in one respect, just what China's insurance industry needs. The population will get much older in the coming decades, but the public pension scheme is still in its infancy. By supplementing public coverage with private policies, the government hopes that people may just manage to escape penury in their old age. At the moment the government covers roughly a third of medical expenses and insurance companies less than a tenth, leaving individuals to pick up more than half the tab themselves, according to Enhance International, an insurance consultancy. That is an especially heavy burden, naturally, for the elderly.

But excessively rapid growth, built on flimsy business models, risks doing more harm than good. There have been plenty of worrying signs. The most aggressive firms have scaled up by offering guaranteed returns of 6% or more on short-term investment products, an extremely risky strategy for what is supposed to be a sober and reliable industry. To deliver these returns despite a lacklustre stockmarket, they have piled on debt and cut into their own margins. Moreover, these short-term products do not

necessarily help investors through retirement: people are free to cash out when their policies mature, leaving them with no coverage against death, illness or accidents.

Regulators appear to have had enough. In March they announced their strictest rules yet to curb speculative behaviour. They barred insurers from selling products with maturities of less than one year and began to phase out those with maturities of less than three years. These measures, though somewhat crude, should help prevent mismatches between long-term assets and short-term liabilities.

This month regulators turned their attention to some of the insurers that have been among the boldest in expanding. First they sent inspectors to Sino Life Insurance Co, which has run down its capital in recent quarters. Then they went to Anbang, which has increased its assets some 50-fold over the past two years. That inspection was a particularly important signal about the clout of regulators. Many observers had assumed that Anbang would receive preferential treatment, thanks to strong political connections (its chairman is married to the granddaughter of Deng Xiaoping, a revered former leader). But regulators blocked its \$14 billion bid earlier this year for Starwood, a big international hotel chain, and now seem to be clipping its wings at home.

More fundamentally, China has also overhauled solvency rules, which should force insurers to change the way they operate. Capital requirements had been based on simple gauges of size. Now they are much closer to the norm in developed markets, varying in line with how quickly policies turn over and how premiums are invested. Firms that rely excessively on short policies or that invest heavily in the stockmarket must hold a much bigger cushion.

The heyday of rapid expansion by opportunistic firms is over, predicts Lee

Yuan Siong of Ping An Insurance, one of China's biggest providers. "The government saw the danger early enough before it got out of control." If the new rules work, insurers will need to focus on persuading people to buy their policies for protection rather than as an investment. That is a safer bet, but a harder sell. ■



中国保险

安全还是遗憾？

监管者试图控制一个重要产业中不守规矩的成员

即使对于习惯于快速增长的中国而言，其保险业的扩张也令人瞩目。在不到四年里，保险公司管理的资产已翻了一番，达到13.9万亿元（2.1万亿美元）。它们的保单销售收入也加速增长，2016年第一季度同比增长42%（见图表）。最惹人注目的是其人员数量的增长。仅在过去的6个月里，保险销售队伍已经增加了200万人。如今雇员总计约720万人，自去年初以来上升了120%。换句话说，中国城市里大约每50名职工里就有1人在卖保险。

一方面，快速增长正是中国保险业所需要的。在未来的几十年里，人口将进一步老龄化，但公共养老金计划仍处在起步阶段。通过用个人保单来补充公共保障，政府只是希望人们能成功地避免在晚年陷入贫困。根据保险咨询公司Enhance International的数据，目前政府支付约三分之一的医疗费用，保险公司支付的不到十分之一。这样一来，一半多的账单就需要人们自己负担。自然，这对老年人是一项特别沉重的负担。

然而，过快增长背后的商业模式站不住脚，则很可能弊大于利。目前已出现许多令人担忧的迹象。最激进的公司扩大规模的方式是为短期投资产品提供6%或更高的回报，这对于一个本应清醒、可靠的行业而言是一个极度危险的策略。股市低迷，为了兑现回报，这些公司堆积了大量债务并削减了自身的利润。此外，这些短期产品并不一定能帮助投资者安度退休时光：保单到期时，人们可以自由变现，此时死亡、疾病或意外事故就不再有保障了。

监管部门似乎已经受够了。三月，它们公布了迄今为止最严格的规则来抑制投机行为。它们禁止保险公司销售存续期小于1年的产品，并开始逐步淘汰存续期小于3年的产品。这些措施虽然略显粗暴，但应该有助于防止长期资产和短期负债之间的期限错配。

本月，监管机构将注意力转向了一些扩张最为大胆的保险公司。它们先是派出检查人员进驻最近几个季度资本缩水的富德生命人寿保险公司，随后又检查了过去2年里资产增加约50倍的安邦保险。这类检查是体现监管机构影响力的一个特别重要的信号。许多观察家原以为安邦会受到优待，因为它拥有强大的政治关系（其董事长娶了备受尊敬的前领导人邓小平的孙女）。但今年早些时候，监管机构叫停了它对大型国际连锁酒店喜达屋的140亿美元竞购，如今似乎又在国内对其加以打压。

更根本的是，中国还全面修订了偿付能力规则，这应该会迫使保险公司改变其运作模式。资本要求以前一直基于对规模的简单测量，现在则更接近于发达国家市场的标准，根据保单满期时间和保费投资情况而有所不同。过度依赖短期保单或是大量投资于股市的公司必须持有更大的缓冲。

平安保险（中国最大保险公司之一）的李源祥预计，投机企业快速扩张的鼎盛时期已经结束。“政府在形势失控之前及时发现了危险。”如果新规则能够奏效，保险公司就得去劝人们为了保障而非投资来买保险了。这是更安全的选择，但销售起来会更难。 ■



Schumpeter

Life in the fast lane

Business people are racing to learn from Formula One drivers

ON THE face of it business executives and Formula One drivers have nothing in common, other than the fact that they do their jobs sitting down. Racing drivers hurtle round a track, touching speeds of 350km an hour. Office-bound managers may occasionally wheel their chairs from one side of their desks to the other. Drivers risk a high-speed pile-up if they lose concentration. Executives merely risk spilling coffee on a Hermès tie.

Yet one of the motor-racing world's gurus now spends much of his time talking to chief executives. Aki Hintsa, a Finnish surgeon, was chief medical officer for the McLaren F1 team for 11 years. His clients have included two former world champions, Sebastian Vettel and Mika Hakkinen, as well as Lewis Hamilton, the current holder. Dr Hintsa's relationship with the business world started informally when a CEO friend turned to him in despair, complaining of burnout. His business, Hintsa Performance, employs 30 people, applying his methods from discreet offices in Geneva and Helsinki. It earns more than 80% of its revenues from working with management teams and individual bosses.

Can business people really learn from Formula One? Dr Hintsa argues that the two worlds have more in common than you might think. Drivers sit atop a pyramid of 500-700 employees, from engineers to marketing departments, whose livelihoods depend on them. Surrounded by sycophants, drivers can easily lose control of their egos. They live horribly peripatetic lives—races are run in every corner of the world. Dr Hintsa says that his grand-prix experience forced him to focus on two problems that also plague executives always on the move.

The first is lack of sleep. A growing body of evidence shows that shortage of shut-eye cripples individuals and poisons organisations. One study shows that staying awake for 20 hours has the same impact on the performance of various cognitive tasks as a blood-alcohol level of 0.1%, well over the limit for driving a car in most countries. Another study shows that being deprived of sleep leads people to adopt a more negative attitude or tone of voice. Employees are also more likely to report disengagement from work if a bad night's sleep makes their bosses grouchy.

Yet sleep deprivation is commonplace in the business world—and is sometimes worn as a badge of honour. A recent survey of 196 business leaders by McKinsey, a management consultancy, revealed that 66% were dissatisfied with the quantity of sleep they got and 55% were dissatisfied with the quality. Too many companies are run by people who are dazed by a lack of sleep.

The second problem shared by those in the driving seat, whether of a racing car or a multinational firm, is constant travelling. Life on the road not only makes sleep harder to manage by cutting the amount of resting time available and confusing the body clock. It has other debilitating effects. Spending long periods in pressurised airline cabins dehydrates the body and messes up circulation. Time in airports and hotels encourages overeating. Airports specialise in junk food; airlines serve over-salted and over-flavoured meals to compensate for the fact that flying dulls the taste buds. Deals are done over extravagant dinners washed down with too much wine by businessmen who then find themselves raiding the minibar at odd times of the night.

Dr Hints provides detailed instructions about how to overcome these difficulties. Bringing healthy snacks when travelling reduces the likelihood that frazzled bosses will delve into the minibar. Dimming the lights gradually in the evening prepares the mind for sleep. Switching off screens

two hours before bed saves bombarding the brain with blue light, which tells it to stay awake. Reading a book is better than goggling at a device.

His advice for coping with jet lag is complicated. His clients receive detailed charts that tell them on what side of the plane to sit and when to wear sunglasses after landing (when travelling east it is wise to wear shades on arrival to minimise exposure to daylight). The main thing is to decide whether to adapt the environment to your body, or your body to the environment. On a short trip, he advises sticking as closely as possible to a normal schedule and adjust meetings and bedtime accordingly. On longer jaunts, start adjusting to the new time zone a week in advance. And pay attention to light: bright lights send the brain instructions to wake up and dimmer lights tell it to close down.

| *Sleeping your way to success*

Dr Hintsa is riding a wave of interest in how to improve the personal performance of executives. Hintsa Performance has a number of direct competitors such as Tignum, based in Phoenix, Arizona. Big management consultancies have started paying attention to the subject of shut-eye: the latest edition of the *McKinsey Quarterly* contains an article on how “sleep-awareness programmes can produce better leaders”. Caroline Webb, a former McKinsey consultant, has written a book, “How to Have a Good Day”, that suggests ways of using recent findings from economics and behavioural science to improve working life. Google has established a trend for providing workers with sleep pods, nap rooms and healthy snacks. The Boston Consulting Group has experimented with a “time off” policy: employees spend an evening every week without e-mail or their smartphone, in order to catch up on sleep. Some airlines and hotels are using “smart lighting” to help customers adjust to new time zones.

There are good strategic reasons for this. Companies recognise that, in a world where you can buy so much computer power off the shelf, their

competitive advantage lies in the quality of their employees. But the main reason for the interest in firms like Dr Hintsä's is individual angst rather than a corporate master plan. From the CEO down, people are so hassled by the pace of business life that they are turning to anyone who can help them get their lives under control and their batteries recharged. Everyone could do with the occasional pit-stop. ■



熊彼特

快车道生活

商务人士竞相向一级方程式车手学习

乍看之下，商业高管和一级方程式车手除了都是坐着干活之外并没有什么共同之处。车手在赛道上疾驰，速度可触及350公里每小时，而办公室里的经理们可能偶尔会把椅子从办公桌的一边滑到另一边。车手们要是一分神可能有高速连环相撞的危险，高管们则最多只会把咖啡溅到爱马仕领带上。

然而，赛车界的一位高手现在大部分时间都在和首席执行官们谈话。芬兰外科医生亚基·辛萨（Aki Hintsa）担任迈凯轮F1车队的首席医疗官达11年。他的客户包括两位前世界冠军——塞巴斯蒂安·维泰尔（Sebastian Vettel）和米卡·哈基宁（Mika Hakkinen），还有去年的世界冠军刘易斯·汉密尔顿（Lewis Hamilton）。辛萨不经意间开始涉足商业界，当时一位CEO朋友因为身心俱疲而绝望地向他求助。他的公司Hintsa Performance位于日内瓦和赫尔辛基的办公室并不起眼，有30名员工在那里将他的方法付诸实施。与管理团队和个别老板的合作为公司贡献了超过80%的收入。

商务人士真的能从F1中学到什么吗？辛萨博士认为这两个世界的共通之处比你想象的要多。车手实际上是坐在500-700名员工组成的金字塔的顶端。从工程师到市场营销部，这些员工都要靠他们过活。车手身边尽是一些阿谀奉承的人，这很容易让他们自我膨胀。他们的生活极度奔波——比赛遍布世界上的每一个角落。辛萨说，他的大奖赛经验迫使他关注两个问题，而这两个问题也始终困扰着不断旅行的高管。

首先是睡眠不足。越来越多的证据显示，缺乏合眼的时间不单让身体虚弱，更会对公司造成不良影响。一项研究表明，连续20小时不睡觉对各种认知任务的影响相当于血液里0.1%的酒精含量，而这大大超过了大多数国家的驾车限度。另一项研究表明，缺乏睡眠让人们的态度和说话的语气都

更为负面。如果老板晚上睡得不好导致心情不佳，员工离职的可能性也会更高。

然而，睡眠不足在商业界司空见惯，有时甚至还被看作是一种荣誉。管理咨询公司麦肯锡最近对196位企业领导的调查显示，66%的人不满意自己睡眠的时长，55%的人不满意睡眠的质量。有太多的公司都是由休息不足的人在睡眠惺忪中运营的。

无论是赛车还是跨国公司，坐在驾驶座上的人共有的第二个问题是不断的旅行。一直在路上的生活不仅会因挤占休息时间和搞乱生物钟而使睡眠更加困难，对健康更有其他不良的影响。长时间待在加压的机舱内会让身体脱水并扰乱循环，在机场和酒店的时候则容易暴饮暴食。机场专门兜售垃圾食品，航空公司的餐点则用过重的口味来补偿因飞行而迟钝的味蕾。商人们在饮酒过量的奢华晚宴上敲定交易，然后又在夜深人静时扫荡酒店房间中的迷你吧。

辛萨为克服这些困难提供了详细的指导。如果在旅行时带上些健康的零食，疲惫的老板们就不大会把迷你吧挖个底朝天。晚上渐渐把灯光调暗，让头脑为睡眠做好准备。睡前两小时关掉屏幕，大脑即可免遭使其保持清醒的蓝光轰炸。读上一本书，比在移动设备上打发时间更好。

他为应对时差提出的建议则更为复杂。他的客户会收到详细的图表，告诉他们应该坐在飞机的哪一侧，在着陆后戴上太阳镜（向东飞行时则应在到达后戴上遮阳帽以尽量少暴露于日光下）。最主要的是决定是让环境适应你的身体，还是让身体适应环境。在短期旅行时，他建议尽可能坚持原有的作息，并相应调整会议和就寝时间。如果旅行时间较长，则要提前一个星期开始适应新的时区。还要注意光线——明亮的光线提示大脑醒来，昏暗的光线则告诉它该休息了。

| 睡出成功

辛萨恰好赶上了关注如何提高高管个人绩效的浪潮。Hints Performance有许多直接的竞争对手，如总部设在美国亚利桑那州凤凰城的Tignum。

大型管理咨询公司已经开始关注睡眠的话题：最近一期《麦肯锡季刊》刊登了一篇文章，讲的是“有关睡眠意识的项目如何可以造就更好的领袖”。前麦肯锡咨询顾问卡罗琳·韦伯（Caroline Webb）写了一本题为《如何拥有美好的一天》的书，建议利用经济学和行为科学的最新发现来改善工作生活。谷歌已经形成了一个为员工提供睡眠舱、午睡室和健康零食的潮流。波士顿咨询集团则尝试“定时关机”政策：员工每周有一个晚上不用电子邮件或智能手机以便补觉。一些航空公司和酒店开始采用“智能照明”来帮助客户适应新的时区。

在这背后有着充分的战略原因。公司意识到，在这个可以随时买到如此多计算能力的世界上，其竞争优势在于员工的素质。但是，辛萨这样的公司之所以受到关注，则主要是因为个人的焦虑而不是企业的总体规划。自CEO往下，人们被商业生活滋扰得太多了，他们愿意向任何能够帮自己掌控生活、恢复精力的人寻求帮助。每位车手都可以偶尔进站休整一下呢。





Amazon's clothing coup

Sitting pretty

Amazon looks set to conquer America's clothing market

Times are tough for America's department stores. This month Macy's, Kohl's, JC Penney and Nordstrom all reported slumping sales. Foreign tourists are spending less; consumers are buying other types of goods. Even if they drift back, one threat looks likely to stay: Amazon. In 2011 the online retailer accounted for 1.4% of American sales of clothing, handbags and shoes. Next year Cowen, a financial services firm, expects it to overtake Macy's as America's top seller of apparel. Shoppers like the Amazon's huge selection (about 19m items), easy shipping and partnerships with brands such as Adidas. Not all traditional retailers are floundering; on May 17th TJX reported a 7% bump in comparable sales. The firm's stores satisfy those keen to hunt for discounted designer clothes—a quest hard to mimic online. But Cowen expects even TJX's clothing sales to be less than half of Amazon's by 2020. ■



亚马逊颠覆服装零售业

天时地利

亚马逊或将征服美国服装市场

美国百货业的日子很不好过。本月梅西百货（Macy's）、科尔士百货（Kohl's）、杰西潘尼（JC Penny）以及诺德斯特龙（Nordstrom）均报告销售下滑。海外游客消费减少，消费者也转而购买其他类别的商品；即使他们再转头回来，还有一种威胁大概不会消失：亚马逊。2011年这家线上零售商占据了全美服装、包袋及鞋履销售量的1.4%。次年，财经服务公司科恩（Cowen）预测亚马逊将取代梅西百货坐上美国服装销售的头把交椅。亚马逊的顾客们喜欢其丰富的商品（约一千九百万种）、便捷的配送服务，以及与阿迪达斯这类大品牌的关系。不过并非所有的传统零售商都处境艰难：5月17日，TJX（译注：服装和家庭时尚的低价零售商）报告称其可比销售额有7%的增长。热衷搜寻打折设计师服装的顾客可在TJX的门店里淘到宝贝，这是在网络上难以实现的。但科恩预测，到2020年，即使是TJX，其服装销售额也将不及亚马逊的一半。■



Shopping in America

Between Bentonville and Bezos

Lessons from the two giants of American retailing

FOR decades a titan has towered over America's shopping landscape. Walmart is not just the world's biggest retailer but the biggest private employer and, by sales, the biggest company. Last year its tills rang up takings of \$482 billion, about twice Apple's revenue. But now the beast of Bentonville must cope with an unfamiliar sensation. After ruling as the undisputed disrupter of American retailing, Walmart finds itself being disrupted.

The source of the commotion is online shopping, specifically online shopping at Amazon. E-commerce accounted for \$1 in every \$10 that American shoppers spent last year, up by 15% from 2014. Amazon's North American sales grew at about twice that rate. Walmart's share of America's retail sales, which stands at 10.6%, is still more than twice Amazon's, but it peaked in 2009 at nearly 12%. In January Walmart said it would close 154 American stores. It may need to shut more.

Walmart's "supercentres" once offered an unmatched combination of squeezed prices and expansive choice, but this formula is losing its magic. Discounters and other competitors are rivalling Walmart's low prices at the same time as Amazon's warehouses can beat its range.

Amazon is also offering something different. Whereas Walmart has strived to help Americans save money, Amazon is obsessed with helping them save time. Amazon has become a new kind of big-box retailer, with warehouses placed strategically around America to speed deliveries to customers. Innovations such as Dash, which lets you press a button in your kitchen to order soap or coffee, could turn Amazon from an online store into

something like a utility.

Walmart is fighting back. It is spending billions in the hope of growing even larger. It is offering more goods to more customers, in stores and online. With its legendary attention to detail, it is making its operations even more efficient. For instance, it will save more than 35 truckloads of buttercream icing this year, after spotting that its bakers were leaving too much icing in the bottom of their tubs. By using 27 different boxes rather than 12 to deliver online goods, the firm reckons it can save 7.2m cubic feet of cardboard boxes a year.

Last month sunny results sent up its share price by 10%. Yet far from offering comfort to other retailers hoping to knit together physical and online businesses, Walmart's fightback shows how hard it will be for them to repel Amazon.

Other retailers cannot rival Walmart's size—still its most potent weapon. Nine out of ten Americans live within ten miles of a store owned by Walmart. That gives it a unique advantage in e-commerce, because it can both ship from its stores and let consumers pick up baskets of goods that they ordered online. Its vast grocery business, which is harder to move online than non-perishable goods, provides further protection. Although investments have squeezed Walmart's profits, the firm can afford to invest more than any other in information technology.

| *Space race*

For smaller, worse-managed firms selling clothing, shoes and so on, the prognosis is bleaker. Since April 1st shares in some of America's most famous retailers, including Macy's, Gap and J.C. Penney, have plunged by more than 25%, in part because of the march of online firms. In the age of Amazon only those that offer better service, greater convenience or an experience that is hard to mimic online will do well. TJX, which offers

brand-name goods at a discount, is thriving, because customers prefer hunting for treasures that are physically there in front of them. Customers come to Nike's shops not just for trainers but for running clubs. Walmart is betting that it has the brawn and the brains to be in this group. However, others have less cause for hope. ■



美国零售业

沃尔玛大战亚马逊

美国零售业两大巨头的启示

数十年来，美国的购物界一直矗立着一位巨人。沃尔玛不仅是世界上最大的零售商，也是最大的私人雇主，从销售额来看更是最大的公司。去年它将4820亿美元营业额收入囊中，几乎是苹果公司的两倍。但如今，这家总部设在本顿维的巨兽必须要应对一种陌生的感受。在作为无可争议的颠覆者统治美国零售业多年后，沃尔玛发现自己被颠覆了。

骚动来自于网上购物，特别是亚马逊的网上购物。去年，美国消费者每花10美元，就有1美元是花在了电子商务上，比2014年增长15%。亚马逊北美的销售额增长速度大约比这个数字还要再高一倍。沃尔玛占美国零售销售额的比重是10.6%，仍是亚马逊两倍多，但它在2009年的顶峰时占到了近12%的市场份额。今年1月，沃尔玛表示将在美国关闭154家门店，而且还可能需要关掉更多才行。

沃尔玛的“超级中心”所提供的低价格、多品种组合无与伦比，但这一公式的魔力正在逐渐消失。折扣店等竞争对手的低价堪与沃尔玛媲美，而亚马逊的仓库可在品类上打败它。

亚马逊还能提供些别的东西。在沃尔玛孜孜以求帮美国人省钱的时候，亚马逊则醉心于帮他们节省时间。亚马逊已经成为一种新的超级卖场，其遍布美国的仓库经过精心布局，把货物加速送到客户手中。像Dash这样的创新让你在厨房里按一个按钮即可订购肥皂或咖啡，也许能把亚马逊从在线商店变得更像是公用事业。

沃尔玛正在奋起反击。它花费数十亿美元，希望能继续增长，使规模变得更大。它同时在门店和网上为更多的客户提供更丰富的产品，还凭借其细节传奇般的注重让运营更为高效。例如，在发现面包师在盆底留下了太多奶油糖霜之后，它今年节省的糖霜将超过35辆卡车。通过使用27种而不

是原先的12种盒子来配送在线货物，公司预计一年可以节省720万立方英尺的纸箱。

上个月报告的出色业绩让它的股价上涨了10%。然而，沃尔玛的反击非但没有让其他希望融合线上和线下业务的零售商松一口气，反而证明了要击退亚马逊有多么困难。

沃尔玛的规模让其他零售商难以望其项背——这仍是其最有力的武器。在十个美国人里，就有九个生活在距离沃尔玛门店十英里的范围内。这为它的电子商务创造了独特优势，因为它既可以从门店发货，也可以让消费者到店里来取网上订购的商品。其庞大的食品业务带来了另一层壁垒，因为与非易腐货物相比，食品更难搬到网上销售。虽然投资挤压了沃尔玛的利润，但该公司能够负担信息技术投资的能力比任何对手都强。

| 太空竞赛

对于那些规模较小、管理较差、销售服装鞋帽等产品的公司，前景不容乐观。自4月1日以来，包括梅西百货、盖璞（Gap）和杰西潘尼（JC Penney）在内的几家最著名的美国零售商股价都已经下跌了超过25%，部分原因就是在线企业的竞争。在亚马逊的时代，只有那些提供更好的服务、更多的便利或网上难以模仿的更优秀体验的公司才能兴隆。提供折扣名牌商品的TJX一枝独秀，因为客户喜欢在看得见摸得着的商品里面挑拣宝贝。客户来耐克的商店不光是为了买训练装备，更是为了参加慢跑俱乐部。沃尔玛赌的是自己不但四肢发达，更有灵活的头脑来在这场竞赛中立足。不过，其他公司的希望就更渺茫了。■



Crypto-currencies

Etherised

Bitcoin's resurgence may be short-lived

BITCOIN is back. Fans (and holders) of the crypto-currency were celebrating after its price jumped more than 20% in the five days to May 31st, to nearly \$550—a level it last reached in August 2014. They should contain their elation: the factors driving the rally are not unalloyed positives, and the competition is doing even better (see chart).

Most trading in bitcoin takes place in China: Huobi and OKCoin, two Chinese exchanges, are thought to account for more than 90% of transactions. The currency seems to have become an outlet for Chinese savers frustrated with their limited investment options and searching for high-yielding assets. The Chinese authorities are worried enough to have banned banks from dealing in bitcoin, but individuals are still free to speculate and have been doing so with gusto. Bitcoin's newfound popularity in China is unlikely to diminish its volatility, however, and thus boost its acceptance as a reliable international payment system.

China has also become the global hub for bitcoin mining, the process by which heavy-duty computing power is used to process transactions involving bitcoin, earning those doing the processing some new bitcoin as compensation. Over 80% of new bitcoin are now minted in data centres in places like Sichuan and Inner Mongolia.

All this virtual mining may be playing a part in bitcoin's rally. Operators of bitcoin mines get 25 bitcoin (about \$13,500) for every "block" of transactions they process. But this payment is set to halve on or around July 10th. That is because the maximum number of bitcoin that can ever be produced is limited to 21m. As the number in circulation gets closer to the

limit, the rate at which miners can produce them automatically declines, according to a pre-ordained formula. That makes life harder for miners: on May 29th, one of the biggest, KnCMiner, declared bankruptcy, blaming the coming change. The reduced issuance of new bitcoin should also push up the price, an outcome the current rally seems to be anticipating.

Bitcoin's resurgence has come just as champions of crypto-currencies have started to gravitate to another system, Ethereum, whose digital tokens are called "ether". This has both political and technical causes. Bitcoin's developers have yet to agree on how to increase the capacity of their network, which can only process seven transactions per second. And Ethereum makes it easier for users to create self-executing "smart contracts", something of a fad in the world of crypto-currencies. In late May, Coinbase, one of the biggest bitcoin exchanges, declared bitcoin "stagnant" and said it would start to trade ether too. ■



加密货币

以太天下

比特币的复苏可能只是昙花一现

比特币又回来了。这一加密货币在5月31日之前的五天里价格飙升超过20%，达到近550美元——上一次升至这个价位是在2014年8月。比特币的粉丝（和持有者）一片欢腾。然而他们应该克制一下喜悦情绪：此番推动价格回升的并非是纯粹的积极因素，而且其竞争对手表现更好（见图表）。

大部分的比特币交易都发生在中国：据称中国的两个比特币交易平台火币网和OKCoin网完成了超过90%的比特币交易量。对于苦于投资选择有限而又想寻求高收益资产的中国储户来说，比特币似乎变成了一个投资的出口。中国官方对此忧心忡忡，并因此禁止银行从事比特币交易，但个人仍可自由投机，且一直以来乐此不疲。比特币在中国成为新宠，但其波动性不大会因此降低，其作为可靠国际支付系统而被广泛接受的程度也就不太可能提高。

中国也已成为国际比特币挖矿中心。挖矿过程会用到大量计算能力对涉及比特币的交易进行运算，完成运算者可以挣到新的比特币作为回报。超过80%的新比特币都是在四川和内蒙古等地的数据中心挖掘出来的。

这种虚拟挖矿可能为比特币价格的回升起到了一定的作用。比特币挖矿者每计算一个交易“区块”可获得25比特币（约13,500美元），但这个数字会在7月10日前后减半。这是由于比特币总数上限设定为2100万，流通中的比特币数量越接近上限，矿机的挖矿速度就会根据一个事先设定的公式自动放慢。这让比特币挖矿者的日子更不好过了：5月29日，最大的矿机公司之一KnCMiner宣布破产，并将其归咎于即将到来的变化。新比特币数量的减少也应当推高其价格，这似乎也是本轮价格反弹所预期的结果。

比特币的复苏恰逢加密货币的支持者们开始追捧另一套系统——以太坊

（Ethereum），其数字货币称为“以太币”（ether）。这背后既有政治上也有技术上的原因。比特币的开发者们尚未就如何为网络扩容达成一致，现有网络每秒只能处理7笔交易。而以太坊让用户可以更轻松地创建可自动执行的“智能合约”，这在加密货币界算得上是一种时尚。五月底，最大的比特币交易平台之一Coinbase称比特币“停滞不前”，并表示其也将开始交易以太币。 ■



Value-added tax in Europe

Freedom fighters

Reforms to VAT may lead to a more democratic but convoluted system

IN THE battle to smash the patriarchy, feminist campaigners have found an unlikely ally: the European Commission. Their gripe is with the tampon tax, the minimum 5% rate of value-added tax (VAT) on sanitary products imposed by European law. This is tantamount, in their eyes, to a tax on women—and worse, one which European governments have no power to undo. But new proposals on VAT reform from the commission may change that.

The European Union has no authority over income and payroll taxes, but great authority over VAT. Members must apply a standard VAT rate of no less than 15%; they can have up to two concessionary rates, of at least 5%, but these can only be applied to certain goods, including food, books and medical equipment. There are numerous exceptions to these rules (Ireland exempts tampons from all VAT, for instance), but they were negotiated by the countries concerned upon joining the EU.

This system of centrally imposed exceptions is an odd compromise between two sensible but incompatible goals. It is not very flexible or democratic, as governments have only limited scope to modify the system. But it is not simple or coherent either: rates on a single item can vary wildly (see chart). Moreover, the past 40 years have seen 750 court decisions interpreting VAT law. Surely the European Court of Justice has better things to do than mull Poland's refusal to levy VAT on disinfectants or France's low rate on early performances at theatres with bars?

The effort to minimise the variation in rates stems from a time when VAT was charged according to the rate in a product's country of origin, rather

than where it was bought. The commission did not want countries to give their manufacturers a leg-up (or to poach firms from other members) by setting lower VAT rates on their wares. But since it is now the VAT rate in the purchaser's country that applies, there is no longer any risk of that. Consumers, after all, are relatively immobile, despite the odd cross-border shopping trip.

The commission has proposed two options for reform, both of which hand more VAT-setting power to national governments. The first would maintain a central list of items on which reduced rates are allowed, but expand it and review it more often. It would also rationalise the rules, by letting any country charge the lowest rate on a given item that applies anywhere else in the EU. Britain, for example, could exempt tampons from VAT, as Ireland does.

The second option is more radical: it would scrap the list, and transfer VAT-setting powers to national governments. There would be limits—if countries started applying sweeping carve-outs in an effort to entice shoppers over the border, the commission might intervene—but otherwise countries would be free to adopt as many rates and exemptions as they liked.

No country currently applies the minimum 15% standard rate (the average is 21%), so it seems unlikely that governments would take the opportunity to lower rates across the board. Rather, they would probably tinker: since the crisis there has been an increase in the number of countries using two reduced rates, from 14 out of 28 in 2007 to 19 this year. Analysis from the Centre for Social and Economic Research found that in 2013 countries sacrificed a median of 11.3% of potential VAT revenue via reduced rates. If the current restrictions were lifted, discounts and exemptions would presumably proliferate, to the delight of special interests.

Although such concessions may be good politics, they are sloppy economics. The more exemptions there are, the higher the standard rate has to be to raise the same amount of revenue. Different rates also distort people's spending, penalising some industries and rewarding others. It is an inefficient way to redistribute: when Sir James Mirrlees, a Nobel-prize-winning economist, reviewed Britain's tax system, he found that the government could scrap all concessionary rates, compensate the losers and still bring in £3 billion (\$4.8 billion) more.

Grzegorz Poniatoski, an economist, notes that a proliferation of reduced rates provides more scope for tax dodging by misclassifying products as low-rate items. For Patrick Gibbels of the European Small Business Alliance, "there is too much fragmentation." Encouraging a multitude of different systems could create an administrative burden, which would be particularly onerous for small businesses of the sort that Europeans are keen to cultivate. He prefers the first, more cautious option.

But Pierre Moscovici, the commissioner in charge of VAT, prefers the more radical option. Even if governments do not use the extra freedom wisely, there is a case for letting them make their own mistakes. ■



欧洲增值税

自由斗士

增值税改革可能让税收体系变得更民主，但也更复杂

在摧毁父权的战斗中，女权活动者意外地找到一位盟友：欧盟委员会。她们抱怨的是“卫生棉税”，即欧洲法律对女性卫生用品计征的至少5%的增值税。在她们眼中，这等于是对女性征税，更糟糕的是，欧洲各国政府无权撤销这一税项。但欧盟委员会的增值税改革新提案或许会改变这一切。

欧盟无权干预所得税和工资税，但在增值税的问题上则大权在握。成员国必须统一实施不低于15%的标准增值税率；可以最多实施两项优惠税率，但不可低于5%，且只适用于食品、书籍及医疗设备等特定类别商品。还有诸多不受此规则限制的例外情况（例如，爱尔兰对卫生棉免征增值税），但都是这些国家在加入欧盟时谈判确定的。

这种由欧盟集中规定减免税条件的体系是两个合乎情理却互不相容的目标之间奇怪的妥协。它不太灵活，也不太民主，因为成员国政府修改税制的空间有限。但这套体系并不简单，还不统一：同一类商品的税率在各国可有天壤之别（见图表）。而且，过去40年间，法院已经为解释增值税法律做了750次判决。与其纠缠波兰拒绝对消毒剂征收增值税，或者法国对带酒吧剧院的早场表演保持低税率，欧洲法院总该有些更重要的事情要做吧？

在增值税按产品产地而非购买地税率征收的时代，减少税率差别的努力就已开始。欧盟委员会不希望成员国调低自己产品的增值税率来帮助本国生产商（或者挤压其他成员国的公司）。但现在已改为按购买者所在国家税率征收增值税，故而不存在那样的风险。毕竟虽有跨境购物，消费者还是相对固定在某个国家里。

欧盟委员会提出了两个改革方案，两者都赋予了成员国政府更大的权力来设定增值税率。第一个方案将统一维护允许减税的产品清单，并更为频繁

地扩充和更新这一清单。同时，方案也将理顺规则，允许成员国对指定产品按欧盟内任何地区的最低税率征税。例如，英国可以像爱尔兰那样对卫生棉免征增值税。

第二个方案较为激进：废除这一清单，把设定增值税的权力转交给成员国政府。但会有限制条件，假如成员国大举削减税率以吸引跨境买家，欧盟委员会可能会干预，除此情况外，各国可自由设定税率及豁免条件。

目前欧盟成员国都没有采用15%这一标准税率下限（平均税率为21%），所以似乎各国政府不太可能借此机会全面下调税率。相反，它们可能会拆东墙补西墙：自金融危机以来，28个欧盟国家中，越来越多的国家开始采用两个优惠税率，2007年是14个，今年增至19个。社会及经济研究中心（Centre for Social and Economic Research）的分析显示，2013年，各国因采用优惠税率而少收的增值税收入中位数为11.3%。假如取消目前的限制，估计减免税率的案例将激增，这是某些特殊利益群体喜闻乐见的。

这类优惠也许是好的政治决策，但从经济角度看则是草率之举。税收豁免越多，标准税率则须提至更高水平才能保持收入不变。税率差异也扭曲了人们的消费，导致一些行业受损而另一些行业获益。这是重新分配资源的低效方式：诺贝尔奖得主、经济学家詹姆斯·莫理斯爵士（Sir James Mirrlees）审视英国的税收体系时发现政府可以取消所有优惠税率，补偿输家，同时依然带来额外30亿英镑（48亿美元）的税收。

经济学家格热戈日·波尼亚托夫斯基（Grzegorz Poniowski）指出，如果广泛采用优惠税率，通过将产品谎报为低税率类别来逃税的空间就更大了。欧洲小企业联盟（European Small Business Alliance）的帕特里克·吉贝尔斯（Patrick Gibbels）认为，“这样做太细碎了。”鼓励发展众多不同税收体系会造成管理负担，对于欧洲人热衷扶植的小企业而言这尤其头痛。他更偏好较为谨慎的第一个方案。

但欧盟主管增值税事务的专员皮埃尔·莫斯科维奇（Pierre Moscovici）更倾向于较激进的第二个方案。就算各国政府不能明智地运用这份额外的自

由，让它们自行犯错也合情合理。 ■



Chinese science

Schrödinger's panda

Fraud, bureaucracy and an obsession with quantity over quality still hold Chinese science back

CHINA seems to swing from insecurity about its science to hubris. In 2015, when Tu Youyou, a pharmacologist, became the first scientist to win a Nobel prize for work carried out in China, the state media's reaction was not to celebrate her ground-breaking medicinal chemistry. Rather, they claimed that the award was a recognition of traditional Chinese medicine—something she said had little to do with the work that won her the award.

In early June Xi Jinping, China's president, fell into the opposite trap, of overconfidence. Addressing a sea of scientists at a joint meeting in Beijing of the Chinese Academy of Sciences, the Chinese Academy of Engineering and the China Association for Science and Technology (see picture above), he repeated his government's aim that China should become a leading scientific innovator by 2030 and a dominant scientific country by 2049 (a date chosen because it is the 100th anniversary of the communist takeover).

China already spends lavishly on research and development, and publishes reams of scientific papers. Spending on R&D has more than doubled as a share of the economy since 2000, reaching 2.1% of GDP in 2014, just below the rich-world average, according to the Organisation for Economic Co-operation and Development (OECD), an inter-governmental think-tank. Meanwhile, GDP itself has trebled. The OECD thus says China will be the world's largest R&D spender by 2019. In terms of scientific papers published in English, the country is second only to the United States, and its output is rising by 20% a year.

But much of the published work is insubstantial, and a worrying amount is fraudulent. The process of selecting which projects should benefit from the vast pool of money available is often bureaucratic and wasteful. That, at least, is a widespread view of China's scientific establishment outside China. Much of the criticism is justified, though becoming less so.

| *Mine's bigger than yours*

China should be about to reap some rewards from its massive investment in big—indeed, colossal—science. The world's largest single-aperture radio telescope, being built in Guizhou province, is due to open in September. The Five-hundred-metre Aperture Spherical Telescope (Tianyan, in Chinese) dwarfs all other such instruments; the next-largest has a diameter of 305 metres. China is also building an underground neutrino observatory, its second, in Guangdong province. And it is expanding 25-fold its dark-matter-investigating Jinping underground laboratory, in Sichuan province, making that the world's largest subterranean lab.

As the Large Hadron Collider (LHC) in Europe has shown, in some areas of science size matters. The enormous collecting area of Tianyan, for example, means that it will be able to pick up signals from deeper areas of space. Naturally, China is talking about building an even larger particle collider than the LHC.

There is evidence, too, that the quality of Chinese scientists' work is improving. *Nature*, one of the world's foremost scientific journals, keeps track of the number of articles published in 68 respected periodicals. It takes into account the relative contribution of each author and makes adjustments for the over-representation of papers on astronomy and astrophysics in its sample journals. The result is an index of a country's or an institution's production of high-quality research papers.

According to *Nature*, China's score in this index rose by 44% between 2012

and 2015, leaving it second behind America, whose score fell by 8% in that period. Among institutions, the Chinese Academy of Sciences had by far the highest score, almost double that of second-ranked Harvard University, though this is partly because the academy, with 68,000 employees and 104 institutions, is so large. China's research output is dominated by chemistry and the physical sciences. Over 60% of China's index number is accounted for by articles on chemistry.

These findings are consistent with a study from 2014 in the *Proceedings of the National Academy of Sciences*, by Yu Xie of Peking University and others. Dr Yu found that Chinese scientific papers are being cited more often. In 2011 American scientists had about three times more articles in the 1% of most frequently cited papers than Chinese scientists did. That is a big improvement for China: in 2001 the Americans had 15 times as many.

But as President Xi admitted to the assembled academicians this month, science and technology remains "a bottleneck" for economic growth in China. The biggest problems are fraud and the academies of science and engineering themselves.

In 2014 China's anti-corruption watchdog said it had "uncovered fraud in research grants managed by China's Ministry of Science and Technology". In April the *British Journal of Clinical Pharmacology* retracted an article by scientists from Dalian University, in Liaoning province, because it suspected the peer-review process had been subverted. In 2015 *BioMed Central* retracted more than 40 papers submitted by Chinese researchers.

The prevalence of fraud reflects poor oversight and a dodgy research culture. Both are rooted in problems in the academies, which are dominated by bureaucrats rather than research scientists. In 2010 two Chinese university deans wrote in *Nature's* rival *Science* that "to obtain major grants in China, it is an open secret that doing good research is not as

important as schmoozing with powerful bureaucrats and their favourite experts”.

That is starting to change. The Academy of Sciences altered its criteria for membership in 2014, requiring prospective members to be nominated by other academicians or academic institutions and to be elected by all members. Previously, nominations could come from ministries, the Communist Party, the army and even from companies; the electorate was restricted and thus easier to influence.

But the system remains hierarchical and politicised. Even Ms Tu fell foul of it. Having begun her career in the Cultural Revolution, when scientists were deemed one of “nine black categories”, she does not have a doctorate and did not study abroad. She has been turned down by the Academy of Sciences four times. Chinese science has a way to go before it can lead the world in quality, as well as quantity. ■



中国科研

薛定谔的熊猫

欺诈、官僚作风、重量不重质仍在拖累中国科研发展

在科研问题上，中国似乎已从之前的信心不足变成如今的傲慢自大。2015年，药理学家屠呦呦成为首位凭借在中国进行的科研工作而获得诺贝尔奖的科学家，中国官媒的反应不是为其突破性的药物化学研究成果喝彩，而是宣称此次获奖是对传统中医的认可——然而屠呦呦表示这跟她获奖的工作关系不大。

六月初，中国国家主席习近平就落入了与此相反的一个陷阱——过度自信。在北京召开的中国科学院、中国工程院和中国科协联合会议上（见上图），习近平对众多科学家发表讲话，重申政府的目标是中国要在2030年进入创新型国家前列，2049年成为世界科技强国（选这一年因为那是共产党取得政权100周年）。

中国已在科学研究开发上投入不菲，发表大量科研论文。据跨政府智囊机构经合组织（OECD）的数据，自2000年以来，中国的研发投入占经济比例翻了一倍多，2014年时达到了GDP的2.1%，仅略低于富裕国家的平均水平。同时，GDP本身也增长了两倍。经合组织因而表示，中国将在2019年成为世界上研发投入最多的国家。中国以英语发表的科研论文数量仅次于美国，而且这一数量还在以每年20%的速度上升。

然而很多发表的论文价值不大，而且其中涉嫌造假的数量令人担忧。总体科研经费数目庞大，但挑选哪些科研项目可以获得资助的过程却往往十分官僚并且浪费巨大，至少这是境外对中国科研界的普遍看法。这些批评大部分是有道理的，但情况正在逐渐好转。

| 我的比你大

中国对大型（确切说是巨型）科研项目的庞大投资应该快要有所回报了。在贵州省建造的世界最大单口径射电望远镜将于今年九月启用。这一500

米口径的球面射电望远镜（被称为“天眼”）令所有其他同类设备相形见绌；世界第二大的球面射电望远镜直径为305米。中国也正在广东省建造其第二个地下中微子观测站，同时还将研究暗物质的四川锦屏地下实验室扩建至原来的25倍，使其成为世界最大的地下实验室。

正如欧洲的大型强子对撞机（LHC）已经证明的那样，规模对于某些科学领域的确重要。比如，“天眼”的广阔采集范围意味着它将可接收太空更深处的信号。自然，中国也在讨论建造甚至比LHC更大的粒子对撞机。

也有证据表明中国科学家的科研质量正在改善。世界权威科学期刊《自然》跟踪研究了在68家知名期刊上发表的文章数量。该研究考虑到每位作者的相对贡献，并针对样本期刊中天文学和天体物理学方面论文偏多的情况作了调整。最后得到一个指数，显示某个国家或某家科研机构出产高质量科研论文的情况。

根据《自然》杂志报道，中国的指数在2012年至2015年间上升了44%，如今排名仅次于美国，而后者在同期的得分则下降了8%。在各科研机构中，中国科学院迄今得分最高，几乎比排第二的哈佛大学高一倍。但这一程度上是因为中科院实在是太大了，它拥有68000名员工及104家研究所。中国的研究成果主要集中在化学及物理学领域，其指数得分有超过60%来自化学方面的论文。

这些发现与2014年北京大学谢宇等人在《美国国家科学院院刊》（Proceedings of the National Academy of Sciences）发表的研究结果一致。谢宇博士发现，中国的科研论文被引用频率在上升。2011年，在前1%被引用最多的论文中，美国科学家所发表文章的数量约为中国科学家的三倍。对中国而言这是一大进步：2001年时这一数字为15倍。

但正如习近平主席本月向与会院士们承认的，科技仍然是中国经济增长的“瓶颈”，最大的问题是造假以及科学和工程研究机构自身。

2014年，中国的反腐败监督机构表示“发现中国科技部管理的科研经费存在欺诈”。今年四月，《英国临床药理学杂志》（British Journal of

Clinical Pharmacology) 因怀疑同行评审过程造假而撤回了辽宁省大连大学几位科学家合作的一篇文章。2015年《生物医学中心》(BioMed Central) 撤回了40余篇中国研究者提交的论文。

欺诈盛行反映了监督不力和投机取巧的科研氛围，这正是研究机构的问题根源所在，而主导这些机构的是官僚而非学者。2010年中国两位大学的院长在《自然》的对手期刊《科学》撰文写道：“在中国要获批重大项目资金，重要的不是做好研究，而是跟手握大权的官员及其赏识的专家拉关系，这已是公开的秘密。”

这种情况正在改变。中科院在2014年改变了院士评选标准，要求院士候选人必须由其他院士或学术机构提名，并由全体成员选举产生。此前，提名可能来自政府部委、共产党、军队甚至企业。投票权在少数人手中，因而容易受到影响。

但该体系依然等级森严，且政治气息浓厚。就连屠呦呦也被排斥其外。她在文化大革命期间开始研究生涯，当时科学家被视为“黑九类”。她没有博士学位，也未曾留洋深造。她曾四次落选中科院院士。要想在质量和数量方面都引领全球，中国科研还有很长的路要走。 ■



Free exchange

A fare shake

Jacking up prices may not be the only way to balance supply and demand for taxis

IT IS a familiar ritual for many: after a late night out you reach for your smartphone to hail an Uber home, only to find—disaster—that the fare will be three times the normal rate. Like many things beloved by economists, “surge pricing” of the sort that occasionally afflicts Uber-users is both efficient and deeply unpopular. From a consumer’s perspective, surge pricing is annoying at best and downright offensive when applied during emergencies. Extreme fare surges often lead to outpourings of public criticism: when a snowstorm paralysed New York in 2013, celebrities, including Salman Rushdie, took to social media to rail against triple-digit fares for relatively short rides. Some city governments have banned the practice altogether: Delhi’s did so in April.

Uber is sticking with surge pricing for now, but Jeff Schneider, one of its machine-learning experts, recently suggested that the company is interested in developing systems that rely on technology, rather than price, to allocate cars. Even if such a technological fix proves elusive, however, local governments do not need to regulate or ban surge pricing to reduce its sting.

Surge (or dynamic) pricing relies on frequent price adjustments to match supply and demand. Such systems are sometimes used to set motorway tolls (which rise and fall with demand in an effort to keep traffic flowing), or to adjust the price of energy in electricity markets. A lower-tech version is common after natural disasters, when shopkeepers raise the price of necessities like bottled water and batteries as supplies run low. People understandably detest such practices. It offends the sensibilities of non-economists that the same journey should cost different amounts from one

day or hour to the next—and more, invariably, when the need is most desperate.

Yet surge fares also demonstrate the elegance with which prices moderate a marketplace. When demand in an area spikes and the waiting time for a car rises, surge pricing kicks in; users requesting cars are informed that the fare will be a multiple of the normal rate. As the multiple rises, the market goes to work. Higher fares ration available cars by willingness to pay: to richer users, in some cases, but also to those less able to wait out the surge period or with fewer good alternatives. Charging extra to those without good alternatives sounds like gouging, yet without surge pricing such riders would be less likely to get a ride at all, since there would be no incentive for all the other people requesting cars to drop out. Surge pricing also boosts supply, at least locally. The extra money is shared with drivers, who therefore have an incentive to travel to areas with high demand to help relieve the crush.

A recent analysis published by Uber illustrates how the system is intended to work. Jonathan Hall, head of economic research at Uber, Cory Kendrick, a data scientist at the firm, and Chris Nosko, of the University of Chicago, compared two high-demand cases in New York city to illustrate how surge pricing is intended to work. In March 2015 it kicked in after a sold-out concert by Ariana Grande, a singer, in an arena in the middle of Manhattan. As the show came to an end, the number of people in the area opening the Uber app quadrupled in just a few minutes. Uber's algorithm swiftly applied surge pricing; the average waiting time for a car rose only modestly, while the "completion rate"—the share of requests for rides that are met—never fell below 100%. On New Year's Eve in 2014, in contrast, Uber's surge-pricing algorithm broke down for 26 minutes, leaving New York without surge pricing. The average wait time for a car soared from about two minutes to roughly eight, while the completion rate dropped below 25% (see chart).

The comparison may overstate the power of surge pricing. Even without the help of algorithms, cab drivers know to converge on a venue as an event finishes; more Uber drivers than normal were surely in the area at the end of Ms Grande's concert in expectation of the extra business. Yet the possibility of earning a surge fare may also strengthen drivers' incentives to anticipate and respond pre-emptively to high demand. Ironically, the better Uber's surge-pricing algorithm works, the less the company will need to use it, since drivers' pre-emptive responses will tend to eliminate the demand imbalances that make surge pricing necessary in the first place.

There are tantalising hints that Uber hopes to follow this logic to its conclusion. Mr Schneider noted that clever machine-learning tools could process Uber's piles of data and determine when and where demand is likely to outstrip the supply of cars. There would be no need to wait until demand starts to rise, nor for drivers to scan concert schedules. The ability to anticipate demand would be of some use to Uber today: it could tell drivers where they are likely to be needed. But they would presumably not respond as rapidly as they do to the inducement of surge fares. Eventually, however, Uber hopes to replace its human drivers with autonomous vehicles, which could be directed around the city by the company's computers without any pecuniary incentives. (The company still has an incentive to maximise earnings, though, so it might opt to keep surge pricing even if technology made it redundant, at the risk of further public rage.)

| *Apps and downs*

Whether Uber remains a big part of the transport network in future, and whether it retains surge pricing, depends in part on how well local governments manage the transport system as a whole. In districts or cities where travellers have appealing alternatives, in the form of good public transport or private competitors to Uber, users will be more sensitive to

price. Surge pricing will therefore not generate a big financial windfall for Uber (or its drivers). But where public transport is thin on the ground, or where Uber has little private competition, it is a different story. In other words, surge pricing is really only as painful as local officials allow it to be. ■



自由交流

车费大跳价

对出租车行业来说，提价也许不是平衡供求的唯一方法

很多人都很熟悉这样的情形：外出玩乐至深夜的你拿出智能手机，打算叫一辆优步（Uber）车回家，结果发现——见鬼，车费要比平常贵三倍。如同经济学家们所钟爱的很多事物一样，这种偶尔会让优步用户们饱受困扰的“高峰期定价”行之有效，却十分不受人待见。从消费者的角度讲，高峰期定价至少有些讨厌，但要在有急事时碰到就着实让人光火了。车费涨得太高往往会导致群情激愤。2013年，纽约在一场暴雪后陷入瘫痪，一段并不算长的路程，车费却要高达上百美元。包括萨尔曼·拉什迪（Salman Rushdie，译注：印度裔英国作家）在内的名人们通过社交媒体痛斥这种情况。有些城市的政府索性禁止此类涨价行为——德里已经于四月开始实行。

目前优步仍执行着高峰期定价，但该公司一位机器学习专家杰夫·施耐德（Jeff Schneider）近日表示，公司有兴趣研发依靠技术而非价格来调配车辆的系统。然而，即使技术手段未能奏效，当地政府也没必要为了缓解小小的痛痒，就管控或叫停高峰期定价。

高峰期（或动态）定价通过频繁的价格调整来维持供求平衡。这种机制有时会被用来设定高速路的过路费（随需求涨或跌，以保车流通畅），或在电力市场中调整电价。自然灾害发生后常会出现一种没有什么技术含量的高峰期定价——当瓶装水和电池这些必需品供应吃紧，商家便会提高价格。可想而知，人们痛恨这种做法。同样的车程，在不同的日子甚至不同的时段，费用就会有所差异，需求更为急迫的时候价格肯定还会更高。这严重伤害了经济学家之外人群的感情。

然而，高峰期价格也展示了价格是如何轻巧自如地稳定市场的。当一个地区内需求激增、等车时间延长时，高峰期定价便会介入——叫车的用户会被告知，车费将会是平常的若干倍。随着车费成倍增长，市场开始起效。

高额车费下会按照用户的支付意愿来调配空车：有时会分配给富有的用户，但也会分配给那些不能等高峰期结束，或没有多少其他更好选择的用户。向没有其他出行方式的人收取额外费用听着像在宰客，但要是没有高峰期定价，这些人就更难叫到车，因为其他叫车的人中不太会有人主动中途退出。另外，高峰期定价至少在局部地区刺激了供给。司机们能从多收取的车费中分得一杯羹，因而会有动力开往需求较高的区域以缓解用车压力。

优步最近发布的一项分析报告阐释了这种定价体系的运作机制。优步经济研究部门主管乔纳森·霍尔（Jonathan Hall）、优步数据科学家科里·肯德里克（Cory Kendrick）以及芝加哥大学的克里斯·诺斯科（Chris Nosko）对比了发生在纽约市区的两个高需求案例，来阐明高峰期定价如何运作。2015年3月，女歌手爱莉安娜·格兰德（Ariana Grande）在曼哈顿中部的一处场馆举办了一场爆满的演唱会，高峰期定价就起了作用。随着演出接近尾声，该地区打开优步应用的人数在短短几分钟内增长了四倍。优步的算法迅速启用了高峰期定价；平均等候时间只是稍有增加，而“成单率”——用车需求得到满足的比例——从未低于100%。与这个案例结果相反，2014年的跨年夜，优步的高峰期定价算法出现了26分钟的故障，致使纽约无法实行高峰期定价。结果平均等候时间从约两分钟猛增到近八分钟，成单率则降到了25%以下（见图表）。

这两个案例的对比可能夸大了高峰期定价的效力。即使没有算法的帮助，出租车司机们也知道在某项活动结束后聚集到主办地点附近等活。当然，格兰德的演唱会结束后，场外希望能多拉些活儿的优步司机肯定比平时要多。然而，在高额车费的激励下，司机们更有可能预判高需求并提早响应。讽刺的是，优步高峰期定价的算法运行得越好，优步就越没必要使用它：因为如果司机提早做出了反应，供需失衡有可能会消除，这样一来就没有实施高峰期定价的必要了。

可以从一些有趣的迹象看出，优步很想顺着这个逻辑推出自己的结论。施耐德提到，巧妙的机器学习工具可以处理优步的海量数据，判断何时、何地车辆会有可能供不应求——而无需等待需求开始攀升的那一刻，司机们

也不用去查演唱会日程表。对于今天的优步来说，对需求做出预判的能力还是有些用处的：它可以让司机知道哪里最有可能需要他们。但可以想见，这肯定不会像高峰期车费那样能迅速地促使司机们做出响应。然而优步希望的是有朝一日能用无人驾驶汽车替代真人司机，这样用不着金钱的激励，电脑就可操控车辆在城市中行驶。（但优步仍有追求最大收益的动力，所以即使技术上已毫无必要，优步还是可能会冒着继续触犯众怒的风险而选择保留高峰期定价。）

| 谁主沉浮

未来优步能否继续在交通网络中发挥重要作用，它是否会保留高峰期定价，一定程度上取决于当地政府对交通系统的整体管理水平。在某些地区或城市，乘客若有其他具有吸引力的出行选择，如良好的公共交通或私营的优步竞争者，用户对价格便会更为敏感。如此一来，高峰期定价并不会让优步（或优步司机们）大发横财。但在地面公共交通不发达，或几乎没有私营力量可与优步竞争的地方，情况就不一样了。换言之，高峰期定价让人头痛的程度，实际上完全取决于当地的官员们是否有所作为。 ■



Free exchange

Tales from Silicon wadi

Military insecurity can boost an economy, up to a point

STANDING amid the skyscrapers of Tel Aviv, looking west over the sun-warmed Mediterranean, one can almost forget how unlikely Israel's recent economic success has been. The country is a fortress: a tiny island of prosperity in a troubled region. Its neighbours are hostile; Syria, in the midst of a devastatingly bloody civil war, is a failed state. Israel itself is not only mired in conflict in the Palestinian territories, but riven by internal divisions between observant and secular Jews and between Jews and Arabs. International ire over the treatment of Palestinians leads to calls for boycotts of Israeli goods and divestment from Israeli companies. Yet over the past two decades, this small country, with a population of around 8m, has engineered an economic miracle (see left-hand chart). Israel is testimony to the advantages, and limitations, of fortress economies.

Since the 1990s Israel's economy has been on a tear; between 2004 and 2013 growth in real GDP averaged about 4% a year. Output per person is similar to that in Italy. A nimble tech sector deserves much of the credit. The joke among foreign investors once ran that the best way to make a small fortune in Israel was to begin with a large one. No longer. Relative to the size of the population, there are more researchers working in R&D in Israel than in any other country (see right-hand chart). Venture-capital investment per person is the highest in the world. Israeli startups have increasingly hit it big in recent years, as with Google's acquisition of Waze, which uses crowdsourced data to monitor traffic, for more than \$1 billion in 2013. Cyber-security now generates more export revenue than arms do. Officials from Asia visit to study the tech sector, in the hope of replicating its success.

Israel's experience follows a familiar script: that of the small, embattled country on the up and up. China's previously hopeless nationalists somehow built an economic powerhouse after they had been relegated to the island of Formosa (now Taiwan). Having been booted out of Malaysia, Singapore subsequently became far richer and more productive than its neighbour. In fact, there is good reason to believe that Israel's success stems at least in part from its geopolitical troubles.

Economic development requires a balance between individual freedom and the power of the state. The authorities must be able to collect taxes, for instance, and enforce property rights. External threats have often accelerated the development of the state. National defence is among the purest examples of a public good, and national survival provides a strong motivation to set up a strong state with the authority and legitimacy needed to ensure it. Historically, the expense of war has often prompted governments to improve their capacity to raise revenue. Britain first levied income tax during the Napoleonic wars; other countries instituted it during the arms race before the first world war.

External threats are hardly a sure-fire road to riches. Actual war is destructive. Torsten Persson, of Stockholm University, and Timothy Besley, of the London School of Economics, reckon the underlying institutional strength of the threatened country is crucial. Democracies respond better to external pressure; countries made rich by natural resources do worse. From its earliest days the state of Israel has been democratic (and short on resource wealth)—and has faced a near-constant existential crisis.

The strength and capacity of the Israeli state is most clearly visible in its armed forces, which are arguably the most important public institution in Israeli society. Most Jewish Israelis are conscripted into the military; about 100,000 new recruits, fresh out of secondary school, are drafted each year for a term of service of about two years. The most talented young people in

each cohort are assigned to technical units within the Israel Defence Forces (IDF), such as Unit 8200, a signals-intelligence force similar to America's National Security Agency. Those recruits, in turn, are able to hone their technical skills in the service.

Since the 1990s, when the government became more serious about commercialising the technologies being developed within the IDF, personal relationships built during military service have been critical to the growth of Israel's tech cluster. Friends from the service start firms together after getting out, invest in each others' ventures and provide technical and business advice. The personal networks nurtured by the IDF increase the return to staying in Israel for skilled engineers, helping the country retain talent that might otherwise go abroad. Like America's army and its tech sector, the IDF and Israel's startups have developed a symbiotic relationship; the IDF supplies talent and expertise to the private sector and is in turn a buyer of private firms' inventions.

| *The digital partition*

Yet it would be odd if fortress economies did not face constraints on their growth. The ingenuity and nimbleness of the Israeli tech sector does not extend to industries less closely linked to the work of the IDF: across the economy as a whole, Israel's productivity is among the lowest in the rich world. The paucity of trade with its neighbours is partly to blame. There is no difficulty in selling high-tech services to distant clients, but manufactured goods are another story. Another problem is a dearth of competition in the low-tech parts of the economy.

The underpinnings of the tech sector's success also limit the number of Israelis who are able to participate in it, and thus benefit from it directly. Ultra-orthodox and Arab Israelis do not have to serve in the army and study in segregated school systems, which are generally much worse than those other Israelis attend. These groups, unsurprisingly, are under-represented

in tech. As you pass from predominantly Jewish areas into Arab ones, let alone into the Palestinian territories, the quality of infrastructure deteriorates dramatically. Israeli tech firms that operate in the Palestinian territories keep their presence there quiet, lest investors, customers or activists object. Within walls, there is only ever so much room to grow. ■



自由交流

硅谷故事

军事形势不稳定可以刺激经济，但程度有限

站在特拉维夫的摩天大楼之间，西望阳光和煦的地中海，也许会让你几乎忘记以色列近年来的经济成就是多么的不可思议。这个国家简直是个堡垒——动乱地区中的一个繁荣小岛。邻国都充满敌意；叙利亚的内战极度血腥，国家已然失控。以色列自身不但深陷在巴勒斯坦地区的冲突，而且国内犹太教徒与非教徒之间、犹太人与阿拉伯人之间分歧严重。以色列对待巴勒斯坦人的方式备受国际社会指责，导致人们呼吁抵制以色列商品及从以色列公司撤资。但在过去20年里，这个约800万人口的小国却打造出了一个经济奇迹（见左图）。以色列展现了“堡垒经济体”的优势与局限。

从上世纪90年代开始，以色列的经济发展便势不可挡。2004至2013年间，实际GDP平均年增长率约为4%，而人均产出则与意大利相近。聪明敏锐的科技产业对此功劳不小。外国投资者之间曾流行一个笑话，说要想在以色列赚到一小笔钱，最好的方法是开始时就有一大笔钱。再不是这样了。以色列研发人员占人口的比例居世界首位（见右图），人均风险投资额也是全球最高。近年来，越来越多的以色列创业公司大获成功，比如利用众包数据监测交通情况的Waze，2013年被谷歌以超过10亿美元收购。目前，网络安全服务创造的出口收入比军火更高。亚洲各国官员纷纷到以色列取经，研究其科技业，希望复制其成功。

以色列的历程依循着一套熟悉的模式：腹背受敌的小地方，发展却蒸蒸日上。就像当年四面楚歌的国民党，退守台湾岛后却不知怎么就建立了强大的经济，而新加坡被踢出马来西亚后也变得远比邻国富有且高效。事实上，我们有充分的理由相信，以色列的成功至少部分源于其地缘政治纷争。

经济发展需要平衡个人自由与国家权力。比如，当局必须有权征税及实施产权管理。外部威胁往往加速了国家发展。国防是公共利益的最纯粹例子

之一，国家的求存之需让人们有动力建立强大的政府，并赋予其必要的权力及合法性来保证国家的生存。历史上看，战争的开支往往促使政府提高开源增收的能力。英国在拿破仑战争期间率先开征所得税；其他国家则在第一次世界大战前的军备竞赛时设立这一税项。

外部威胁绝非万无一失的致富之路。实际的战争是破坏性的。斯德哥尔摩大学的托斯顿·帕桑（Torsten Persson）和伦敦经济学院的蒂莫西·贝斯利（Timothy Besley）认为，受威胁国家的基础体制实力是关键。在外部压力下，民主国家的应对能力更强，而靠自然资源致富的国家则表现较差。以色列自建国之初便是民主政权（自然资源稀缺），而且几乎时刻面临着生存危机。

以色列的军队也许是该国最重要的公共建制，最能显现以色列的实力及能力。大部分犹太裔以色列国民会服兵役，每年国家会从高中毕业生中征召约10万新兵，服役两年左右。每个部队中最具才华的年轻人会被派到以色列国防军（IDF）的技术部门，例如类似美国国家信号情报部门“8200部队”。这些士兵继而可在服役期间中磨练并提升技术能力。

自上世纪90年代起，以色列政府开始更认真地把IDF开发的技术商业化，而兵役期间建立的人际关系则成为以色列高科技集群增长的关键。服役时的战友在退役后会合伙创业，互相投资各自的创业公司，并提供技术及商业建议。IDF造就的人脉网令熟练工程师留在以色列的回报提高，有助该国留住本来可能流失海外的人才。与美军和美国科技业一样，IDF和以色列的创业公司已发展出一种共生关系；IDF向私营部门提供人才和专业知识，反过来又购买私营企业创造的产品。

| 数字隔墙

但若说堡垒经济体的增长没有局限因素，那就太奇怪了。以色列科技业的巧思与聪敏并未扩展至与IDF关联不那么紧密的行业：就整体经济而言，以色列的生产率是富裕国家中最低的。这部分归咎于缺乏与邻国的贸易往来。向远方的客户销售高科技服务不成问题，但销售制成品则是另一回事。还有一个问题是其低技术含量的经济部门缺乏竞争。

以色列科技行业的成功基础也限制了可参与其中并直接获益的国民数量。极端正统犹太教徒及阿拉伯裔以色列人无须服兵役，其就读的隔离学校体系一般也比其他以色列人的学校差得多。这些群体无疑较少进入高科技业。当你从犹太人为主的地区进入阿拉伯人聚居的地区（更别说巴勒斯坦地区）时，所见到的基建设施质量下滑严重。在巴勒斯坦地区运营的以色列科技公司行事低调，以免招惹投资者、客户或激进分子反对。在围墙之内，增长空间也就只有这么多了。 ■



Cancer treatment

On target

The personalisation of cancer treatments is leading to better outcomes for patients. It will also pave the way to cures

“CURE” is not a word much used by oncologists. The best they normally talk of is “remission”. But the past five years have begun to change that. More than 70 new drugs have come to market, and describing the consequences of some of them as revolutionary is not hyperbole—at least for those patients lucky enough to respond positively to them. Being given a diagnosis of advanced melanoma, for example, was once tantamount to being handed a death warrant. Median life expectancy after such news was six to nine months. But recently developed “immuno-oncology” drugs, which co-opt the immune system to fight tumours, are so effective that, in around a fifth of cases, there is talk among experts that the patients involved have actually been cured.

This sort of upbeat news is reinvigorating the study of cancer. At this year’s meeting of the American Society of Clinical Oncology (ASCO), held in early June in Chicago, doctors had a spring in their step. Not only do they have new drugs to deploy, they are also developing better ways of using existing ones. They are getting better at diagnosis, too, finding methods to study the weak spots of cancers in parts of the body conventional biopsies cannot reach, and also to pin down tumours that were previously unlocatable. The upshot is that they are beginning to be able to tailor treatments to the needs of individual patients, an approach called personalised medicine.

These days cancer is seen less as a disease of specific organs, and more as one of molecular mechanisms caused by the mutation of specific genes. The implication of this change of viewpoint is that the best treatment for, say, colorectal cancer may turn out to be something already approved for

use against tumours in an entirely different part of the body, such as the breast (pictured above, in a magnetic-resonance-imaging, or MRI, scan; the tumour is in the right-hand breast, from the reader's point of view). One study presented at ASCO found that 29 of 129 patients responded to drugs that had originally been approved for use on cancers found in parts of the body different from where those patients' own tumours were. Therapies designed for breast and gastric cancers involving a gene called *HER2* were particularly useful. These *HER2* drugs act on a growth-promoting protein that is overproduced in *HER2*-positive tumours. Seven of 20 patients with colorectal cancer, three of eight with bladder cancer and three of six with bile-duct cancer responded well to these drugs.

| *Metaphysicians*

Another study, a “meta-analysis” of almost 350 early-stage drug trials which gathered the results of these small experiments together in a statistically meaningful way, tried to work out how much benefit there was in matching the molecular characteristics of the tumour of a patient with his treatment. Such matching proved worthwhile. Using it caused tumours to shrink by an average of 31%. Established treatments without such matching resulted in an average shrinkage of only 5%.

Work published in the *New England Journal of Medicine*, to coincide with the ASCO meeting, also showed the value of the molecular approach. Elli Papaemmanuil of Memorial Sloan Kettering Cancer Centre in New York, and her colleagues, have produced a molecular classification of acute myeloid leukaemia. They have divided this disease into 11 classes, each with distinct diagnostic features and clinical outcomes, based on which mutated genes seem to be driving the cancer's development. While this work has not yet led to better treatments, it seems almost bound to in the future.

ASCO itself sees so much value in the personalised, molecular approach to

diagnosis and treatment that, despite its being a professional body for doctors rather than a research organisation in its own right, it has decided to run a clinical trial (its first ever) to look at this approach's potential. TAPUR, as the trial is called, will offer patients a genetic test and then select drugs that look to be good matches, but which are not approved for the specific cancer a patient is suffering from.

The National Cancer Institute, an American government agency, is trying something similar with a trial it calls MATCH. This involves sending tumour biopsies to gene-testing laboratories that then scan them for more than 4,000 possible variants of 143 pertinent genes. Indeed, personalised treatment is becoming so fashionable that even America's vice-president has got involved. On June 6th Joe Biden announced a project intended to set up a way of sharing genomic and clinical data between cancer researchers, in order to help advance the field.

Taking biopsies such as those that form part of the MATCH trial is a routine part of cancer therapy. It, too, though, is ripe for improvement. Some tissues (blood, lymph and skin, for example) are easy to get at, but many tumours are deep in the body, or in vital organs, or both. Sampling these is invasive and potentially dangerous. Researchers have therefore wondered for a long time whether something as simple as a blood test might replace such a biopsy. This hope is based on the knowledge that tumours shed pieces of genetic material, known as circulating tumour DNA (ctDNA), into the bloodstream.

Until recently scientific instruments have not been sensitive enough to detect ctDNA routinely and reliably. That is now changing. "Liquid biopsies", which will not only diagnose hard-to-get-at solid tumours but also monitor the progress of their treatment, are on the verge of reality. At the ASCO meeting researchers sponsored by Guardant Health, a diagnostics company, announced the results of one of the largest liquid-biopsy studies

so far.

| *Liquid asset*

This study looked for the ctDNA of six relevant genes in 15,000 patients suffering from one of 50 types of tumour. The test was not perfect. Only 83% of patients had sufficient ctDNA for it to show up. But in those cases where ctDNA was detected the mutations indicated were also present in conventional biopsies between 94% and 100% of the time. The test, in other words, is reliable. Moreover, in almost two-thirds of the cases where ctDNA was detected, the results led to suggestions about how the patients involved should be treated.

If liquid biopsy can be made routine, the clinical consequences will be vast. Conventional biopsies can be both costly and slow to process. Also, the heterogeneity of many tumours, caused by progressive mutation over the course of time, is hard to sample by nipping out one bit of the tumour. If ctDNA is shed by all parts of a tumour, though, a liquid biopsy will be able to capture these differences. It will, as well, be able to follow them as they progress because, unlike conventional biopsy, it can be done frequently without harming the patient. That is important. What constitutes the best treatment can change as the tumour itself changes.

Many researchers therefore feel it is only a matter of time before liquid biopsies become a standard part of therapy. They are already coming to market. Foundation Medicine, of Cambridge, Massachusetts, launched a commercial liquid biopsy in May. Qiagen, a German firm, followed suit on June 1st. Genomic Health, of Redwood City, California, says it will offer a test later this year. And Myriad Genetics, based in Salt Lake City, is also developing such tests.

Such is the excitement over liquid biopsies that some wonder if they might be used to catch cancers even before symptoms are apparent. The earlier a

tumour is spotted, the easier it is to cure. The biggest maker of DNA-sequencing machines, Illumina, based in San Diego, has said that it will form an offshoot, Grail, to develop just such a test. The proposed test will use “ultra-deep sequencing”, a technique that reads the DNA in a sample tens of thousands of times over, in order to pick up rare signals such as that from ctDNA.

Yet one of the flaws of ctDNA is that it does not reveal where in the body a cancer is. Some argue that MRI is now sophisticated enough to screen individuals for the presence of most cancers. The Health Nucleus, a firm based in San Diego, is offering full-body scans using it for just this purpose. David Karow, a clinical radiologist who works both there and at the nearby San Diego campus of the University of California, is optimistic about the potential of the technique for wider use. He has been part of a study published in *Clinical Cancer Research* which suggests that a souped-up form of MRI might become the standard method for prostate-cancer screening. His research indicates that such MRI can differentiate between benign and malignant growths, and can distinguish among the latter between those that just need to be monitored, and the “aggressive” ones that need to be treated.

Personalised cancer treatment, long talked of, is thus now becoming real. By detecting problems earlier and getting therapies right first time, it will save lives that might otherwise be lost. Better knowledge of the underlying processes of cancer, meanwhile, will extend the range of lives that medicine can aspire to save. There is still a long way to go. But gradually and inexorably the appeals court of oncology is tearing up cancer’s death warrants. ■



癌症治疗

直指目标

癌症的个性化治疗为病人带来了更好的结果，也将为治愈癌症铺平道路

“治愈”不是一个肿瘤学家们常用的词，通常他们最乐观的说法就是“缓解”。不过这种情况在过去的五年中已经开始改变。目前已有七十多种新药上市，说其中一些药的效果堪称革命性完全不是夸张——至少对那些对药物有积极反应的幸运患者来说是这样。举个例子，被确诊晚期黑色素瘤曾经相当于被判了死刑——此时病人预期寿命的中值仅为六到九个月。但是新近研发的免疫肿瘤药物可让人体自身的免疫系统对抗肿瘤，其效果好到在约五分之一的病例中，专家们会谈论说患者真的痊愈了。

这类振奋人心的消息给癌症研究注入了新的活力。美国临床肿瘤协会（ASCO）年会六月初在芝加哥举行，与会医生们个个步伐轻快。他们不仅有新药可用，还在改进使用现有药物的方法。癌症诊断的水平也在提高——传统的活组织检查难以触及身体某些部位的癌症，但医生们找到了研究这类癌症“弱点”的方法。对于之前难以确定位置的肿瘤，医生们也找到了定位手段。目前的成果是，专家们开始能够根据患者个人的需要为其量身定制治疗方案，这种手段被称为个性化治疗。

如今人们更倾向于认为癌症是特定基因发生突变而引发的一种分子机制，而不是特定脏器发生的病变。这种观点的改变意味着，也许最后我们会发现，对某种癌症（如结肠癌）的最佳治疗方法其实早已获批用于一个完全不同部位的肿瘤，比如乳腺（见上图的核磁共振成像（MRI）；从读者角度看肿瘤位于右乳）。ASCO年会上报告的一项研究发现，所使用药物对129名患者中的29名起效，而这些药物原本针对的患癌部位与患者所患并不相同。基于HER2（人类表皮生长因子受体-2）基因设计的乳腺癌与胃癌疗法尤其有效。HER2阳性肿瘤会过度产生一种可促进生长的蛋白质，而HER2药物即是对这种蛋白质起效。20位结直肠癌患者中的7位、8位膀胱癌患者中的3位以及6位胆管癌患者中的3位都对这些药物反应良好。

另一项研究对大约350例药物试验的初期阶段进行了“荟萃分析”（meta分析），将这些小型试验的结果以具有统计意义的方式收集起来，探寻让治疗方法与患者的肿瘤分子特征相匹配效果如何。事实证明这种匹配值得去做。使用这种方法时肿瘤平均缩小了31%，而未加匹配的现有治疗方案只能使肿瘤平均缩小5%。

发表在《新英格兰医学杂志》上的研究成果也印证了ASCO会议上的报告，同样展示了分子方法的价值。纽约纪念斯隆-凯特琳癌症中心（Memorial Sloan Kettering Cancer Centre）的艾丽·帕潘曼努伊尔（Elli Papaemmanuil）和她的同事们对急性髓细胞白血病（AML）进行了分子分类。根据促进癌症发展的突变基因类型，他们将这种疾病分为11类，每一类都有独特的诊断指征和临床表现。虽然目前这项研究尚未得出更好的治疗方法，但看起来几乎指日可待。

ASCO也十分看重借助分子手段的个性化诊治方案。虽然它属于医生的专业团体而非独立的研究机构，但仍（史无前例地）决定开展一项临床试验，以检验这一方法的潜力。这项名为“TAPUR”的试验会为患者进行基因检测，之后挑选可能与之匹配的药物，但这些药物本身并未批准用于患者所患的那种癌症。

美国政府机构国家癌症研究所（National Cancer Institute）也在进行一个其称为“MATCH”的类似试验。这项试验中，肿瘤的活检取样被送到基因检测实验室，对143个相关基因的4000多种可能的变异进行扫描。个性化治疗确乎已成为一个流行事物，连美国副总统都参与了进来。6月6日，约瑟夫·拜登宣布启动一项计划，旨在实现癌症研究机构之间基因和临床数据共享，进而促进该领域的发展。

MATCH试验所采用的活检取样是癌症治疗的常规手段，但现在活检也到了该改进的时候。血液、淋巴和皮肤这样的组织容易取得，但很多肿瘤都位于身体“深处”或在重要脏器上，或两者兼有。对这些肿瘤取样需侵入体内因而具有潜在风险。因此很长时间以来，研究人员都在思考能否用如血

检一样简便的方法来替代活检。这种愿望的根据是，肿瘤会将遗传物质，即循环肿瘤DNA（ctDNA）释放到血液中。

眼下科学仪器还不够灵敏，难以使ctDNA检测成为常规而可靠的检测方法。这种状况如今有所改变了。“液态活检”即将变成现实——它不仅能可诊断难以触及的实体瘤，还可以监测其治疗进程。在ASCO年会上，由癌症诊断公司Guardant Health赞助的研究人员发布了目前最大规模液态活检的一次研究结果。

| “流动”资产

这项研究在15000位身患50种肿瘤之一的病人中寻找6个相关基因的ctDNA。研究结果不算完美，只在83%的病人血液中检测到足够的ctDNA。但在这些病例中，用ctDNA检测到的基因突变与传统活检结果的一致率达到了94%到100%。换言之，这种检测手段是可靠的。另外，检测出ctDNA的病例中，有三分之二的检测结果能够为如何治疗参与的病人提出建议。

如果能使液体活检成为常规检查方法，将会有重大的临床意义。传统活检花费高昂，处理过程也很漫长。随着时间的推移而发生的渐进突变也会让许多肿瘤出现异质性，而通过夹取一点点肿瘤组织来取样就很难判别。但如果肿瘤的各个部分都释放了ctDNA，液体活检就能够捕捉到这些不同。此外，液体活检还能追踪肿瘤的变化，因为和传统活检不同，液体活检可以多次进行且不会对病人造成伤害，这一点十分重要。如此一来，最佳治疗方案就可随着肿瘤的变化而相应调整。

很多研究者因此认为，液体活检成为治疗中的标准步骤只是时间问题。目前液体活检已进入市场。马萨诸塞州剑桥市的Foudation Medicine公司于5月推出了商业液体活检，德国公司Qiagen则于6月1日跟进。加州红木城（Redwood City）的Genomic Health公司也表示今年稍后会提供这一检测。本部位于盐湖城的万基遗传（Myriad Genetics）也在开发类似的检测。

液体活检让人振奋不已，这让一些人猜想液体活检能否在症状还未出现时就捕捉到癌症：毕竟肿瘤发现得越早，就越容易治愈。总部位于圣迭戈的Illumina是DNA测序仪最大的生产商，它声称将成立一家新公司Grail来开发这样的测试。该测试会采用“超深度测序”，这种技术能读取一个样本上的DNA达数万次，以捕捉例如来自ctDNA的罕见信号。

但ctDNA的一个不足是它无法揭示癌症位于身体何处。一些人提出，核磁共振成像（MRI）现在已足够精密，可为个人筛查出绝大多数种癌症。总部在圣迭戈的Health Nucleus就利用MRI进行全身扫描以筛查癌症。供职于该机构和附近加州大学圣迭戈分校的临床放射学家大卫·克洛（David Karow）对MRI的前景很乐观，他认为这个技术会有更广泛的应用。他参与的一项相关研究发表在《临床癌症研究》（Clinical Cancer Research）上，指出MRI增强扫描或许可以成为前列腺癌筛查的标准方法。他的研究表明，这种MRI扫描能够区分良性与恶性赘生物，对于后者还能区别仅需监控的赘生物和需采取治疗的“侵略性”赘生物。

人们对个性化癌症治疗的谈论越来越近，如今终于要变成现实了。通过更早地检测问题并在一开始即给予正确的治疗，就能拯救许多原本会失去的生命。同时，通过更好地理解癌症背后的发展过程，医学所能期望挽救生命的患者范围也将扩大。今后要走的路还很长，然而肿瘤学的上诉法庭正不可阻挡地一点一点将癌症的死刑判决书撕碎。 ■



The sociology of science

In death, there is life

Big-name scientists may end up stifling progress in their fields

MAX PLANCK, the inventor of quantum theory, once said that science advances one funeral at a time. He meant—or, at least, is presumed to have meant—that the death of a dominant mind in a field liberates others with different points of view to make their cases more freely, without treading on the toes of established authority. It might also rearrange patterns of funding, for they, too, often reflect established hierarchies.

But was Planck right? For almost a decade Pierre Azoulay of the Massachusetts Institute of Technology has been trying to find out. His conclusion, reported in a working paper by the National Bureau of Economic Research, is a qualified “yes”.

Dr Azoulay first published on the subject in 2010 in the *Quarterly Journal of Economics*. On that occasion he came to an apparently different conclusion. This was that the death of a star resulted in a marked slowing of the published output of the star’s collaborators, a phenomenon which sometimes lasted for decades. But subsequent conversations led him to suspect this was not the whole story. Some scientists he spoke to agreed that the *Quarterly Journal* paper captured their experience. Others, though, dissented. These latter claimed that a star’s dominance often sucked the intellectual oxygen from a field, and that his or her demise let it back in.

With the assistance of two others, Christian Fons-Rosen of the Pompeu Fabra University in Barcelona and Joshua Graff Zivin of the University of California, San Diego, Dr Azoulay decided to dig deeper. The trio focused on biology, America and the period between 1975 and 2003. They mined online databases to extract the publication records of biologists working in

different fields before and after the deaths of stars in those fields. Crucially, their data included both people who had collaborated with the star, and people who had not.

The three researchers' definition of scientific stardom rested on such criteria as patents held, funding received and publications widely cited. Among those stars they identified, 452 also had in common the fact that they had died early—meaning, in this context, before they could retire or leave active research to take up administrative roles. They were, in other words, at their intellectual peaks.

Gratifyingly for Dr Azoulay, he and his colleagues confirmed his earlier finding. A star's collaborators did indeed produce fewer articles after that star's death—as many as 40% less a year, on average. But they also found a contrary effect. This was that publications by researchers who had not collaborated with the star (and who were indeed sometimes working in entirely different fields at the time of the “extinction event”) increased by 8% a year. Within five years of a star's death, the increase in non-collaborators' articles had fully compensated for the drop-off in those of the collaborators.

That the loss of his mentor would harm an acolyte's career makes perfect sense. Why outsiders should benefit, though, is less clear. Dr Azoulay found that few of the stars in his sample sat on committees that distributed funds or edited journals, so explicit favouritism does not seem to be the answer. Perhaps the explanation does indeed lie in that woolly but evocative phrase, “intellectual oxygen”. A star's death gives outsiders room to breathe.

Morbid though the thought is, Dr Azoulay's hypothesis has the scientific virtue of generating testable predictions. Among the influential scientists who have died prematurely in the past two years are David Flockhart, who helped create the field of personalised medicine; Yoshiki Sasai, a

prominent stem-cell biologist; and Allison Doupe, a neurobiologist who studied birdsong as a model for human language. It will be interesting to see how the careers of others in these fields now evolve. ■



科学社会学

死中有生

声名显赫的科学家可能最终扼杀他们所在领域的发展

量子理论之父马克斯·普朗克（Max Planck）曾说过，科学每经过一次葬礼就前进一步。他的意思是，或者至少他的本意应该是，某个领域重量级人物的死亡会解放持不同观点的人，他们可以更加自由地阐述观点，而不会触犯公认的权威。这可能还会重新调整资金分配的方式，因为这些通常也反映出已确立的等级。

但是普朗克对吗？麻省理工学院的皮埃尔·阿祖雷（Pierre Azoulay）花费了近十年时间一探究竟。他的结论发表在美国国家经济研究局（the National Bureau of Economic Research）的一份工作报告中，答案是这在一定程度上是对的。

2010年阿祖雷博士在《经济学季刊》（Quarterly Journal of Economics）上首次就这一主题发表了文章。当时他得出的结论明显不同。因为大师的逝去导致其合作者发表的成果明显减缓，这一现象有时会持续数十年。但是后续的对话让他怀疑这并不能反映事实的全貌。他采访的一些科学家表示赞同，认为《季刊》论文正体现了他们的经历。但也有人不同意。他们认为一位大师的主导地位常常会吸走这一领域的学术氧气，而他或她的死亡让氧气得以恢复。

在巴塞罗那庞培法布拉大学（Pompeu Fabra University）的克里斯蒂安·冯罗森（Christian Fons-Rosen）和加州大学圣地亚哥分校的约书亚·格拉夫·兹文（Joshua Graff Zivin）的协助下，阿祖雷博士决定深挖这一主题。他们三人着重考察了1975年至2003年间生物学在美国的发展情况。他们研究了网上数据库，摘取了不同领域的生物学家在各自领域的大师陨落前后的发表记录。关键在于，他们的数据既包括和大师合作过的人，也包括没有与之合作过的人。

这三位研究者通过如所持专利、所获得的资助以及被广泛引用的出版物等来定义大师。在他们选定的大师中，有452位还有一个共同点——英年早逝，也就是说，在他们退休或者离开研究领域从事管理工作之前就去世了。换句话说，他们正处于才智的巅峰。

令阿祖雷博士欣慰的是，他和同事们肯定了自己之前的发现。在大师逝世之后，其合作者发表的文章确实减少了，一年平均减少了40%。但是他们也发现了一个相反的效应。未曾与大师合作过的研究者（以及在“大师去世”发生时确有时在完全不同的领域从事研究的人）发表的文章一年增加了8%。大师陨落五年内，非合作者发表文章的增长量已经完全抵消了合作者发表量的减少。

失去导师会损害助手的事业，这顺理成章。不过圈外人为何会得益，原因还不甚清晰。阿祖雷博士发现他的取样中几乎没有大师位列基金分配或期刊编辑的委员会，因此明显偏袒似乎不是原因。或许答案真的存在于那个模糊但耐人寻味的名词中——“学术氧气”。大师的陨落给了外人呼吸的空间。

尽管这一想法让人毛骨悚然，但阿祖雷博士的假设有一个科学上的优点——能够做出可被检验的预言。过去两年中，英年早逝的有影响力的科学家包括参与创建了个性化医疗领域的大卫·弗洛克哈特（David Flockhart）、声名卓著的干细胞生物学家笹井芳树（Yoshiki Sasai）以及将鸟鸣作为人类语言模型研究的神经生物学家艾莉森·杜碧（Allison Doupe）。这些领域其他人的事业现在将如何发展，让我们拭目以待。■



Dawn of the oil industry

Guts, greed and gushers

ExxonMobil and Royal Dutch Shell dominate world oil. A century ago, they were born fighting each other

JUST over 100 years ago Standard Oil, from which both Exxon and Mobil sprang, was the undisputed leader of the global oil industry. American trustbusters were soon hot on the heels of its competition-killing owner, John D. Rockefeller. So too was a scrappy Anglo-Dutch company, the product of a merger of Shell Oil with Royal Dutch in 1907, which had defied fearsome odds to muscle onto Standard's home turf in America.

That amalgamation had been the work of two men: Marcus Samuel, a brilliant Jewish merchant who built the Shell Transportation and Trading Company from his father's business selling seashells in Houndsditch, East London, and Henri Deterding, a Dutch wheeler-dealer who built Royal Dutch from unpromising beginnings in the swamps of Sumatra into an Asian powerhouse. These two egos, for years bitter rivals, eventually joined forces to confront a "hammerlock on the planet's oil market". Their story, though not new, is grippingly retold in "Breaking Rockefeller".

Rockefeller's life is vivid enough, though he is more of a presence snaking menacingly through the book than a central character. From his grand Manhattan office on 26 Broadway, the fastidiously punctual former book-keeper, with an eye permanently on the ledger, launched a "cut-to-kill" strategy whenever competition threatened his stranglehold on the kerosene industry. He would slash prices in one district to snuff out rivals, and raise them elsewhere to recoup his profits. Such was his dominance of global petroleum that he could do this with impunity throughout America, Europe and Asia.

The guts, greed and gusto of this cast of characters are what gives the book its vigour. The colourful backwaters where they waged their counter-offensives, from London's East End, to Baku in the Caspian, to Spindletop, Texas, add historical flavour. Peter Doran, a Washington-based scholar on European affairs, admits he has borrowed heavily from such books as "The Prize" by Daniel Yergin to tell his story. Samuel ordered almost all of his papers to be burned when he died, so some of the lively personality traits found here may be more the result of imaginative storytelling than documentary rigour.

But the book is timely in an era when America's shale revolution has upset the OPEC cartel's efforts to control the world's oil markets, and eastern Europe struggles to free its gas markets from dependence on Russia's Gazprom. It is a vivid reminder of the dangers of monopolies, and of the merits of no-holds barred competition and technological upheaval.

Samuel's great coup was to commission the first modern oil tanker, which enabled him to ship hydrocarbons through the Suez Canal. Thus he could undercut Rockefeller in the Far East with cheap Russian fuel. Royal Dutch's triumph came from applying new geological methods to find gushers of crude in the Dutch colonies of the East Indies, enabling it to fight Shell in Asia.

Their tie-up, arranged by another intriguing Londoner, Fred "Shady" Lane, followed the Russian revolution of 1905, which knocked out Shell's Caspian production and almost broke the company. But the timing proved superb. Instead of fighting each other, jointly they became a match for Standard. Its empire was under attack from Ida Tarbell, an American investigative journalist whose father had been ruined by Rockefeller. Her 19-part series starting in 1902 revealed Standard's secret contracts, kickback schemes, Rockefeller's "unholy alliance" between oil refiners and producers, and the extent of its monopoly.

Within a decade, the Supreme Court had ordered Standard Oil to be dismantled, though the bits into which it was broken were so valuable that “in the span of a few months at the end of 1911, Rockefeller went from being a very rich man to a fabulously wealthy one,” Mr Doran writes. His end, as a cheeky old man playing golf and seducing girls in the back seat of his car in Florida, is described with humour.

So is the retirement of Samuel, or Viscount Bearsted as he became, who helped persuade Winston Churchill to commission oil-burning dreadnoughts just before the first world war. Having climbed the social ladder as a Jew in Victorian England was a source of lifelong pride: “You can’t think what pleasure it gives me to put ‘The Honourable’ on my children’s envelopes,” he said after being made a peer.

The book acknowledges that Royal Dutch Shell could not have toppled Standard Oil alone. “The trustbusters weakened Rockefeller’s monopoly. Free marketeers like Deterding [and Samuel] provided a competitive alternative to it.” Thanks to the competition that they engendered, the oil industry has become more vigorous ever since. The author does not dwell on the challenges to oil’s supremacy that have arisen lately as a result of climate change. But if Royal Dutch Shell’s challenge to Standard Oil is any lesson, companies that develop alternative forms of energy will only become true challengers to Big Oil with guts, greed and better technology. They are not quite there yet. ■



石油业的黎明

胆量、贪婪与喷油井

埃克森美孚和荷兰皇家壳牌主导着世界石油市场，百年前它们就注定相争

在一百多年前，标准石油公司（Standard Oil），即埃克森（Exxon）和美孚（Mobil）的前身，是全球石油行业无可争议的领导者。不久美国的反托拉斯人士就盯上了该公司的所有者、扼杀竞争的约翰·洛克菲勒。同样盯住他的还有一家好斗的英荷公司，这家公司是1907年壳牌石油（Shell Oil）和荷兰皇家（Royal Dutch）合并的产物，它面对可怜的胜算毫无惧色，决心在标准石油的美国老家与它角斗一番。

这一合并是二人之功：才华横溢的犹太商人马库斯·塞缪尔（Marcus Samuel）和精明狡猾的荷兰商人亨利·德特丁（Henri Deterding）。前者将其父在东伦敦宏兹迪池区（Houndsditch）卖贝壳的生意发展成了壳牌交通和贸易公司（Shell Transportation and Trading Company），后者则把荷兰皇家从苏门达腊沼泽地中了无前途的生意做成了亚洲一霸。二人均自视甚高，缠斗多年，最终选择联手抵御“这一星球石油市场上的绝对领袖”。他们的故事虽不新鲜，但在《打败洛克菲勒》中再度娓娓道来，依然引人入胜。

洛克菲勒的一生可谓辉煌，但在本书中他不是核心人物，而更像一个阴暗危险的存在。在位于曼哈顿百老汇大街26号的豪华办公室里，这位一丝不苟守时的前簿记员，时时刻刻盯着账本。一旦有竞争威胁到他对煤油行业的掌控，他便实施“降价碾压”战略。他会在一个地区大幅降价以扼杀对手，同时在其他地区涨价以弥补利润。他已全面统治全球石油市场，以至于在美国、欧洲和亚洲都能这样恣意妄为。

正是这群人物的胆识、贪婪与激情让这本书热血沸腾。从伦敦东区到里海的巴库（Baku），再到得克萨斯州的斯平德尔托普（Spindletop），他们发动反攻的地方偏僻隐蔽，形形色色，更增添了历史风情。彼得·杜兰（Peter Doran）是华盛顿一位欧洲事务方面的学者，他承认叙事时大量

借用了其他作品，如丹尼尔·耶金（Daniel Yergin）所著的《石油·金钱·权力》（The Prize）。塞缪尔曾下令在他死后烧毁他几乎所有的文件，因此书中所见的一些生动鲜明的人物特点与其说是精确纪实，不如说是虚构的故事。

但是本书的面世恰逢其时——美国页岩油革命扰乱了卡特尔欧佩克控制全球石油市场的企图，东欧正努力让其天然气市场摆脱对俄罗斯天然气工业股份公司（Gazprom）的依赖。本书生动地提醒世人垄断企业的危险，以及无约束自由竞争和技术剧变的价值。

塞缪尔的漂亮一击是造出了第一艘现代油轮，使其能够通过苏伊士运河运送石油，从而将便宜的俄罗斯石油以低于洛克菲勒的价格卖到远东地区。荷兰皇家的胜利则源自利用新的地质学方法，在东印度群岛的荷兰殖民地找到原油喷油井，让它能够在亚洲同壳牌相争。

1905年的俄国革命摧毁了壳牌在里海的石油生产，几乎使之破产。此后，另一位耐人寻味的伦敦人弗雷德·“阴森”·莱恩（Fred “Shady” Lane）促成了两家公司的联姻。但其时机堪称绝妙。两家公司从此不再鹬蚌相争，而是联起手来，可与标准石油一较高下。当时标准石油帝国正受到美国调查记者艾达·塔贝尔（Ida Tarbell）的攻击，她的父亲因洛克菲勒而破产。她始于1902年的19篇系列报道揭露了标准石油的秘密合同、回扣体系、洛克菲勒与炼油厂商和生产商结成的“邪恶联盟”，以及公司垄断的程度。

不出十年，美国最高法院要求拆分标准石油，尽管拆分后的部分非常值钱，以至于“1911年末的那几个月，洛克菲勒从一个非常富有的人变成了一个超级富有的人。”杜兰写道。作者以诙谐笔调描绘出他的结局：一个嬉皮笑脸的老爷子，在佛罗里达打打高尔夫，并在汽车后座上勾引女孩子。

塞缪尔——或那个新获封的“贝尔斯泰德子爵”——退休时也是一样。就在第一次世界大战之前，他劝说丘吉尔将烧油的无畏战舰纳入军中。作为英国维多利亚时期的犹太人，能爬上社会阶梯顶端是一辈子的骄傲：“你想

都想不到能在孩子们的信封上加上‘尊贵的’让我有多开心。”他在获封之后如是说。

本书承认荷兰皇家壳牌无法单枪匹马战胜标准石油。“反托拉斯人士削弱了洛克菲勒的垄断地位。德特丁（和塞缪尔）这样的自由市场人士提供了有竞争力的其他选择。”多亏了它们带来的竞争，石油行业才从此变得更有活力。作者并未细述近来因气候变化而引发的对石油统治地位的挑战。但是如果说荷兰皇家壳牌对标准石油的挑战给我们什么经验的话，那就是研发新型替代能源的公司只有在拥有胆量、贪婪和更好的技术时，才能成为石油巨头的真正挑战。现在它们的火候还未到。■



Schumpeter

Keeping it under your hat

An old management idea gets a new lease of life

APPLE and Tesla are two of the world's most talked-about companies. They are also two of the most vertically integrated. Apple not only writes much of its own software, but designs its own chips and runs its own shops. Tesla makes 80% of its electric cars and sells them directly to its customers. It is also constructing a network of service stations and building the world's biggest battery factory, in the Nevada desert.

A century ago this sort of vertical integration was the rule: companies integrated “backwards”, by buying sources for raw materials and suppliers, and “forwards”, by buying distributors. Standard Oil owned delivery wagons and refineries in addition to oil wells. Carnegie owned iron-ore deposits and rail carriages as well as blast furnaces. In his 1926 book “Today and Tomorrow” Henry Ford wrote that vertical integration was the key to his success: “If you want it done right, do it yourself.” He claimed he could extract ore in Minnesota from his own mines, ship it to his River Rouge facility in Detroit and have it sitting as a Model T in a Chicago driveway—in no more than 84 hours.

Today this sort of bundling is rare: for the past 30 years firms have been focusing on their core business and contracting out everything else to specialists. Steelmakers sold their mining operations and carmakers spun off their parts suppliers. Controlling it all made sense, the argument went, when markets were rudimentary: when supplies of vital materials were limited or contractors could cheat you. As markets became more sophisticated these justifications fell away. Thanks to globalisation, companies could always find new resources and better suppliers.

Yet a growing number of companies are having second thoughts. This is most visible in information technology. The industry's leaders were at the heart of the contracting-out revolution. Vertically integrated companies such as IBM outsourced as much as possible in order to lower costs. Upstarts such as Microsoft prospered by focusing on a narrow—but exceptionally valuable—slice of the pie: the operating system of personal computers. Now many startups in Silicon Valley pride themselves for being “full stack”. But re-bundling can be found everywhere, from fashion to manufacturing.

Reasons for the reversal abound, but five stand out. The most important is simplicity. Consumers are willing to pay a premium for well-integrated products that do not force them to deal with different suppliers or land them with components that do not talk to each other. They want to be able simply to press a button and let the machine do the rest. This is largely why Apple opted for integration, as did Nest, a maker of wireless thermostats.

A second reason is that firms operating on the technological frontier often find it more efficient to do things in-house. Companies that are inventing the future frequently have no choice but to pour money into new ventures rather than buy components off the shelf. This explains Tesla's “gigafactory” for batteries: their availability is the biggest constraint on the firm's growth. Boeing tried to cut its production costs by outsourcing 70% of the production of its 787 Dreamliner to hundreds of different suppliers—more than any airliner before. The result was a disaster: parts came in late; bits didn't fit together; deadlines were missed. The firm reversed course, bringing manufacturing back in house and buying a factory.

A third reason is choice: the more the market has to offer, the more important it is to build a relationship with customers. Netflix and Amazon now create their own television shows in order to keep their viewers from

buying more generic content elsewhere. Harry's, an American company that sends its subscribers a regular supply of razors and shaving cream, spent \$100m to buy a German razor-blade factory.

Choice is reinforced by speed: fashion brands such as Spain's Zara have resisted contracting out everything. Instead, they operate their own clothes factories, employ their own designers and run their own shops. This gives them a big advantage: they can turn the latest trend into new product, often in small batches, and have it in stores in a couple of weeks. Less vertically integrated brands such as Gap and American Apparel find they are stuck with yesterday's creations because they cannot get supply chains to produce new wares quickly.

And then there is a combination of old worries about geopolitical uncertainty and new worries about the environment. In 2014 Ferrero, an Italian confectionary-maker, bought Oltan Gida, which produces one-third of Turkey's hazelnuts, the vital ingredient in Nutella. In 2015 IKEA, a Swedish furniture company, bought nearly 100,000 acres of forests in Romania and the Baltic region. Earlier this year ChemChina, a state-owned company, purchased Syngenta, a Swiss seeds and pesticides group, for \$43 billion, driven by the government's quest for food security. Cruise companies such as Costa Cruises and Disney have bought islands in the Caribbean and the Bahamas so that they can guarantee that their passengers will have somewhere empty and unspoiled to visit when they sail past.

| *Core complexities*

The renewed fashion for vertical integration will not sweep all before it. For the most mundane products the logic of contracting out still reigns supreme. And today's bundling is less ambitious than Henry Ford's: Apple, for instance, contracts out a lot of production to contract manufacturers such as Foxconn (though it keeps them on a tight leash). Integration is also

hard to pull off: Tesla lost some of its shine on April 11th when it recalled 2,700 of its sport-utility vehicles because of a glitch. That said, striking the right balance between doing things in-house and contracting things out is clearly much more complicated than it was in the days when Tom Peters and his fellow gurus told companies to focus on what they do best and outsource the rest. ■



熊彼特

收入囊中

古老的管理理念焕发新生

苹果公司和特斯拉都是人们最爱谈论的公司，这两个公司的垂直整合程度也名列前茅。苹果不仅大部分软件是自己写的，芯片也由自己设计，连商店都自己开。特斯拉80%的电动车都是自己生产，并直接销售给客户。它还在构建一个充电服务站网络，并在内华达沙漠建设世界上最大的电池厂。

一个世纪以前，这种垂直整合堪称法则：企业“向后”整合，购买原材料来源和供应商；同时“向前”整合，购买分销商。标准石油公司有油井，更拥有送货车和炼油厂。卡内基不但有高炉，还有铁矿床和火车车皮。亨利·福特（Henry Ford）在他1926年的著作《今天和明天》（Today and Tomorrow）中写道，垂直整合是他成功的关键：“如果你想做好，那就自己做。”他号称可以在明尼苏达州他自己的矿山中开采矿石，运到位于底特律的红河谷工厂，再把它变成停在芝加哥的一辆T型车——一切都在84个小时之内完成。

如今，这种捆绑就很罕见了。过去30年里，各个公司一直专注于自己的核心业务，其他的一切都外包给专门人士处理。钢铁制造商出售了采矿业务，汽车制造商剥离了零部件供应商。这种观点说的是，在市场还处于原始状态时，什么都要控制是有道理的，因为关键材料的供应有限，或者承包商可能会欺骗你。随着市场变得越来越成熟，这些理由都站不住脚了。有了全球化，企业总是可以找到新的资源和更好的供应商。

然而，越来越多的公司另有考虑。这在信息技术领域尤为明显。行业领袖们本来是处于外包革命的中心。IBM等垂直整合的公司尽可能地进行外包以降低成本。新贵如微软则是专注于一块非常狭窄但价值极高的蛋糕——个人电脑的操作系统。现在，很多硅谷创业公司都自豪地自称是“全栈”。但从时装到制造业，重新捆绑随处可见。

反转的理由比比皆是，但有五个理由引人瞩目。最重要的一点是简单。消费者愿意为整合良好的产品支付溢价，这样他们就不会被迫和不同的供应商打交道，或是拿到一堆无法相互沟通的零件。他们希望能够按一个按钮，机器就什么都做好了。这在很大程度上就是苹果公司以及无线温控器制造商Nest选择整合的原因。

第二个原因是，站在技术前沿的企业时常发现通过内部做事效率更高。发明未来的公司经常没有购买现成零件的选择，只能投资于新的项目。这就解释了特斯拉为什么要建立电池“超级工厂”——电池能不能做出来是企业增长的最大制约因素。为了降低生产成本，波音公司试图把787梦想飞机70%的生产外包给数百个不同的供应商——这在客机生产上是前所未有的。结果是一场灾难——部件来晚了，零件装不到一起，进度一再拖延。最后，波音公司改弦易辙，购买了一家工厂，亲自上阵主持生产。

第三个原因是选择：市场机会越多，与客户建立关系就越重要。Netflix和亚马逊现在都自己做电视节目，以免观众从其他地方购买更常见的内容。定期给订户寄送剃须刀和剃须膏的美国公司Harry's花了一亿美元购买了一家德国剃须刀片厂。

速度也强化了这种选择：如西班牙的Zara等时尚品牌很抗拒全部外包。相反，它们自己开服装厂，自己雇设计师，自己经营店铺。这让它们有一个很大的优势：它们可以将最新的潮流融入新产品，通常批量很小，并在几个星期内铺货到店。Gap和American Apparel等垂直整合较少的品牌就发现自己手上总是堆着过时的产品，因为它们没办法让供应链快速生产新产品。

再有就是地缘政治不确定性的旧患加上环境影响的新愁。2014年，意大利糖果制造商费列罗（Ferrero）收购了占土耳其榛子市场三分之一产量的Oltan GIDA，而榛子是能多益（Nutella）巧克力榛子酱的关键成分。2015年，瑞典家具公司宜家（IKEA）收购了罗马尼亚和波罗的海地区近10万英亩的森林。今年早些时候，在政府要求食品安全的推动下，国有企业中国化工集团公司以430亿美元的价格收购了瑞士种子和农药集团先正达

（Syngenta）。歌诗达邮轮（Costa Cruises）和迪斯尼等邮轮公司都在加勒比和巴哈马群岛购买岛屿，以保证乘客总有一些空置且未受污染的地方可以参观。

| 核心复杂性

垂直整合的新浪潮尚不会横扫一切。对于最普通的产品来说，还是外包的逻辑占据统治地位。今天的捆绑不像亨利·福特当年那么包罗万象——比如苹果就把很多生产工作外包给富士康等合同制造商（虽然还保持着严格的控制）。整合也很难做好，在4月11日因故障召回了2700辆SUV后，特斯拉也多少有些黯然失色。虽然如此，要在内部工作和外包之间找到好的平衡点，显然已经比汤姆·彼得斯（Tom Peters）和其他大师们告诫公司应该专注于自己最擅长的事然后把剩下的外包要复杂得多了。■



The Panama Canal

Wider impact

What the expansion of Panama's waterway means for world trade

WORKERS at a fish market in Panama City disagree on the benefits of the country's newly widened canal. One optimistically hopes the government will have more funds to pay for air-conditioning in their broiling workplace. Another draws a finger across his throat and says, "The people will get nothing." A third calls it "the biggest opportunity" in Panama. The last verdict is certainly true of the government's take. The revenue it receives each year from the Panama Canal Authority (ACP) is expected to double to around \$2 billion in 2021. This is a country that knows how to reap the benefits of its geography.

The ACP will be able to charge more for passage to bigger ships now that massive new locks have been built at both the Pacific and Atlantic ends of the canal and channels have been deepened and widened. The \$5 billion venture will be inaugurated on June 26th when the first vessel officially sails through. The widening of the canal was initially mooted before the second world war, but became more urgent as ever larger ships were unable to use it.

Over 960m cubic metres of cargo passed through the canal in 2015, a new record and an amount that Francisco Miguez of the ACP calls "the maximum we could do in the existing locks". The expansion increases capacity to 1.7 billion cubic metres. The biggest container ships that could use the old canal, known as Panamax, can carry around 5,000 TEUs (20-foot equivalent units, or a standard shipping container). Neo-Panamax that will squeeze through the new locks can carry around 13,000 TEUs. Although the world's largest ships have space for nearly 20,000 TEUs, the majority of the global fleet will now fit through the canal.

The expansion will not only fill the coffers of the ACP and the Panamanian government. It will also change how freight moves around the world. Traffic could divert from the Suez Canal. Larger vessels, which currently ply that route between Asia and America's east coast, now have the option of going through Panama. America's east-coast ports should get busier. In the past, many containers heading from Asia to the eastern seaboard would arrive at west-coast ports, such as Los Angeles and Long Beach, and then travel to their destinations by road or rail. Bigger ships may now sail directly to ports in the Gulf of Mexico or the east coast, though shipping times will be longer. And vessels carrying liquefied natural gas from America's shale beds will be able to pass through the locks for the first time, heading to Asia. They are expected to account for 20% of cargo by volume by 2020.

East-coast ports are preparing for the windfall, says Mika Vehvilainen of Cargotec, a maker of cargo-handling equipment. Ports in Baltimore, Charleston, Miami, New York and Savannah are updating facilities to accommodate the Neo-Panamaxes. The Port Authority of New York and New Jersey plans to spend \$2.7 billion on enlarging its terminals and shipping lanes, and a further \$1.3 billion to raise a bridge by 20 metres.

Shipping lines' costs will also fall, in part through economies of scale but also because ports are automating facilities at the same time as preparing them for Neo-Panamaxes, says Kim Fejfer, boss of APM Terminals, the ports division of Denmark's Maersk Group, the world's biggest shipping firm. Ports in the Gulf of Mexico are already embracing these new technologies.

Customers may not, however, benefit much from the reduction in shipping costs. Rates have already fallen over the past two years—by up to 40% for containers on some routes, and slightly less for bulk commodities such as coal. The response, industry consolidation, may mute incentives to pass savings on. Earlier this year China's two biggest shipping lines merged to

form the world's fourth-largest operator. Firms are also building alliances to manage capacity. In January 2015 Maersk and MSC, the world's largest shippers, launched 2M, an alliance to share space on their vessels. In May this year, six other shipping lines with a global market share of 18% launched "The Alliance". There are rumours of a huge tie-up between several medium-sized firms.

Widening the Panama Canal may not bring cool air to sweaty fishmongers. But it should certainly give some parts of the shipping industry a boost. Whether the benefits of lower costs trickle down to consumers will depend on the internal machinations of the shipping industry. ■



巴拿马运河

扩建的影响

拓宽巴拿马运河对世界贸易意味着什么

巴拿马城的一个鱼市里，工人们对该国新扩建运河的好处意见不一。一名工人乐观地希望政府能用更多资金来为他们酷热的车间购置空调。另一名工人用手指划过自己的喉咙说：“人们什么也得不到。”第三名工人称它为巴拿马“最大的机会”。最后这个判断肯定符合政府的心意。政府每年从巴拿马运河管理局（ACP）获得的收入预计将于2021年翻一番，增至约20亿美元。这个国家非常明白如何从其地形中获利。

如今该运河的太平洋和大西洋两端都建造了庞大的新船闸，而且航道也已加深拓宽，ACP能够对更大的船只收取更多的通行费用。这一耗资50亿美元的项目将于6月26日举办开通典礼，并有首艘船只正式通过。扩建巴拿马运河的议题早在第二次世界大战之前就已提出，并由于更大的船只一直无法通行而变得更为紧迫。

2015年，超过9.6亿立方米的贸易物通过巴拿马运河，创下新的纪录。ACP的弗朗西斯科·米格斯（Francisco Miguez）认为这一数量是“我们现有船闸能达到的极限”。此次扩建把运能增至17亿立方米。能通过旧运河的最大集装箱船（称为“巴拿马型船”）可运载大约5000个标准箱（TEU，即20英尺集装箱）。而可以通过新船闸的“新巴拿马型船”则能装载大约1.3万个标准箱。尽管世界上最大的船舶能容纳将近2万个标准箱，但毕竟全球大部分船舶都能通过巴拿马运河了。

此次扩建不但将充实ACP和巴拿马政府的腰包，而且还将改变货物在世界各地的运输方式。它可能会分流苏伊士运河的运量：目前往返于亚洲和美国东海岸之间的较大型船只现在可以选择取道巴拿马运河。美国东海岸的港口应该会更忙碌。过去，许多从亚洲运往美国东岸的集装箱会抵达洛杉矶和长滩等西岸港口，然后经公路或铁路运往目的地。现在，尽管航行的时间会更长，但较大型船只能够直接航行到墨西哥湾或美国东海岸的港

口。而且，运送美国页岩层LNG（液化天然气）的船只将能首次通过巴拿马运河的新船闸前往亚洲。预计到2020年它们将占货运总量的20%。

货物装卸设备制造商卡哥特科公司（Cargotec）的米卡·韦赫维莱宁（Mika Vehvilainen）表示，东海岸的港口正在为这个意外收获而做准备。巴尔的摩、查尔斯顿、迈阿密、纽约和萨凡纳等地的港口正在更新设施以容纳“新巴拿马型船”。纽约和新泽西的港口管理局计划花费27亿美元来扩建码头和拓宽航道，并计划进一步投入13亿美元将一座桥抬高20米。

马士基集装箱码头公司（APM Terminals）是世界上最大航运公司丹麦马士基集团的港口部门，它的老板费逸凡（Kim Fejfer）认为，航运企业的成本也将降低，一部分是由于规模经济，同时也缘于港口在为“新巴拿马型船”做准备之际还在进行设施自动化。墨西哥湾的港口已经开始采用这些新技术。

然而，客户也许并不会从航运成本下降之中受益多少。在过去的两年中，费率已经降低，一些航线的集装箱费率降幅高达40%，煤炭等散货运费则降幅稍小。其反响就是产业整合，而这可能会使航运企业缺乏动力把节约的成本让渡出去。今年早些时候，中国两家最大的航运公司合并成为世界第四大航运企业。各航运公司也建立联盟来管理运能。2015年1月，世界上最大两家航运公司马士基和地中海航运（MSC）推出了2M联盟，这使它们共享运能。今年5月，另外六家拥有全球18%市场份额的航运公司推出了“联盟”（The Alliance）。有传言称，几家中型企业之间将建立庞大的联合关系。

扩建巴拿马运河可能不会为汗流浹背的鱼贩们带来凉爽的空气，但它势必会推动航运业某些领域的发展。至于成本降低的好处能否惠及消费者，就要看航运业的内部谋划了。■



Schumpeter

Sleepy giant

China Inc needs better management to become more productive

CHINESE business leaders gather on June 26th in Tianjin, a charmless industrial city near Beijing, for the annual “Summer Davos” conference. This talking shop for big shots, organised by the World Economic Forum, will feature endless discussions about the fourth industrial revolution, panels on the internet of things and briefings on other whizzy topics that occupy the minds of business leaders the world over. China’s bosses will lap it up. The country wants to shift from its position as the world’s sweatshop to become a powerhouse of creativity and invention. The priority for corporate chiefs, runs the fashionable refrain, must now be to embrace trailblazing innovation and technology. In fact, a better bet would be to concentrate on the nuts and bolts of management.

China does need to shift from brawn to brain, but Chinese companies are not going to turn into Google or Apple overnight. Most of them, especially those controlled by the state, will continue to plod on in unsexy industries, such as steel or cement, for some time yet. For this cohort of firms, the central problem is not a lack of futuristic thinking or transformative innovation but how to get better at what they do.

Many are struggling just to get by, according to a report released on June 23rd by the McKinsey Global Institute (MGI), a think-tank. It calculates that over four-fifths of all “economic profits” (which take into account the cost of capital) generated in China come from one industry: finance. And that is not the result of the brilliance of China’s bankers, but rather of state-run banks being guaranteed profits by the regulatory system. By the same measure, almost half of the 20 biggest industries make a loss.

That points to China Inc's dirty secret. Outside the country, its firms are often portrayed as mighty enterprises poised to conquer the world. China's best are indeed world-beaters (think of Huawei, a telecoms-equipment giant, or Haier, an innovative white-goods goliath). Export-oriented manufacturers (nearly all of them private) have sharpened up dramatically. Mainly thanks to their efforts, productivity in China rose sharply between 1990 and 2010, outpacing many countries.

But that growth rate should not distract from the absolute levels of productivity, which are still abysmal. Across a variety of industries, in services and manufacturing, Chinese labour productivity is still just 15-30% of the OECD average despite those two decades of improvement. This is not just because the economy is biased toward heavy industry and dominated by stodgy state-owned enterprises (SOEs) that overinvest and underperform. Productivity lags behind badly at firms across the economy.

The boffins at MGI scrutinised the financial performance of some 10,000 Chinese and American companies. They found that three-quarters of the gap in returns between the two groups is explained by the performance of individual companies, not merely the mix of businesses in the Chinese economy. If local firms could improve performance by enough to match the average return on equity of American firms, it would lift the economy-wide return on invested capital in China from 7.4% to 10.2%.

How might this happen? Some things only the government can do. Letting failing firms go bust would be the most powerful reform of all. At the moment, no big company, public or private, can go bankrupt in China. Official subsidies, cheap loans and the inevitable bail-outs from local officials, worried about jobs and social upheaval, ensure survival. Another way to boost productivity would be to open up to competition the many parts of the economy (energy, telecoms, banking, airlines) that are run by oligopolistic SOEs.

Rather than wait for liberal reforms that may never come, however, managers in China must crack on with their own productivity efforts. The country has some extraordinarily efficient factories run by contract manufacturers such as Taiwan's Foxconn and America's Flex (formerly Flextronics). But it has a far greater number of poor performers. Globally proven management techniques like Six Sigma, a data-driven approach to running a company, and "lean manufacturing" have been tried only in name. They must now be taken up in earnest.

Technology need not be right at the cutting edge to help corporate officers do the basics better. More automation would boost productivity. Although China is the world's biggest buyer of industrial robots, it still has only 36 per 10,000 manufacturing workers—half the global level and less than a tenth of the proportion in South Korea. Digital technology is another path to productivity gains. China's logistics industry, for example, is a fragmented, over-regulated and corruption-riddled mess. Digital platforms that co-ordinate scheduling, warehousing and deliveries could boost the efforts of the 700,000 firms in this business.

Boards have a role to play, too, in realigning incentives for managers so that long-term productivity gains are rewarded. Most firms pay executives a salary and bonus that is determined by short-term performance. A study of firms listed on Chinese stock exchanges by BCG, another consultancy, found no correlation between executive pay and company performance.

| *Be normal*

In the end, the most important thing managers in China need to change is their outlook. After a long period of double-digit growth, many firms are still on an expansionist course. But with the economy now slowing, bosses must shift away from the strategy of growing at all costs to an approach that emphasises the boring stuff: cost cutting, restructuring and operational efficiencies. As MGI's Jonathan Woetzel puts it, companies in China need to

do more everyday “blocking and tackling”. This sort of talk may not impress the Davos set, but the resulting productivity gains are much more likely than all the guff in Tianjin to spark China’s next industrial revolution. ■



熊彼特

困倦的巨人

中国公司需要更好的管理来提高生产力

今年6月26日，中国的商业领袖们聚集在天津——北京附近一个乏善可陈的工业城市——参加一年一度的“夏季达沃斯”会议。在这场世界经济论坛为大腕们举办的空谈大会上，将没完没了地讨论第四次工业革命，开展关于物联网的座谈，还会介绍让全世界商界领袖心驰神往的其他新奇话题。这一切中国的老板们都会照单全收。中国希望自己能从全球血汗工厂变成创意和发明的强国。时髦的说法是，如今企业老总的当务之急是必须拥抱开创性的创新和科技。事实上，更好的选择是把注意力放在管理的基本细节上。

中国确实需要从体力转向脑力，但中国企业不会一夜之间就变成谷歌或苹果。大多数企业，尤其是那些由国有企业，在接下来的一段时间里，仍将继续在钢铁或水泥等乏味的行业里艰难前行。对于这样一些公司，核心问题不是缺乏对未来的思考或是革命性得创新，而是如何把手头的事情做得更好。

根据智库麦肯锡全球研究院（MGI）在6月23日公布的一份报告，很多企业都在苦苦支撑。据计算，中国产生的“经济利润”（其中考虑到资本成本）中有五分之四都来自同一个行业：金融。这不是因为中国的银行家们智慧过人，而是监管体系保证国有银行能拿到利润。按照同样的计算，最大的20个行业中几乎一半都在亏损。

这揭示出了中国公司一个不可告人的秘密。在国外，中国公司常常被描述为准备征服世界的强大企业。中国最好的企业的确是举世无双（想想电信设备巨头华为，或是创新白色家电巨无霸海尔），出口导向型制造商（几乎全为私营）进展神速。中国的生产力在1990年至2010年间飞速提升，超过了许多国家，这大部分要归功于上述企业的努力。

但是高增长率不应该让我们忽视生产力的绝对水平——它仍然非常糟糕。在服务业和制造业中的许多行业里，尽管进步了二十年，中国的劳动生产率仍然仅为经合组织平均水平的15-30%。这不仅仅是由于经济偏重重工业，并被过度投资却业绩不佳的古板国有企业所主导。各行各业都有企业生产力严重滞后。

MGI的研究员们仔细审查了大约1万家中国和美国公司的财务业绩。他们发现，两国公司的收益差距中，有四分之三都可以用公司的具体业绩来解释，而不仅仅是中国经济中的企业组成。如果中国企业能够把业绩提高到与美国公司的平均净资产收益率相当的水平，就可把中国的整体资本回报率从7.4%提高到10.2%。

这要怎么才能做到呢？有些事只有政府才能做。让失败的公司破产将是最强有力的改革。目前，无论是国营还是私营，没有一家大公司可以在中国破产。官方补贴、低息贷款，加上担心就业和社会动荡的地方官员必然出手纾困，保证企业能存活下去。提高生产力的另一方式是在国有企业寡头垄断的诸多经济部门（能源、电信、银行、航空公司）开放竞争。

中国管理者不应该去等待那也许永远也不会到来的自由主义改革，而是必须自己努力弥合生产力上的差距。中国有一些由承包制造商运营的工厂极度高效，如台湾的富士康和美国的伟创力。但表现不佳的工厂却要得多。对一些经过全球检验的成熟管理技术，如数据驱动运营的六西格玛和“精益制造”的尝试都只是徒有其名。现在必须要认真实施它们了。

不一定需要最前沿的技术才能帮助企业官员把基础工作搞好。更高的自动化水平将提高生产力。尽管中国是世界上最大的工业机器人买家，每1万名制造业工人中仍然只有36台机器人——仅是全球水平的一半，韩国水平的十分之一。数字技术是提高生产力的另一个途径。比如，中国物流行业是一个极度分散、过度管制和充满腐败的烂摊子。统筹调度、仓储和配送的数字化平台可以让这一行业的70万家公司提高效率。

在调整管理层激励、奖励长期生产力提升方面，董事会也能发挥作用。大

多数企业高管的工资和奖金都是按短期业绩确定的。波士顿咨询公司针对中国上市公司的一项研究发现，高管薪酬与公司业绩之间没有相关性。

| 回归正常

归根结底，中国管理者最需要改变的东西是对前景的看法。在长期的两位数增长之后，许多公司仍然处在扩张主义轨道上。但随着经济发展放缓，老板们必须改变不惜一切代价求增长的策略，转而强调一些比较乏味的东西：削减成本、重组和运营效率。正如MGI的华强森（Jonathan Woetzel）所言，中国公司需要更多地去做好日常的基础工作。此类说法也许不会让达沃斯那帮人眼前一亮，但比起在天津的夸夸其谈，由此带来的生产率提升激发中国下一次工业革命的可能性要大得多。■



Johnson

Double-plus effective

Why Donald Trump's rhetoric—with apologies to Orwell—works so well

IT IS easy to make fun of the way Donald Trump uses the English language. His tweets tend to follow the same structure: two brief statements, then a single emotive word or phrase and an exclamation mark. (On June 12th, after the Orlando shootings: “We must be smart!”) He invents playground nicknames for his opponents (Little Marco, Lyin’ Ted, Crooked Hillary). His vocabulary is earthy: “big-league”, to describe how he would do things, or “schlonged”, for someone beaten badly. During the primary campaign, his swearing was so criticised that he promised to stop (and actually did).

How did this man become the presidential nominee of the party of Abraham Lincoln? He must be doing something right: after all, language is virtually all a politician has to wield influence with (handshakes and hugs aside). Something about the way he talks and writes swept more experienced politicians aside.

First, he keeps it simple. Journalists sometimes attack politicians for simple language, even going so far as to use a misleading scale used to estimate the difficulty of a reading passage in American schools. These critics say Trump “uses the simple language of a ten-year-old”. But the “Flesch-Kincaid” reading-level test measures only the length of sentences and words, and says nothing about content. At worst, it measures exactly the wrong thing in political speech: short sentences containing common words are, all things being equal, a good thing. “Never use a long word when a short one will do,” Orwell wrote in “Politics and the English Language”. Simplicity is not stupidity; making language easy to apprehend is intrinsic to making it appealing. Countless psychological studies have shown that what is easy to process is seen as more truthful. “I’m going to

build a big, beautiful wall and Mexico is going to pay for it” may be preposterous, but it is easy to understand, and the human brain, in its weakness, likes easy things.

Another Trump tactic is repetition. This, too, may be incorrectly seen as childish. Trump does often say exactly the same thing several times in a row in a crude, hammer-blow fashion. But in more sophisticated guise, repetition is a venerable rhetorical tool. Mark Antony sarcastically repeats the taunt that Brutus is “an honourable man” after Brutus murders Caesar. Winston Churchill rallied Britain with, “We shall fight on the beaches, we shall fight on the landing grounds, we shall fight in the fields and in the streets...” And the most beloved rhetorical repetition of the 20th century is the great refrain, “I have a dream.” Mr Trump is certainly no Martin Luther King, but he knows how to leave an audience remembering what he said.

Yet the most effective way Trump beguiles his audience is perhaps the simplest: he does not give speeches. Instead, he talks. (Only rarely, when even he realises that his mouth can get him into trouble—as in his first speech after the Orlando shootings—does he resort to a teleprompter.) He does not even seem to have a “stump speech”. Bored reporters following ordinary candidates on the trail know that, even though they speak without notes, politicians reheat the same hash in town after town. Mr Trump, as noted above, repeats many tropes. But he also genuinely speaks off the cuff, avoiding the standard sunny string of clichés, which makes him fascinating to journalists. A Trump speech may actually make news. This is what happened when a barely planned digression about a fraud case generated a controversy: Mr Trump rambled that the judge ruling against him was conflicted because he was “a Mexican” (actually an American-born son of Mexican parents).

This unscripted quality is powerful. Even a valid argument is weakened if it sounds canned. Even an invalid one sounds stronger if it appears

spontaneous, especially to voters disgusted with the professional politicians. This reveals a dangerous double edge to Orwell's famous rules for clear and honest English. An honest speaker would do well to keep words and sentences short and concrete, and to avoid clichés, as Orwell advises. But a demagogue can use these tools, too. Orwell believed in the talismanic power of clear language to make lies and appalling talk plain. But some voters cannot recognise a lie, and others want to hear appalling things. If there are enough of these, then a looseness with the facts, a smash-mouth approach to opponents and a mesmerisingly demotic style make a dangerously effective cocktail. ■



约翰逊

效果爆棚

唐纳德·特朗普的修辞艺术——请奥威尔见谅——为何效果显著

要取笑唐纳德·特朗普的英文表达很容易。他的推特一般有个固定的套路：两个简短句，然后一个表达情绪的词或短语外加一个感叹号。（6月12日奥兰多枪击事件之后他写道：“我们必须学聪明点！”）他还像小孩一样给他的竞选对手起外号（小马可、骗子泰德、滑头希拉里）。他用词不雅：用“牛叉”来形容他将如何行事，或用“被干惨了”来形容一个人的惨败。在初选期间，他的粗口备受批评，最终不得不许诺改口（也确实改了）。

这个人是如何成为林肯党派的总统候选人呢？他肯定有其独到之处：毕竟，语言基本上是一个政客能用来发挥影响的唯一手段（除握手和拥抱以外）。他说话和写东西的一些方式让更有经验的政客都靠边站了。

首先，他言辞简单。记者有时会因政客用语简单而对其进行批评，甚至会用到美国学校里评估一篇文章阅读难度的一个误导性标准。这些评论员认为特朗普“用的是一个10岁儿童的简单语言”。但是弗莱士-金凯德（Flesch-Kincaid）阅读水平测试仅仅衡量句子和单词的长度，并不反映内容难度。至少，它恰恰显示出政治演讲的不当之处：同等条件下，常用词汇组成的短句是个优点。奥威尔在《政治和英语语言》（Politics and the English Language）中写道：“能用简单的词汇就决不用复杂的。”简单不等于愚蠢，要让语言吸引人就得让它易于理解。无数心理学研究显示人们认为容易理解的就更加真实。“我要建一堵漂亮的高墙，还得是墨西哥买单”的言论可能很荒谬，但简单易懂。而人脑的弱点就是它喜欢简单的东西。

特朗普的另一个策略是重复，这可能也会被错误地视为是幼稚的表现。特朗普确实经常会把同一件事像敲榔头一样翻来覆去重复好几次。但掩饰巧妙的话，重复是一种久经磨练、效果显著的修辞工具。布鲁特斯谋杀凯撒

之后，马克·安东尼（Mark Antony）多次辛辣地挖苦布鲁特斯是“一个可敬的人”。丘吉尔在鼓舞英国的斗志时用的是排比句——“我们将在海滩上作战！我们将在登陆地点作战！我们将在田野和街头作战！……”20世纪最受仰慕的修辞性重复就是那句伟大的叠句“我有一个梦想”。特朗普自然不是马丁·路德·金，但他深知如何让听众牢记他讲过的话。

然而特朗普蒙蔽听众最有效的方式或许也是最简单的：他不是在进行演讲。相反，他只是谈谈话而已。（只有少数几次，连他都意识到他的大嘴巴会给自己惹来麻烦的时候——正如他在奥兰多枪击事件后首次发言——他才对着提词器照本宣科。）他甚至好像都没有一篇“竞选演讲”。那些在竞选中追踪报道普通候选人而倍感无聊的记者都知道，尽管政客们是脱稿演讲，但他们每去一个地方都不过是重复陈词滥调而已。而正如前文所述，特朗普也是在重复各种讲法。但他是真正地在即兴演讲，避免了一连串光荣正面的常用套话，这也是他吸引记者的原因。特朗普讲话可能真的能成为新闻，他在一起欺诈案件中引发争议的出格言论就是如此，显然未经计划，他就信口开河地说，宣判他败诉的法官有利益冲突，因为他是“一个墨西哥人”（实际上是美国出生，父母是墨西哥人）。

这种不打草稿的讲话方式威力巨大，一个论点如果听起来是老调重弹，就算有理有据，效果还是会打折扣；如果是即兴而发的，即使论点站不住脚，听起来也有道理地多，对那些一心厌烦职业政客的选民来说更是如此。奥威尔所坚持的英语应简单而诚恳的原则因此成了危险的双刃剑。一个诚恳的发言人可以像奥威尔所愿那样，词句短小精悍，避免套话，并因此获得成功。但一个煽动民心的政客也可以利用这些方法。奥威尔认为直白语言的魔力可以让人们一眼识别谎言和危言耸听。但有些选民们无法辨识谎言，而有些就喜欢听些骇人听闻的话。如果这样的选民足够多，那说话罔顾事实、向对手大放厥词、通俗而令人着迷的风格结合起来，就会调出一杯酒劲很大的鸡尾酒。■



Anthropology

The medium is the messengers

A global study reveals how people fit social media into their lives

TO SOME, Facebook, Twitter and similar social-media platforms are the acme of communication—better, even, than face-to-face conversations, since more people can be involved. Others think of them more as acne, a rash that fosters narcissism, threatens privacy and reduces intelligent discourse to the exchange of flippant memes. They might even, these kinds of arguments go, be creating a generation of electronic addicts who are incapable of reflective, individual, original thought.

A topic ripe for anthropological study, then. And such a study, the “Why We Post” project, has just been published by nine anthropologists, led by Daniel Miller of University College, London.

The participants in “Why We Post” worked independently for 15 months at locations in Brazil, Britain, Chile, China (one rural and one industrial site), India, Italy, Trinidad and Tobago, and Turkey. They embedded themselves within families and their surrounding communities. That, the team believes, let them form a nuanced view of the roles of social media in their study sites which could not be gained by analysing participants’ public postings.

These fly-on-the-wall perspectives refute much received wisdom. One of the sceptics’ biggest bêtes noires is the “selfie”—which is often blamed for fostering self-regard and an undue focus on attractiveness. “Why We Post”, however, reveals that the selfie itself has many faces. In Italy girls were indeed seen to take dozens of pictures of themselves before settling on one to post. In Brazil many selfies posted by men were taken at the gym. But at the British site, Dr Miller found, schoolchildren posted five times as many

“groupies” (images of the picture-taker with friends) as they did selfies. Britons have also created a category called “uglies”, wherein the purpose is to take as unflattering a self-portrait as possible. And in Chile another unique genre has developed: the “footie”. This is a shot taken of the user’s propped-up feet, a sign of relaxation.

The often-humorous, marked-up images known as memes have also come in for criticism. They debase traditional forms of public debate, lament some, spreading far and wide with little context. But memes serve different purposes in different cultures. In India they tend to focus on serious and religious issues; Trinidadian memes are more often send-ups of politicians. Yet in all cases Dr Miller sees meme-passing not as limiting what social-media users think and say, but as enabling discourse. Many users happily forward memes laced with strong ideological messages about which they would not dare to comment individually.

Critics also often view the online personae people create for their social-media postings as false fronts designed for the medium at hand. Trinidadians, however, disagree. They see online profiles as more representative of a person’s true self even than what is seen in real life. And, though the perceived loss through social media of the anonymity that once characterised online life causes much hand-wringing in the West, young boys and girls in Turkey see things differently. Social media permit them to be in constant contact with one another, in full view of their parents, but to keep their conversations and photos to themselves.

In rural China and Turkey social media were viewed as a distraction from education. But in industrial China and Brazil they were seen to be an educational resource. Such a divide was evident in India, too. There, high-income families regarded them with suspicion but low-income families advocated them as a supplementary source of schooling. In Britain, meanwhile, they were valued not directly as a means of education, but as a

way for pupils, parents and teachers to communicate.

“Why We Post” thus challenges the idea that the adoption of social media follows a single and predictable trajectory. Indeed, the Chinese sites show that the use of such media can vary from place to place within a single country. The study also refutes the idea that social media are making humans any less human. Users are, in Dr Miller’s words, “merely attaining something that was latent in human beings”.

The sceptics’ reaction to new technology seems equally deep-rooted. New means of communication from railways and the telegraph onwards have always attracted critics. Sooner or later, the doubters either convert, or die. The adopters, meanwhile, chatter on until the next wave of disruption happens, an advance that some of them will reject as unnecessary and possibly dangerous flummery. ■



人类学

聊天即媒介

一项全球调查揭示人们如何在生活中使用社交媒体

一些人认为，Facebook、推特和类似的社交媒体平台可以让更多人参与，因而是一种极致的沟通方式，甚至优于面对面交谈。其他人则认为它们更像青春期的粉刺，助长自恋、威胁隐私，让智慧的辩论消减为转发轻率的讽刺图片。这类观点认为，它们甚至可能创造出没有反思、独立和创新思考能力的“电子产品上瘾”一代。

由此可见，这个话题已经适合于人类学研究。由伦敦大学学院的丹尼尔·米勒（Daniel Miller）牵头的九位人类学家最近就发表了这样的研究报告，名为“我们为何发帖子”（Why We Post）。

“我们为何发帖子”的参与者在巴西、英国、智利、中国（在农村和工业区各有一个调查点）、印度、意大利、特立尼达和多巴哥、土耳其独立工作了15个月。他们投身于家庭生活和周围社区之中。研究团队相信，这将帮助他们观察社交媒体在不同研究地点所扮演的角色，形成细致且具有差异性的结论，而单单分析参与者公开发布的帖子无法获得这样的见解。

这种从近距离旁观者角度做出的调研反驳了许多流行的观点。社交媒体怀疑论者最厌恶的事物之一是“自拍照”。人们常指责它助长了自我欣赏以及对外表过度的关注。然而，“我们为何发帖子”的研究却揭示，自拍照本身却有很多面相。在意大利，研究人员观察到，女孩们会拍多达几十张照片后才选定一张发出去。在巴西，男人们上传的自拍照有许多都是在健身房内拍摄的。而在英国，米勒博士发现，学童们发布的与朋友的合影是自拍照的五倍之多。英国人还创造了“丑照”这一类别，尽可能地把自已拍得难看。在智利则发展出了一种独特的新类型“足拍”，秀出自己高高搁起的双脚——一种放松的姿态。

通常幽默风趣、会加上一些标题文字的讽刺搞笑图也已招来批评。一些人

哀叹，它们贬低了公共辩论这种传统形式，欠缺背景信息却广泛传播。然而，这类图片在不同的文化中发挥着不同的作用。在印度它们往往聚焦于严肃的议题和宗教类议题。在特立尼达它们大多用来讽刺政客。但米勒博士认为，在所有案例中，这些图片的传播并没有限制社交媒体用户的思考和表达，反而激发了对话。许多用户愉快地转发带有强烈意识形态内涵的图片，而他们自己是不敢单独发出这类评论的。

批评人士常认为，人们为社交媒体发帖所创造的网上形象是为手头的媒介而设计的假面。特立尼达人却不这么看。他们认为网络甚至要比真实生活更体现一个人真正的自我。在社交媒体上，匿名这一网络生活曾经最为显著的特质已经消失殆尽，这在西方国家引发了诸多不安，但土耳其的青少年有不同的感受。社交媒体让他们可以在父母的眼皮底下不间断地相互联络，却不让父母知晓谈话内容或看到照片。

在中国农村和土耳其，人们认为社交媒体会影响教育。但在中国的工业地区及巴西，它却被视作一种教育资源。这样的分化在印度也很明显。在那里，高收入家庭对社交媒体持怀疑态度，而低收入家庭则提倡它们是一种补充性的求学资源。在英国，它们并不被推崇为直接的教育手段，而是学生、家长及教师交流的渠道。

由此，“我们为何发帖子”挑战了一种认知，即社交媒体的使用是遵循单一而可预测的轨道。实际上，在中国的调查显示，对这类媒体的使用在同一个国家的不同地点也不尽相同。该研究还驳斥了社交媒体正把人类变得更不人性的观点。用米勒博士的话说，其用户“只是在实现一些人性中潜藏的东西”。

怀疑论者对新技术的反应看来也同样源自人性的深处。在铁路和电报之后，每一种新的交流方式都招来了批评者。迟早，怀疑者或会皈依，或会离世。与此同时，采纳了新技术的人们则继续交谈，直到下一波颠覆发生。他们中的一些人会排斥这些发展，说它们毫无必要，也可能称之为危险的噱头。 ■



Schumpeter

The emporium strikes back

Platforms are the future—but not for everyone

“INTERESTING thesis, but don’t use the word ‘platform’ in the title. No one knows what it means.” That was the reaction of a professor at MIT in 2000 upon reading the dissertation of Annabelle Gawer, now co-director of the Centre for Digital Economy at the University of Surrey. She ignored the advice and kept the title.

If anyone were to counsel Ms Gawer against using the word today, it would be for the opposite reason: overuse. Academic papers on the concept are now legion. Books are multiplying, too: after “Platform Revolution” in March, this month will see the release of “Matchmakers” (with the p-word in the subtitle). Rare is the startup that does not want to be a platform. A rapidly growing number of incumbent firms, too, are striving to build platforms. Yet the professor’s problem remains pertinent: confusion still reigns over what exactly platforms are. And this, combined with the hype, hides the fact that they are not for everyone.

Broadly defined, platforms are a type of marketplace where people and businesses trade under a set of rules set by the owner or operator. Among the first were the emporiums in ancient Greece, designated places near docks where traders could exchange merchandise. More recently, digitisation and the internet have given rise to a new type that is both marketplace and shared base. Operating systems are an example, such as Windows for personal computers and Android for smartphones; these programs provide basic services that applications developed by others need to run. Another version is e-commerce sites, including Amazon and eBay, which connect sellers and buyers (hence the title “Matchmakers”). Social networks, too, are platforms: they bring together consumers, advertisers

and software developers.

These modern platforms have three things in common. They are “multi-sided”, meaning they have more than one group of customers. They exhibit strong “network effects”: a growing group of one sort of customer attracts more of the other, which again draws in more of the first and so on. And they are controlled by one company, which can dictate the terms of trade, such as what type of businesses are allowed on its digital property and what they have to pay for the privilege.

Such features have allowed American companies in particular to build global digital emporiums that have come to dominate the technology industry. In late 2015 the 44 platform firms based in Silicon Valley alone boasted a combined market capitalisation of \$2.2 trillion, according to the Centre for Global Enterprise (CGE), a think-tank. Among them, Apple’s iPhone exemplifies best how to run a platform: anybody can write an app, but it has to pass strict tests and the firm keeps 30% of all sales.

As everything from toothbrushes to tractors grows more connected the phenomenon is spreading to other industries. The latest iterations gather mounds of data, analyse them and serve up the results, thus enabling all kinds of digital offerings, from predicting failures to giving advice. One example of such a data platform is Nest, a subsidiary of Alphabet, Google’s holding company. It sells devices, such as wireless thermostats and smoke detectors, which double as vehicles to collect information, allowing the company to offer tailored energy and security services.

This trend alarms non-tech firms. They fret that if the likes of Apple and Google come to control such data platforms, these new intermediaries will seize a big chunk of their profits. This fear has sparked a rush to build or buy such systems. Last year carmakers Audi, BMW and Daimler acquired Here, a digital-mapping firm. General Electric, an American conglomerate,

is betting big on Predix, which helps customers improve how they run locomotives, jet engines and other gear. Apollo Hospitals in India is creating a marketplace for health-care services.

Many more established companies are sure to follow suit, as are thousands of startups. But before they tread this path, they should consider a few caveats. First, most products and services are not substantial enough to make a good platform. And even if they are, it is not always a good idea to turn them into one, says Ms Gawer, who is co-authoring a book to debunk myths about the concept. The late Steve Jobs, for instance, long resisted opening Apple's app store to others for fear of losing control.

Second, network effects often fizzle. All sides of an online marketplace have to be nurtured in parallel to avoid imbalances, such as having far more sellers than buyers. During the dotcom bubble most business-to-business marketplaces failed because their pursuit of growth led to such lopsidedness. Even firms that had a head start, such as MySpace and Nokia, a social network and a mobile-phone maker respectively, didn't manage to turn themselves into fully fledged platforms. Most successful ones are the product of specific circumstances and even chance, reckons Peter Evans of CGE. Amazon, for example, took off in part because its customers did not have to pay sales tax if they were outside the firm's home state, Washington.

Third, it is not always easy to make money from platforms. Misjudge how much to charge each group of customers, and the flywheel can come to a juddering halt. What is more, for a platform to make good money, switching to a rival has to be costly, argues Andrei Hagiu of Harvard Business School. This risk even hangs over Uber, the fast-expanding taxi-hailing service: using a competitor is easy for both passengers and drivers.

| *Apps of the world, unite!*

Platforms with a leg in the physical world are likely to take more time to emerge than the purely digital sort. And firms have some alternatives: those with outstanding products and a strong brand can try to forgo others' platforms, hoping that they succeed on their own. But ultimately most firms will have no choice but to do business on somebody else's digital property, and to agitate for better terms if the owner gets too greedy. Call it the class struggle of platform capitalism. ■



熊彼特

集市反击战

平台是未来——但并非适合所有人

“论文很有趣，但题目里不要用‘平台’一词。没人知道它是什么意思。”这是2000年麻省理工学院（MIT）一位教授读完安娜贝尔·加威尔（Annabelle Gawer）的学位论文后的反应。她如今是萨里大学（Surrey University）数字经济中心联合主任。彼时的她无视这个建议，保留了原题目。

如果今天还有人建议加威尔不要用这个词，原因却会是它已被滥用，恰恰与当初相反。关于这一概念的学术论文不可胜数，书籍也在大量增长：继三月的《平台革命》（Platform Revolution），本月《介绍人》（Matchmakers）也将发布（副标题中“平台”一词赫然在目）。鲜有初创企业不想成为平台，努力搭建平台的现有企业数量也在迅速增长。但那位麻省理工教授的问题仍然有意义：人们对平台到底是什么依旧迷惑重重。加之对其热火朝天的宣扬，掩盖了平台并不适于所有人的事实。

广义上讲，平台是一种交易场所，其所有人或运营者设定一系列规则，在此人们依照这些规则进行交易和业务往来。最早的平台之一是古希腊的集市，即临近码头的一些指定场地，商贩可在其中进行商品交易。近来，数字化和互联网催生了一种既是交易场所又是共享库的新型平台。操作系统便是一个例子，如个人电脑的Windows以及智能手机的安卓系统。这些程序提供基本的服务，可以运行他人开发的程序。另一种平台是亚马逊和eBay这样的电子商务网站，它们为卖家与买家搭起桥梁（即《介绍人》这个书名的由来）。社交网络也是平台——它们将消费者、广告商以及软件开发人员汇聚在一起。

上述现代平台有三个共同之处。首先它们都是“多边”的，意思是其客户群不止一种；其次它们都展示了强大的“网络效应”：一种客户群体持续成长，吸引了其他类型的客户，继而又会反过来吸引更多第一种客户，如此

反复。最后，它们都分别由一家公司控制，交易条件由公司设定，如可以在其数字平台上进行何种业务，为获得此资格需支付什么等等。

这些特质使得一些公司，尤其是美国公司建立起了已然主导科技产业的全球数字化集市。根据智库全球企业中心（CGE）的数据，2015年年底，仅44家总部设于硅谷的平台公司总市值便达2.2万亿美元。其中，苹果的iPhone堪称平台运营的典范：任何人都可以编写应用，但这些应用需通过严格的测试，且30%的销售总额归苹果所有。

从牙刷到拖拉机，所有事物都愈发密切地相互关联起来；这种现象也扩散到其他领域。最近的几次迭代会采集到海量数据进行分析并呈现结果，从而可提供从预测故障到提供建议等多种数字服务。谷歌的控股公司Alphabet旗下的子公司Nest便是此类数据平台。它出售无线恒温器和烟雾探测器等装置，这些装置可以兼做信息采集，使公司可以为客户提供量身定制的能源和安全服务。

这一风潮使非科技公司忧心忡忡。它们担心，如果这种数据平台都将由苹果和谷歌这类公司控制，自身的利润便会有一大块被这些新兴媒介抢走。这种恐慌情绪引发了搭建或购买这类系统的热潮。去年，汽车制造商奥迪、宝马及戴姆勒收购了数字地图公司Here。美国大型联合企业通用电气则在Predix上投下重注，这一产品可帮助客户更好地操作机车、喷气式发动机和其他设备。印度的阿波罗医院（Apollo Hospitals）也在为健康护理服务打造交易平台。

必然会有越来越多的老牌公司随之效仿，数千家创业公司亦然。但在决定沿着这条道路行进之前，它们应先考虑以下几点。首先，多数产品和服务的规模并不足以形成一个很好的平台。即使可以，把它们转变成平台在加威尔看来也不一定是个好主意。目前她正与人合著一本书，力图为平台这一概念祛魅。比如，已故的史蒂夫·乔布斯在很长一段时期内都抗拒将苹果应用商店向他人开放，就是因为担心失去控制。

第二，网络效应经常会失效。一个在线市场需均衡培育各方力量，避免卖

家数量远超买家之类的失衡状况。互联网泡沫中多数B2B网站都失败了，原因就是它们对增长的追求造成了上述不均衡。即使是一些起初势头很好的公司，如社交网络MySpace和手机制造商诺基亚，也并没能发展成完善的平台。CGE的彼得·伊文斯（Peter Evans）认为，多数成功的平台其实都是特定环境甚至机会的产物。例如亚马逊之所以能成功，部分原因就是其总部所在地华盛顿州之外的顾客无需缴纳销售税。

第三，靠平台赚钱也不会一直那么容易。一旦对该向每个顾客群收取多少费用判断错误，平台的运作就可能戛然而止。此外，哈佛商学院的安德烈·哈吉犹（Andei Hagiú）指出，一个平台若要赚大钱，需要让客户觉得转投它的对手成本高昂。连迅速扩张的叫车服务商优步（Uber）都面临着客户流失的危险：对乘客和司机来说，转而使用优步的竞争者非常容易。

| 全世界应用们，联合起来！

与纯数字形态的相比，一只脚踏在实体世界的平台可能需更多的时间才能成型。企业们也还是有另外一些选择：那些有着出色产品和强大品牌的公司可以试着放弃他人的平台，寄希望于自身力量去追求成功。但最终多数公司都会别无选择，只能借由他人的数字平台做生意；如果对方胃口变得太大，还得为争取更好的交易条件而抗争——不妨称之为平台资本主义下的阶级斗争吧。■



Online platforms

Nostrums for rostrums

The growing power of online platforms is worrisome. But regulators should tread carefully

IN 1949 Frank McNamara, an executive at a struggling finance company, had the idea of a charge card to settle the tab at high-class eateries. First, he had to solve a tricky problem. Restaurants would not accept a charge card as payment unless customers wanted to use one; and diners would not carry a card unless restaurants accepted it. His solution was to give away his card to a few hundred well-heeled New Yorkers: once the elite of Manhattan's gourmands were signed up, he could persuade a few upscale restaurants to accept his new charge card and also to pay him a commission. Within a year, the Diners Club card was accepted in hundreds of places and carried by over 40,000 people.

The Diners Club may not seem to have much in common with digital giants like Facebook, Google, Uber and Amazon. But such businesses are all examples of "platforms": they act as matchmakers between various entities and they typically charge different prices to different actors in the market. Google connects websites, consumers and advertisers, who foot the bill. Facebook does something similar for its members. Uber matches passengers and drivers, who pay the ride-hailing app a slice of the fare. Amazon brings together shoppers with retailers, who pay a fee.

The growing clout of online platforms is a boon to society but a headache for trustbusters. Platforms benefit from the power of networks: the more potential matches there are on one side of a platform, the greater the number that flock to the other side. The consequence may be a monopoly. That is normally a red flag for trustbusters, who are scrambling to keep pace with the rise of platforms. But they should tread carefully. The nature of

platforms means established rules of regulation often do not apply.

| *Think different*

In a conventional, “one-sided” market, prices are related to the cost of supplying goods and services. If a business can charge a big mark-up over its marginal cost of production, a wise regulator would strive to ensure there are enough firms vying for business or, where that is not possible, to set prices in line with the monopolist’s costs. Such precepts are little use in regulating platforms. Their prices are set with an eye to the widest participation. Often consumers pay nothing for platform services—or are even charged a negative price (think of the rewards systems run by some payment cards). Pushing down prices on one side of the platform may cause charges on the other side to rise, a bit like a waterbed. That in turn may drive some consumers away from the platform, leaving everyone worse off. Such uncertainties mean that regulators must not act precipitously.

But they are right to be thinking about the unique economics of platforms. Tech giants like to claim there is no need for special regulation. The winner-takes-all aspect of networks may mean there is less competition inside the market, but there is still fierce rivalry for the market, because countless startups are vying to be the next Google or Facebook. Unfortunately, incumbents may be able to subvert this rivalry.

One of their strategies is to use mergers. “Shoot-out” acquisitions is the name given to purchases of startups with the aim of eliminating a potential rival. Many claim that Facebook’s acquisition of WhatsApp was in this category. A recent parliamentary report in Britain noted that Google had made 187 purchases of other tech firms. Trustbusters tend to ignore mergers of businesses in unrelated markets and big firms hoovering up small fry. Buyers of firms with an EU-wide turnover of less than €100m do not have to notify the European Commission. Rules that take into account

how markets may develop over longer periods will be fiendish to craft. But they are needed.

A second concern is talent. Tech firms are jealous of their secrets. When their best people leave, they take ideas with them. Yet clauses in job contracts that restrict what types of work employees can do once they leave a company are also a means of thwarting the emergence of rivals. California has shown the way by clamping down on such practices.

A third issue is the power of personal data. Google is such an effective search engine in part because its algorithms draw on vast logs of past queries. Amazon can use customers' trading history to guide its marketing with greater precision. These data troves raise barriers to entry to the next Google or Amazon. There are no easy fixes, however. Even defining who owns information is complex; making data portable is tricky.

As Frank McNamara and his heirs have found, a successful platform company finds ways of balancing the interests of the parties it brings together. Regulators of online platforms face a similar balancing act—between the incentives for new firms to emerge and the benefits to consumers of large incumbents. That will require new ways of thinking and careful judgment. In the meantime, however, the priority for trustbusters must be to ensure they do no harm. ■



在线平台

为监管平台支招

在线平台日益强大让人不安，但监管机构需谨慎行事

1949年，弗兰克·麦克纳马拉（Frank McNamara）在一家苦苦挣扎的金融公司做高管。他有了个主意，想在高级餐厅中推广一种记账卡用以结账。首先，他需要解决一个棘手的问题：除非有顾客要用，否则餐馆不会接受用记账卡买单；而除非有餐馆接受，否则顾客才不会带着这张卡。他的解决方法是向几百个有钱的纽约人派发记账卡——如果能与曼哈顿美食家中的精英们签约，他就可以借此说服几家高级餐厅接受他的新型记账卡，并向他支付佣金。一年之内，大来卡（Diners Club Card）就被数百个场所接受，用户也超过四万。

大来俱乐部（Diners Club）似乎和Facebook、谷歌、优步以及亚马逊这些数字巨头并无太多相似之处。但它们所开展的业务都属于“平台”：它们在多个实体中充当介绍人，并且通常会向不同的市场参与者收取不同的费用。谷歌将网站、消费者以及负责买单的广告商联结在一起，Facebook也为用户做着类似的事情。优步为司机和乘客牵线，司机则把车费的一部分付给叫车应用。亚马逊为购物者和零售商搭桥，并由后者向其付费。

在线平台的影响力持续增强，这对社会来说是件好事，但却让反托拉斯官员们很头痛。平台得益于网络的力量：平台的一方拥有的用户越多，就会吸引越多的人涌入平台另一方与之配对，其结果也许就是形成垄断。这通常会让奋力追赶平台发展步伐的反托拉斯官员们警觉起来。但是，他们需谨慎行事，因为平台的性质意味着现有规章制度常常并不适用。

| 不同凡想

在传统的“单边”市场，价格与供应商品和服务的成本相关。如果一家企业能够在生产的边际成本之上大幅加价，明智的监管者会力求有足够多的公司来参与商业竞争。若这一点无法实现，监管机构便会根据垄断企业的成本来设定价格。但这些手段在监管平台时却很难奏效。平台制定价格的目

标是让尽可能多的人参与进来，消费者通常无需为平台服务支付任何费用，有时甚至还能倒赚钱（想想某些支付卡实行的奖励机制）。压低平台一方用户的支付费用也许会导致另一方付费增加，这有些像水床。这样一来，一些用户也许就会从平台出走，从而让所有人都陷入困境。鉴于如此种种的不确定性，监管部门决不能贸然行事。

但是它们确实应该开始琢磨这门独特的平台经济学了。科技巨头们乐于宣称平台无需特别的监管。网络世界中胜者为王的特性也许意味着市场内部的竞争会少些；然而，争抢市场的竞争却依然激烈，因为无数的初创企业都在争做下一个谷歌或Facebook。不幸的是，现有企业也许能够压制竞争。

它们的策略之一是并购。为消除潜在的竞争者而收购初创企业的行为被称作“斩草除根”式的并购，很多人认为Facebook收购WhatsApp便属于此类。英国最近的一份议会报告中提到，谷歌已收购了187家科技公司。反托拉斯官员倾向于忽视不相关市场中的企业并购，忙着鲸吞小鱼小虾的大企业也没有引起他们的注意。若在欧盟范围内交易金额不超过一亿欧元，公司就无需向欧盟委员会通报其收购行为。要制定考虑市场长期将如何发展的规则绝非易事，但这非常必要。

另一个担忧是人才。科技公司都把自己的机密盯得很紧。最好的员工一旦离职，也会将创意带走。但是工作合同会明文禁止员工离职后去做某些类型的工作，这也是一种预防出现竞争对手的方法。加州已严厉打击这种行为，可供借鉴。

第三个问题是个人数据的强大力量。谷歌作为搜索引擎之所以如此高效，部分原因就是它的算法利用了大量过往的搜索记录。亚马逊也可利用客户的交易记录进行更为精准的营销。对于想成为下一个谷歌或亚马逊的公司来说，这些数据宝库提高了准入门槛。但这一问题并没有简单的解决办法，连信息归属的界定都很复杂。要让数据跟着个人走，这事儿比较微妙。

正如弗兰克·马克纳马拉（Frank McNamara）及其继承者们所认识到的那样，一个成功的平台公司会寻求各种方法来平衡平台上各方的利益。在线平台的监管者也需做出类似的努力，既要鼓励新企业的出现，也要维护现有大型企业的客户利益。这就需要崭新的思路和审慎的判断。但与此同时，反托拉斯官员们的首要任务还是要确保这些平台不会做坏事。 ■



French manufacturers in Morocco

Factories in the sun

European firms bring carmaking and an aerospace industry to north Africa

CONSIDERING the help provided to big foreign manufacturers in Morocco over the past few years, it would have taken a serious effort by them to fail. Renault, a French carmaker, for example, is thriving: of 2.8m cars it made globally last year, one in ten trundled out from its two shiny assembly plants in Tangier and Casablanca. It hopes eventually to make 400,000 cars a year. The government provided land, excellent roads and power supply, tax advantages and a dedicated railway line to get the vehicles to an enormous port in Tangier. Official efforts to snip red tape and make it easier for firms to operate, and a penchant for signing free-trade deals, help to explain why foreign-direct investment is soaring, even as it shrivels for its neighbours.

One of Morocco's main draws is a supply of cheap labour. But it has also spent heavily on infrastructure, and not only for Renault. Its road network, railways, airports and ports are modern and well-maintained. It is handily close to the European home of many of the firms that have invested. But most of all, unlike Algeria, Tunisia and Egypt, which to varying degrees can match these other advantages, it offers political stability. The king, Mohammed VI, has championed a plan to industrialise quickly and create jobs for young Moroccans. "We are trying to do in ten years what Britain or France took 80 years to do," says a Moroccan businessman working with Safran, a French industrial group.

The country's welcome mat has brought jobs. Four years ago Renault invested €1.6 billion (\$2.1 billion) in its main car plant, Africa's largest, and it now employs nearly 10,000 staff locally. The firm is one of Morocco's biggest companies. It produces vehicles such as the Lodgy, an entry-level

people-carrier sold in Europe. Rapid growth proved possible partly because the king ordained it (his decrees get otherwise languorous civil servants to jump)—for example, in providing generous subsidies for training. Other firms are being lured by Morocco's largesse. PSA Peugeot Citroën will open an assembly plant in Kenitra, on the Atlantic coast, in 2019, and plans to make 200,000 cars a year.

Domestic sales account for a modest part of production. Marc Nassif, general manager for Renault in Morocco, says locals bought 125,000 cars last year, about two-fifths of them from his firm. More important are car exports that earned Morocco a hefty €4.8 billion last year, making them the country's biggest single export. That is not a bad record for a country that, until recently, relied mostly on textiles and tourists for hard currency.

Shifting production to lower-cost countries is an old strategy for European carmakers. Renault already has "huge facilities" in Slovenia, Romania, Turkey and Russia, as well as Spain, says Mr Nassif. As wages rise there, cheaper north Africa is more tempting. By one estimate monthly labour costs for Renault workers in Romania or Turkey are around €950, compared with €350 in Morocco.

Other factors also help to explain Renault's expansion. Carmakers are relying on sales in new markets to keep growing. African consumers are a long-term bet. To make vehicles that will appeal to their customers, carmakers like to keep production close so they can tweak to satisfy local tastes. "The main point is you must manufacture where you sell," says Mr Nassif.

Cheap and well-trained locals and official munificence explain a boom in another manufacturing industry, aerospace. Its growth was also ordained by Morocco's king just over a decade ago. Now some 100 firms, including Bombardier, Safran, UTC, Hexcel and Eaton, employ 11,500 people, mostly

in a tax-free zone by Casablanca airport. An industry veteran says the goal is to double that workforce, at least, by the end of this decade.

Hamid Benbrahim el-Andaloussi, who heads the industry's trade body, says a starting monthly salary in aerospace is equivalent to \$400 or less, rising to \$800 for middle managers. Fitting wiring is more akin to craft than mass production, so high-quality workers are crucial, too. Morocco's government funds a facility run by the firms—similar to support for the car industry—to train some 800 workers each year. It is being expanded.

In Safran's factory in Casablanca, workers assemble nacelles—structures encasing engines under aircraft wings—and fit honeycomb composites that help to muffle the screams of jet engines. The boss of Safran Nacelles in Morocco, Thierry Fradet, praises his expanding factory's location, saying finished goods can reach Toulouse, Airbus's headquarters, in southern France within three days, by lorry and ship.

Such industries are reshaping Morocco's economy. But assembly does not bring the bigger gains of higher-value work, such as research and design, nor create a wider system of local suppliers. Mr Nassif expects local firms will eventually supply two-thirds of components at Renault's Tangier plant, though he does not say when. Creating a supply chain is hard in aerospace, says a manager at Matis, a joint venture between Safran and Boeing for aircraft wiring. Suppliers are expected to share in the investment costs and risks of developing new components. The next job—getting small, local firms to flourish—will prove tougher than luring big foreign ones in the first place. ■



法国制造商在摩洛哥

阳光下的工厂

欧洲公司将汽车制造和航空航天工业带到北非

在过去的几年里，摩洛哥的大型外国制造商得到了诸多帮助，以至于它失败恐怕都要费一番功夫。雷诺便是受益者之一。这家蓬勃发展的法国汽车制造商去年在全球范围内的产量为280万辆，其中十分之一都来自其位于丹吉尔（Tangier）和卡萨布兰卡的两座闪闪发亮的装配厂。雷诺希望最终能使年产量达到40万辆。摩洛哥政府为企业提供了土地、优质的道路和电力供应、税收优惠以及一条专用铁路线，可将汽车运至丹吉尔的庞大港口。政府力争摒弃行政上的繁文缛节来使企业运作更加简单，还热衷于签署各种自由贸易协议。如此人们便可理解为什么虽然外国直接投资在周边邻国出现萎缩，却在摩洛哥迅速增长。

使摩洛哥具吸引力的主要因素之一是它廉价的劳动力。但除此之外，政府还肯花重金建设基础设施，且并不仅仅是为了方便雷诺。它的公路网、铁路、机场和港口都很先进且维护良好。对于许多在此投资的公司来说，摩洛哥距其欧洲部门不远，十分方便。虽然阿尔及利亚、突尼斯和埃及在不同程度上也具备这些优势，但摩洛哥优于这些国家的最重要因素就是政局的稳定。国王穆罕穆德六世大力支持一项快速工业化并为摩洛哥的年轻人创造工作机会的计划。一位与法国高科技企业集团赛峰（Safran）有合作关系的摩洛哥商人说：“我们正努力在十年内做到英国或法国需要八十年才能做到的事情。”

摩洛哥对外资的欢迎态度也为本国创造了工作机会。四年前雷诺投资16亿欧元（21亿美元）成立了它的主要汽车工厂，它也是非洲最大的汽车厂。如今，这家工厂已雇佣了近万名当地员工。雷诺是摩洛哥最大的公司之一，产品包括在欧洲销售的Lodgy，一个适合多人乘坐的入门级车型。汽车制造业的快速发展之所以成为可能，部分原因是国王本人的旨意（他的法令使原本松懈懒散的公务员们警醒过来）——比如他为工人的培训提供数目可观的补助金。摩洛哥政府的大手笔投入也吸引了其他多家公司。

2019年，标致雪铁龙集团也将在大西洋沿岸的盖尼特拉（Kenitra）成立一座装配厂，并计划一年生产20万辆汽车。

在摩洛哥本土的销售只占产量有限的一部分。雷诺摩洛哥分公司的总经理马克·纳西夫（Marc Nassif）说，去年当地人购买了12.5万辆车，大约五分之二产自雷诺。对摩洛哥来说，更重要的是车辆的出口。去年车辆出口为摩洛哥带来了48亿欧元的高额收入，成为该国最大的出口项目。对于一个直到最近都主要依赖纺织品和旅游业来获得硬通货的国家来说，这已经算不错的业绩了。

将生产转移到成本更低的国家是欧洲汽车制造商的惯用策略。纳西夫说，雷诺“庞大的工厂”已遍布斯洛文尼亚、罗马尼亚、土耳其、俄罗斯以及西班牙。但随着这些地方工资水平的提高，劳动力廉价的北非便展现出越来越强的吸引力。在罗马尼亚或土耳其，经估算，一位雷诺员工的月人工成本约为950欧元，而在摩洛哥则只有350欧元。

另一个因素也可解释雷诺的扩张。如今，汽车制造商销量的增长开始依赖新兴市场，非洲消费者可作为一个长期的赌注。为了生产出能获得消费者青睐的汽车，汽车制造商会愿意就近安排生产，以便对车辆加以改进使之符合当地消费者的偏好。纳西夫指出：“关键是必须在哪里卖就在哪里生产。”

廉价而训练有素的劳动力以及慷慨大气的政府也促成了另外一项制造业——航空和航天工业的蓬勃发展。十几年前，摩洛哥国王也曾下令发展航空航天工业。现在，包括庞巴迪、赛峰、联合技术公司（UTC）、赫氏（Hexcel）以及伊顿（Eaton）在内的约一百家公司雇佣了11 500名员工。这些公司多数都位于卡萨布兰卡机场旁的免税区。一位行业资深人士表示，他们的目标是2020年前让员工数至少增加一倍。

行业贸易组织领导哈密德·本布拉西姆·埃尔-安达卢西（Hamid Benbrahim el-Andaloussi）说，航空航天工业的起薪折合每月400美元或更低，升至中层经理后会增加到800美元。组装布线更像是手艺活而非批

量生产，所以高质量的工人也同样重要。摩洛哥政府还像支持汽车制造业那样，资助了一个由公司经营的培训机构，每年可培训约800名工人。这个机构的规模也在不断扩大。

在赛峰位于卡萨布兰卡的工厂里，工人们负责组装引擎短舱——机翼下方用于装载引擎的结构，以及安装有助于抑制喷气式引擎噪音的蜂窝复合材料。赛峰短舱公司（Safran Nacelles）在摩洛哥的工厂正在扩张，老板蒂阿里·弗拉代（Thierry Fradet）对其地理位置称赞有加。他说，成品在三天之内就可通过陆运和海运到达位于法国南部图卢兹的空中客车总部。

这些行业正在重塑摩洛哥的经济。但组装无法像研发和设计等价值较高的工作那样带来更多的利润，也不能建立起更广泛的本地供应商体系。纳西夫预测，雷诺丹吉尔工厂里三分之二的零部件最终都会来自于本土公司，但他并没说具体会是什么时候。赛峰与波音的合资企业、专事飞机布线的Matis的一位经理指出，在航空航天领域里建立起供应链并不容易。供应商应分担投资成本并共同面对开发新部件所产生的风险。当地政府的下一项任务是让小型本土企业发展起来，这可比引进大型跨国公司困难得多。





Developing economies

The long road

Making sense of euphoria and despair about emerging markets

GLOBALISATION has gone into reverse gear. Trade volumes have stagnated and the value of the capital flows sloshing around the world has dropped by over half since 2007. The West is angry and inward-looking.

Disappointment festers in the emerging world. In the boom years between 2003 and 2010 it appeared that a new era of openness and global supply chains would help emerging countries to grow at turbocharged rates for decades, closing the gap with the rich world. Today that idea is out of fashion. Brazil's economy is shrinking, China's debts are terrifying and Russia is a rusting autocracy. Emerging countries are growing at 4%, half as fast as in 2006.

Into the wreckage steps Ruchir Sharma, a fund manager and author of the bestselling "Breakout Nations", which came out in 2012. His new book, "The Rise and Fall of Nations", has three aims: to assess the crash; to dismantle the analysis that led investors and economists to get overexcited; and to offer a new framework for thinking about emerging countries. The result is ambitious. It covers four-fifths of the world's population and 40% of its GDP, and though it is sometimes rambling, it is also entertaining, acute and disarmingly honest. Instead of pious statements about poverty, or portentous mutterings on the importance of American leadership, Mr Sharma sees the world from the ruthless and restless perspective of an investor.

The emerging-market slump, he argues, is not over yet. Commodity-exporting economies, such as Russia, Brazil and South Africa, have yet to adjust fully. Some multinational firms cannot admit that their investments abroad will not return a decent profit. To counteract the global slowdown

after the crisis of 2008-09, most emerging economies went on borrowing binges. China, in Mr Sharma's view, is almost certain to face a crunch of some kind. No country, he says, has "ever survived a debt binge of such a scale without suffering a severe economic slowdown".

Plenty of executives and forecasters mistook a commodity-driven boom for a step-change in long-term prospects. On paper there are some reasons why GDP per person might increase much faster in emerging economies than in rich ones: for example, they might be able to leapfrog generations of technology, learning from rich countries' experience. But history suggests that sustaining fast growth is terribly hard in practice. Since 1945 most countries' spurts of success have been followed by periods of mediocre growth or worse.

Some forecasters then compounded this error by making projections over a dizzyingly long time. At the height of the emerging-market boom, it became routine for bosses and bankers to discuss the relative size of the GDPs of America and India and China in 2050. Mr Sharma thinks that looking beyond a horizon of between five and ten years is useless, and even then things are murky.

What organising idea should replace the belief that the emerging world will one day converge with the rich world? Mr Sharma's proposal is cycles. Countries' prospects rise and fall over cycles of up to ten years. Spurts of fast growth contain the seeds of their own destruction: exuberant investors sponsor frothy projects and politicians become complacent. After a slump banks and firms eventually purge their balance sheets and reformers are emboldened, allowing growth to pick up again.

It is hardly a novel way of thinking about the world, but Mr Sharma has ten tests for working out where countries are on this rollercoaster ride. For example, a country at the beginning of a rising cycle will often have an

expanding manufacturing base, stable debts, low inflation, a cheap currency that boosts exports, a state that builds bridges but does not meddle, few crony billionaires, and hungry leaders who have not been in office long enough to become lazy or corrupt.

For investors, the trick is to bet on a country before the next cycle of hype begins (and then sell before it peaks). Fittingly, Mr Sharma is keen on countries that few investors think about much: Pakistan and Romania, for example.

He has a knack for sharp comparisons between countries. Australia's history of high immigration is contrasted with Japan's insularity. The puny trade links between India, Pakistan, Bangladesh and Sri Lanka are compared with the umbilical cords that bind South-East Asia and which have made it richer. He is pithy, too. In countries with rotten financial systems, "a shake-up of banking is a shake-up of society". China's periodic attempts to perk up its economy are like watching "a ping-pong ball bouncing down stairs".

The book has two limitations. First, it is an unashamedly business-class view of the world. Mr Sharma name-drops and networks like mad, often to entertaining effect. Visiting China less than a year after the collapse of Lehman Brothers, he finds an air of "triumphant self-satisfaction". In 2015 Najib Razak, Malaysia's prime minister, gets confused while addressing a room full of investors in New York, despite an aide's attempts to keep him on-message. Yet there is little first-hand reporting on the slower currents of change in the emerging world—such as the shift from the countryside to cities—that continue regardless of where currencies and shares trade.

The second flaw is that Mr Sharma doesn't tackle whether it makes sense for most people to compare countries as he does. His point is that although no grand theory explains the world, an experienced observer can make

informed guesses about which places are on the up or in decline. This is a useful skill for a portfolio manager, shifting money around the world. But it is of less use to people in government, or to companies, whose time horizons are longer. If Mr Sharma is right that global capital flows will remain depressed, and that developing economies face a pedestrian future, then the hot money chasing them will recede—as, perhaps, will the influence of famous fund managers. Until then, Mr Sharma's book is a fine guide to the great emerging market boom and bust. ■



发展中经济体

长路漫漫

理解对新兴市场的欢欣和绝望

全球化已开起了倒车。贸易量停滞不前，自2007年起，全世界流动资本额已下跌过半。西方世界忿然不平，转而关注自身。失望的情绪在新兴世界蔓延。2003年到2010年期间一派繁荣，当时看来，一个开放和形成全球供应链的时代似乎能助力新兴国家以强劲的态势发展数十载，拉近与富裕世界的距离。今天这一想法已经过时。巴西的经济在萎缩，中国的债务令人生畏，俄罗斯的独裁专制锈迹斑斑。新兴国家如今以4%的速度增长，仅为2006年的一半。

基金经理鲁奇尔·夏尔马（Ruchir Sharma）走进这片窘迫的境地一探究竟，2012年他写过一本畅销书，名为《一炮走红的国家》（Breakout Nations）。他的新书《诸国兴与衰》（The Rise and Fall of Nations）有三个目的：评估危机情况；打破那些让投资者和经济学家过度兴奋的分析；为如何思考新兴国家提供一个新框架。该书成果斐然。它涉及到全球五分之四的人口和40%的GDP，尽管有些地方含糊冗长，但读来仍是有趣、辛辣，并且坦诚得令人抵触情绪顿消。夏尔马既没有对贫困做忠实的陈述，也没有装腔作势地在美国领导地位的重要性上喋喋不休，他从一个投资者的角度看世界，冷酷无情且毫不安分。

他认为新兴市场的衰落还没有结束。俄罗斯、巴西和南非等大宗商品出口国尚未调整充分。一些跨国公司无法承认它们的外国投资不会获得可观的利润。为了应对2008年至2009年经济危机之后的全球经济放缓，大部分新兴经济体仍旧大举借债。在夏尔马看来，中国几乎铁定会面临某种财政紧缩。他说，没有哪个国家“不经历严重的经济滑坡就能熬过这么大规模的举债”。

很多公司高管和预测者错将大宗商品推动的繁荣当成长期发展过程中的突发变化。理论上，人均GDP的增长在新兴经济体可能比在富裕国家快得

多，原因有几条：例如，它们或许可以学习富裕国家的经验，从而跃过几代技术发展。但是历史表明要保持快速增长在实践中非常困难。自1945年以来，大部分国家在短暂爆发的成功过后都经历了平平无奇的增长甚至下滑。

有些预测者错上加错，对一段长远得令人茫然的前景作出推断。在新兴市场繁荣的鼎盛时期，老板们和银行家们讨论2050年美国、印度和中国GDP的相对规模如同家常便饭。夏尔马认为展望五到十年之后的未来毫无意义，即使到那时，情况也并不会明朗。

应当用什么样的核心观点取代新兴世界终有一天会与富裕世界接轨的信念呢？夏尔马提出的是循环。各国前景起起落落，几乎最多十年为一个循环。爆发式的快速增长种下了自我毁灭的种子：狂热的投资人资助泡沫项目，政客们盲目乐观。经济衰退后，银行和公司最终清理了它们的资产负债表，改革家有了底气，令经济增速能够再度回升。

这谈不上是新颖的世界观，但夏尔马有十个测试来确定这趟过山车上的各个国家身处何处。例如，位于上升期之初的国家通常会有不断扩大的生产基地，这样的国家债务稳定，通胀低，货币低廉提振出口，政府修路架桥但不过多干预，靠裙带关系发达的亿万富豪很少，雄心勃勃的领导人掌权不久，尚未变得懒惰或腐败。

对于投资者来说，秘诀是在下一轮大肆炒作开始之前对某个国家下注（并且在达到顶峰时卖掉）。与此相应的是，夏尔马热衷的国家是少有投资者问津的，例如巴基斯坦和罗马尼亚。

他善于在国家之间做鲜明对比。澳大利亚大量移民的历史与日本的岛国状态反差极大。相比印度、巴基斯坦、孟加拉和斯里兰卡之间微不足道的贸易联系，将东南亚国家结合在一起的纽带已让这一地区更加富裕。他的语言也很精辟。对于有着腐败金融系统的国家，他写道“银行业剧变即社会的剧变”；中国定期提振经济的努力就像看着“一个乒乓球弹跳着滚下台阶”。

该书也有两大局限。第一，书中不加掩饰地流露出商务人士看世界的气息。夏尔马忘乎所以地搬出名人抬高自己并打通人脉，以致常常引人发笑。雷曼兄弟倒闭后不到一年，他到访中国，发现有种“得意洋洋的自满”氛围。2015年马来西亚总理纳吉布在纽约给一屋子投资者致辞时犯了糊涂，尽管一位助手努力给他提醒。不过书中鲜见一手报道描述新兴世界趋缓的变革潮流，如从乡村到城市的转变，这些变革仍在继续，无论货币和股票在何处交易。

第二点缺陷是夏尔马没有解决一个问题，即像他这样在各国间做比较对大多数人来说是否有意义。他要强调的是尽管没有大一统的理论解释这个世界，但经验丰富的观察家能够对哪些地方在上升哪些在衰退做出有根据的猜测。这对要把钱在全世界挪来挪去的投资组合经理来说是有用的技巧，但对于政府官员或者对公司来说就不那么有用，因为其眼光更加长远。全球资本流动仍将保持低迷，发展中经济体的未来将平淡无奇——如果夏尔马的这些看法是对的，那么追随着它们的资金将消退，知名基金经理的影响力可能也随之减弱。在那之前，就宏大新兴市场的繁荣与萧条而言，夏尔马的新书是个不错的指引。■



Artificial intelligence

March of the machines

What history tells us about the future of artificial intelligence—and how society should respond

EXPERTS warn that “the substitution of machinery for human labour” may “render the population redundant”. They worry that “the discovery of this mighty power” has come “before we knew how to employ it rightly”. Such fears are expressed today by those who worry that advances in artificial intelligence (AI) could destroy millions of jobs and pose a “Terminator”-style threat to humanity. But these are in fact the words of commentators discussing mechanisation and steam power two centuries ago. Back then the controversy over the dangers posed by machines was known as the “machinery question”. Now a very similar debate is under way.

After many false dawns, AI has made extraordinary progress in the past few years, thanks to a versatile technique called “deep learning”. Given enough data, large (or “deep”) neural networks, modelled on the brain’s architecture, can be trained to do all kinds of things. They power Google’s search engine, Facebook’s automatic photo tagging, Apple’s voice assistant, Amazon’s shopping recommendations and Tesla’s self-driving cars. But this rapid progress has also led to concerns about safety and job losses. Stephen Hawking, Elon Musk and others wonder whether AI could get out of control, precipitating a sci-fi conflict between people and machines. Others worry that AI will cause widespread unemployment, by automating cognitive tasks that could previously be done only by people. After 200 years, the machinery question is back. It needs to be answered.

| *Machinery questions and answers*

The most alarming scenario is of rogue AI turning evil, as seen in countless sci-fi films. It is the modern expression of an old fear, going back to

“Frankenstein” (1818) and beyond. But although AI systems are impressive, they can perform only very specific tasks: a general AI capable of outwitting its human creators remains a distant and uncertain prospect. Worrying about it is like worrying about overpopulation on Mars before colonists have even set foot there, says Andrew Ng, an AI researcher. The more pressing aspect of the machinery question is what impact AI might have on people’s jobs and way of life.

This fear also has a long history. Panics about “technological unemployment” struck in the 1960s (when firms first installed computers and robots) and the 1980s (when PCs landed on desks). Each time, it seemed that widespread automation of skilled workers’ jobs was just around the corner.

Each time, in fact, technology ultimately created more jobs than it destroyed, as the automation of one chore increased demand for people to do the related tasks that were still beyond machines. Replacing some bank tellers with ATMs, for example, made it cheaper to open new branches, creating many more new jobs in sales and customer service. Similarly, e-commerce has increased overall employment in retailing. As with the introduction of computing into offices, AI will not so much replace workers directly as require them to gain new skills to complement it. Although a much-cited paper suggests that up to 47% of American jobs face potential automation in the next decade or two, other studies estimate that less than 10% will actually go.

Even if job losses in the short term are likely to be more than offset by the creation of new jobs in the long term, the experience of the 19th century shows that the transition can be traumatic. Economic growth took off after centuries of stagnant living standards, but decades passed before this was fully reflected in higher wages. The rapid shift of growing populations from farms to urban factories contributed to unrest across Europe. Governments

took a century to respond with new education and welfare systems.

This time the transition is likely to be faster, as technologies diffuse more quickly than they did 200 years ago. Income inequality is already growing, because high-skill workers benefit disproportionately when technology complements their jobs. This poses two challenges for employers and policymakers: how to help existing workers acquire new skills; and how to prepare future generations for a workplace stuffed full of AI.

| *An intelligent response*

As technology changes the skills needed for each profession, workers will have to adjust. That will mean making education and training flexible enough to teach new skills quickly and efficiently. It will require a greater emphasis on lifelong learning and on-the-job training, and wider use of online learning and video-game-style simulation. AI may itself help, by personalising computer-based learning and by identifying workers' skills gaps and opportunities for retraining.

Social and character skills will matter more, too. When jobs are perishable, technologies come and go and people's working lives are longer, social skills are a foundation. They can give humans an edge, helping them do work that calls for empathy and human interaction—traits that are beyond machines.

And welfare systems will have to be updated, to smooth the transitions between jobs and to support workers while they pick up new skills. One scheme widely touted as a panacea is a "basic income", paid to everybody regardless of their situation. But that would not make sense without strong evidence that this technological revolution, unlike previous ones, is eroding the demand for labour. Instead countries should learn from Denmark's "flexicurity" system, which lets firms hire and fire easily, while supporting unemployed workers as they retrain and look for new jobs.

Benefits, pensions and health care should follow individual workers, rather than being tied (as often today) to employers.

Despite the march of technology, there is little sign that industrial-era education and welfare systems are yet being modernised and made flexible. Policymakers need to get going now because, the longer they delay, the greater the burden on the welfare state. John Stuart Mill wrote in the 1840s that “there cannot be a more legitimate object of the legislator’s care” than looking after those whose livelihoods are disrupted by technology. That was true in the era of the steam engine, and it remains true in the era of artificial intelligence. ■



人工智能

机器的迈进

历史能告诉我们有关人工智能的未来——以及社会该如何应对

专家警告说“机器对人类劳工的替代”可能“造成人口过剩”，他们担心“这种强大力量被开发出来”，而“我们还不知道如何正确运用它”。如今一些人表达了这种恐惧，这些人担心人工智能（AI）可能会毁掉数以百万计的工作岗位，并对人类造成类似“终结者”那样的威胁。但是这实际上正是两个世纪之前评论员们谈论机械化和蒸汽动力时的口吻。在那时，对机器所带来的危险的讨论被称为“机械问题”。眼下的争论与此非常类似。

在很多次虚幻的曙光之后，AI过去几年里已经取得了非凡的进步，这得感谢“深度学习”这种用途广泛的技术。只要有足够的数据，模拟人类大脑构造的大型（或“深度”）神经网络就可以被训练来做各种各样的事情。它们支撑着谷歌的搜索引擎、Facebook的自动图片标记、苹果的语音助手、亚马逊的购物推荐和特斯拉的自动驾驶汽车。但是这种快速的进步也引起了对其安全性和导致失业的担忧。史蒂芬·霍金、埃隆·马斯克等人担心AI是否会失控，迅速在人类和机器间引发科幻小说中所描述的那种冲突。其他人则忧心一旦AI将之前只能由人类完成的认知型工作自动化，将会引发广泛的失业。200年后，机械问题卷土重来。它需要答案。

| 机械问题及其答案

最令人担忧的场景是不安分的AI变得邪恶，就像数不胜数的科幻电影里那样。这是古老恐惧的现代表达，可以追溯到1818年出版的《科学怪人》（Frankenstein）乃至更早的作品。但尽管AI系统令人印象深刻，它们还是只能完成非常具体的任务：要让通用AI的聪明程度超过其创造者依旧是一种遥远且充满不确定性的预期。AI研究人员吴恩达表示，担心这一点，就好像在人类移民还未能踏足火星前就担心火星人口会过多一样。机械问题中更紧迫的方面，是AI会如何影响人们的工作及生活方式。

这种担忧也由来已久。对“技术性失业”的恐慌曾在上世纪60年代（企业首

次安装计算机和机器人）和80年代（个人电脑出现在办公桌上）爆发。每一次出现时，似乎熟练工人的工作都会很快被自动化大量取代。

而实际情况却是，每一次技术最终创造的工作都比摧毁的要多，因为每一项繁琐工作的自动化，都需要人们去做更多机器仍不能完成的相关工作。例如，ATM机取代了部分银行柜员，让开设新网点的成本更低，从而在销售和客户服务方面创造了更多新岗位。同样，电子商务提高了零售业的整体就业。就像在办公室中引入电脑一样，AI并不会直接替代人类员工，而更多的是要求他们学习新技能来更好地利用它。尽管一篇广为引用的论文认为，在未来一二十年，高达47%的美国工作岗位可能实现自动化，但其他研究则估计实际消失的岗位将不到10%。

即使长期创造的新工作会多于短期内丧失的工作，19世纪的经历表明这种转型仍然会非常痛苦。经济增长在生活水平停滞数百年后终于起飞，但经济成果完全体现为工资的上涨却是在几十年之后。越来越多的人口从农村涌向城市工厂，这一快速转变造成了整个欧洲的动荡。各国政府花了一个世纪才建立起新的教育和福利体系来应对这一局面。

这一次的转型可能会更快，因为技术传播比200年前来得更为迅速。收入不平等已在加剧，由于在工作中有了技术的帮助，高技能工人能获得超额的收益。这对雇主和政策制定者提出了两个挑战：如何帮助现有工人获得新技能，以及如何让子孙后代为充斥着AI的职场做好准备。

| 智慧应对

由于技术改变了各行各业所需的技能，人们必须做出调整。这意味着教育和培训要足够灵活，才能让人快速高效地学习新技能。这会要求我们更加重视终身学习和在职培训，以及更广泛地使用在线学习和电子游戏式的模拟。AI本身也可能会有帮助，它可以让在计算机上的学习更加个性化，还能找出员工的技能缺口和再培训机会。

社交和人格技能也将更为重要。当工作不再永久、技术潮起潮落、人们的工作年限更长，社交技能就成了基础。它给予人类一种优势，帮助人们从

事需要同理心和人际互动的工作——这些都是机器所不具备的特质。

福利体系也必须调整，让工作间的过渡更为顺畅，并在工人们学习新技能时提供支持。一个被普遍推崇为灵丹妙药的计划是“基本收入”，即向每个人都提供收入，不论他们处境如何。但这样做完全说不通，除非存在有力的证据表明这次技术革命不同以往，会侵蚀对劳动力的需求。相反，各国应该学习丹麦的“弹性保障”（flexicurity）体系，它让公司可以方便地雇用和解雇员工，同时为失业人员提供支持，以便他们接受再培训和寻找新工作。福利、养老金和医疗保障应该跟着员工个人走，而非像现在常见的和雇主挂钩。

尽管技术在进步，但仍鲜有迹象显示工业时代的教育和福利体系正变得现代化和更为灵活。政策制定者需要现在就着手处理，因为拖延越久，福利国家的负担就越重。约翰·斯图尔特·密尔（John Stuart Mill）在19世纪40年代写道，相比生计被技术所破坏的人们，“不可能有更合法的目标需要立法者的关心”了。这在蒸汽机时代千真万确，在人工智能时代也依然如此。 ■



The internet

Reweaving the web

A slew of startups is trying to decentralise the online world

TIM BERNERS-LEE ends “Weaving the Web”, a book written in the late 1990s, on an optimistic note: “The experience of seeing the web take off by the grassroots effort of thousands gives me tremendous hope that...we can collectively make our world what we want.” Nearly two decades later the inventor of the web no longer sounds as cheerful. “The problem is the dominance of one search engine, one big social network, one Twitter for micro-blogging,” he declared on June 7th at a conference in San Francisco.

Mr Berners-Lee’s observation that the internet has become heavily centralised is not new, yet in recent months warnings such as his have grown louder. Pundits estimate that Google’s many sites attract an estimated 40% of all traffic on the web. Facebook’s apps are similarly dominant on smartphones. Together these two firms will soon rake in two-thirds of all online-advertising revenues. The takeover of LinkedIn, a social network for professionals, by Microsoft, a software and cloud-computing giant, will only reinforce such worries.

In recent years, other “control points” have emerged, according to Yochai Benkler of Harvard University. Smartphones, which now generate more than half of online traffic, are not as open a platform as the internet: access to the two dominant mobile operating systems, Android and iOS, is regulated by Google and Apple, respectively. Cloud computing, too, is a centralised affair, with Amazon leading the pack, followed by Microsoft and Google. These same companies, as well as Facebook, are in control of ever-growing piles of personal and other data. Such information may ultimately allow these online giants “to predict, shape and ‘nudge’ the behaviours of hundreds of millions of people,” notes Mr Benkler in a recent paper.

Now a new band of entrepreneurs and venture-capital firms is emerging with a mission to “re-decentralise” the internet. This is not the first time that new technology has pushed against the centralising forces of the internet. In the early 2000s “peer-to-peer” services such as Napster and Kazaa, for instance, allowed users to share music files rather than download them from a central server. But lawsuits from record labels and, in some cases, a failure to find ways to profit from these services meant these technologies ended up being limited to a few services, such as Skype, which offers free internet calling.

If decentralisation is now making a comeback, it is largely because of the rise of bitcoin, a crypto-currency, and its underlying technology, the blockchain. This is a globally distributed database, which is maintained not by a single actor, such as a bank, but collaboratively by many.

Bitcoin and the blockchain have “shown what is possible,” says Juan Benet, who invented the InterPlanetary File System, one of a number of efforts to build an infrastructure for a more decentralised internet. IPFS eliminates the need for websites to have a central server; instead, files are stored all over the web. BigchainDB, another such project, is developing a globally distributed database, which is faster and bigger than the blockchain (although it also makes use of it). And Storj offers a form of collaborative cloud storage: data are spread over the computers that have signed up to the service.

Distributed applications are cropping up, too. Blockstack Labs’ offering, called Onename, which is also based on the blockchain, allows users to register their online identity; the idea is that they do not have to rely on log-ins provided by Facebook or Google. IndieWeb allows people to maintain information they want to share with the world without using centralised social networks. OpenBazaar is a collection of independent online shops.

Such services are likely to multiply. One reason is that investors are showing interest. BlueYard, a venture-capital firm, recently invited other venture capitalists and entrepreneurs to a conference in Berlin. “We used to spend a lot of time investing in firms with network effects,” explained Brad Burnham of Union Square Ventures, referring to the mechanics of online markets, which allow successful firms to become dominant. “Now we are spending a lot of time figuring out how we could undo those effects.” His firm has invested in both Blockstack Labs and OpenBazaar, in the hope that they will curb the momentum of Facebook and Amazon.

The second is that the technology to build decentralised applications, which is still in its infancy, will get better. For instance, bitcoin’s blockchain is no longer the only game in town. It now competes with Ethereum, a similar system that offers more scope for developers to write applications. They can, for instance, design “smart contracts”, business rules encoded in programs that execute themselves automatically: funds are transferred, for example, only if the majority of owners have digitally signed off a transaction. Consensus, a firm that designs such contracts, has used them to create a local marketplace for renewable energy in Brooklyn without the need for a central utility.

Whether these new businesses will take the world by storm is unclear. A big hurdle—which previous efforts at decentralised technology failed to clear—is to be as convenient and seductive as centralised incumbents. Regulators are likely to mount resistance against projects that transcend national jurisdictions. Initiatives such as the DAO, a novel investment vehicle that lets its shareholders vote on how to spend their money, is not based in any country—not even a tax haven—but on Ethereum’s blockchain.

Then there is the question of how decentralised services will earn their keep. Most are based on open-source software, which anybody can use

without charge, so startups will have to make money with add-on services, such as updates, maintenance and subscriptions. More fundamentally, an internet that eschews control points may be one that affords firms less opportunity to build profits. To create a return that makes venture capitalists happy, the new tech firms will almost certainly come under pressure to get ever bigger. Decentralisation might fit the vision of the web's founding father, but the internet became centralised for a reason. ■



互联网

重织网络

一些初创公司正试图让网络世界去中心化

在写于上世纪90年代末的《编织万维网》一书末尾，蒂姆·伯纳斯-李乐观地写道：“看到成千上万的草根力量让网络腾飞给了我极大的希望……我们可以一起创造我们想要的世界。”将近20年后，互联网的发明人不再这么兴高采烈了。“问题是一个搜索引擎、一个大的社交网络、一个用于发微博的Twitter的霸主地位。”他6月7日在旧金山的一次会议上说道。

伯纳斯-李关于互联网已经高度集中化的观点并不新颖，然而近几个月来类似于他的这种警告变得越发强烈。有专家估计，谷歌旗下的诸多网站吸引了网络上全部流量的40%，Facebook应用则在智能手机上拥有类似的势力。总之这两家公司很快就会将全部在线广告营收的三分之二收入囊中。软件和云计算巨头微软对专业人士社交网络领英的收购只会强化这一担忧。

根据哈佛大学的尤查·本科勒（Yochai Benkler）说法，其他“控制点”已于近年出现。智能手机如今产生了一半以上的网络流量，却不像互联网那样开放：两个主要的移动操作系统Android和iOS分别由谷歌和苹果把持。云计算也一样集中——亚马逊一马当先，微软和谷歌紧随其后。这些公司再加上Facebook，控制了不断增长的个人数据和其他数据。这些信息可能最终会让这些网络巨头得以“预测、塑造和‘推动’亿万人的行为”，本科勒在最近的一篇文章中指出。

如今，一批新的创业者和风险投资公司正在兴起，目的是要让互联网“重新去中心”。这已不是新技术第一次想要对抗互联网的集中力量。在21世纪初，Napster和Kazaa等“点对点”服务让用户可以共享音乐文件而不是从中央服务器下载。但是唱片公司的诉讼，以及有些情况下未能从服务中找到盈利途径，最终让这些技术局限于少数服务，如提供免费网络电话的Skype。

如果去中心化卷土重来，在很大程度上是因为加密货币比特币及其底层技术区块链的兴起。这是一个全球分布的数据库，它不像银行那样由单一机构维护，而是由许多人协作完成。

比特币和区块链已经“展示了可能性”，发明了星际文件系统（IPFS）的胡安·贝尼特（Juan Benet）说。IPFS是建立更为去中心化互联网的若干工作之一，它让网站无需拥有中央服务器，而是把文件存储在网络各处。另一个类似的项目BigchainDB正在开发一种全球分布式数据库，该数据库比区块链更快、更大（虽然也要用到区块链）。Storj则提供一种协作式云存储，把数据分布在注册了服务的计算机上。

分布式应用程序也异军突起。Blockstack Labs的产品名为Onename，它也是基于区块链，用户可以用它来注册自己的网上身份，其想法是用户不必依赖Facebook或谷歌进行登录。IndieWeb让人们能够维护要与世界分享的信息而无需使用集中化社交网络。OpenBazaar则是一组独立网上商店的集合。

这样的服务很可能会越来越多。原因之一是投资者对此表现出了兴趣。风险投资公司BlueYard最近邀请其他风险资本家和企业家到柏林参加一个会议。“我们曾经花了很多时间投资于具有网络效应的企业，”联合广场风险投资公司的布莱德·伯恩汉姆（Brad Burnham）解释道——他指的是让成功的公司成为霸主的在线市场机制——“现在我们又要花很多时间来搞清楚如何消除这些影响。”他的公司对Blockstack Labs和OpenBazaar都进行了投资，希望它们能遏制Facebook和亚马逊的势头。

第二个原因是建立去中心化应用的技术尚处于起步阶段，还将不断进步。举例来说，比特币的区块链不再是“独一份”，以太坊如今在和它竞争。以太坊是一个类似的系统，可为开发者提供更多编写应用程序的空间，比如可以设计“智能合同”，即将业务规则写进程序自动执行——例如只有在大多数业主数字签名批准交易后才能转移资金。设计此类合同的Consensys公司已经用它们在布鲁克林创建了一个当地的可再生能源市场，而无需集中化的公共事业公司。

这些新业务是否将迅速席卷世界还是一个未知数。先前的去中心化工作未能逾越的一大障碍，是它要和现有的中心化服务一样便捷诱人。监管机构很可能会给超越国家管辖范围的项目施加阻力。像DAO这样的新型投资工具让股东就如何支配自己的钱进行投票，该项目不位于任何国家——甚至不在避税天堂，而是存在于以太坊的区块链上。

再有一个问题就是去中心化服务自身如何赚钱。大部分此类服务都是基于开源软件，任何人都可以免费使用，那么创业公司要赚钱却不能依靠更新、维护和订阅等附加服务。更重要的，互联网如果回避“控制点”，可能会让企业获利的机会减少。要产生让风险资本家高兴的回报，新的技术公司几乎肯定会面临不断扩张的压力。去中心化可能符合互联网之父的期待，但互联网也不是无缘无故就变得这么集中的。■



Globalisation

Bridges versus borders

How capitalism reshapes geography

THE lines on a map of the world often bear little relation to reality. This can be a frightening realisation: Syria's boundaries, for instance, do not correspond to how power is really exercised in the Middle East. But there is another, less pernicious, force which can erase national borders: global supply chains.

Parag Khanna wants to show how connected the world really is. Large chunks of his new book, "Connectography" (an apparent portmanteau of "connective cartography"), describe the infrastructure that knits the world together: container ships twice the length of an aircraft-carrier, motorways traversing entire continents. By some estimates, he says, people will "build more infrastructures in the next 40 years alone than it has in the past 4,000". There is a "non-state" world, he argues. European companies do research in America, manufacturing in China and back-office work in the Middle East. Factor all this in and as much as 40% of American exports contain imports. Products should carry the label "made everywhere", he says.

Dubai is the *locus classicus* of Mr Khanna's vision. As much as 90% of its population is foreign-born, more than double the rate in New York. Low taxes, openness to immigrants and good transport connections mean that people from all over the world converge on Dubai to do business. And what is true in Dubai is increasingly true everywhere. "[T]he supply of everything *can* meet demand for anything; anything or anyone *can* get nearly anywhere," he gushes.

For those who fear that the world is becoming too inward-looking,

“Connectography” is a refreshing, optimistic vision. (For people who dislike Dubai, the future will seem somewhat bleaker.) Yet in neither case does it matter. This cartoonish version of globalisation bears little relation to reality. Folk like Mr Khanna can jet around striking deals wherever they please, but most people have no such luck. The millions of refugees fleeing Syria are part of no global supply chain. The author enthuses about a “global expatriate horde”, yet his own data show that the number of migrants as a proportion of the world’s population is hardly higher than it was 50 years ago. One of the many maps included in the book, showing the railways, roads and electricity cables of Africa, implies that moving around and trading on the continent is a breeze. It is not.

“Connectography” takes little notice of recent developments. Global trade growth has slowed since the financial crisis. Mr Khanna also ignores a trend much discussed by economists: the “reshoring” of certain economic activities to rich countries as fears grow about political instability and as China gets too expensive. The Trans-Pacific Partnership, a potential deal between America and 11 other countries to free up trade, gets a glowing review—yet by failing to discuss the tortuous negotiations over the agreement he tells only half the story. Supply chains do not simply trample over governments. Just ask Russia or Ukraine, where a conflict over borders has prompted them to cut economic ties.

A bullish, exaggerated thesis is acceptable in a short article, but this book is more than 400 pages long. It is stuffed with sweeping, sometimes bizarre statements (“China wants to be a giant Germany”, or “Try to imagine Ethiopia’s nearly 100m people today without Chinese investment”) and jargon aplenty. Mr Khanna lists over 400 people in a nine-page acknowledgments section, and it feels as though he has included a few ideas from each one.

Perhaps the most convincing point in the book concerns policy

prescriptions. To become part of global supply chains, Mr Khanna argues, it is essential to invest in infrastructure. China, in particular, has built a sprawling network of ports, canals and the like across the world to acquire and transport natural resources. By contrast, rich countries, especially America, now underfund capital goods, in an attempt to reduce public spending. This short-term skimping bodes ill for future growth. A reminder of the importance of infrastructure is helpful, but most of Mr Khanna's ideas are half-baked. ■



全球化

跨境桥对阵国境线

资本主义如何重塑地理

地图上的界线常常与现实关系不大。意识到这一点可能很吓人：以叙利亚为例，其边界与在中东真正行使权力的区域并不相符。但除了权力以外，还有另一种杀伤力小一点的力量也可以消弭国家之间边界：全球供应链。

帕拉格·卡纳（Parag Khanna）想要告诉大家全球的联系到底有多紧密。他的新书《连接力地图》（Connectography，显然是“连接”和“制图”两词的混成词）用了很多笔墨来描述将世界各地交织在一起的基础设施：有两个航空母舰那么长的货柜船、横贯整个大洲的高速公路等。卡纳说，据估计人们“仅在未来40年里将建造的基础设施就会超过过去4000年的总和”。他说现在的世界是一个“非国家”的世界。欧洲公司在美国做研发，在中国生产，后台办公室设在中东。这些都考虑进去的话，高达40%的美国出口产品中都含有进口成分。卡纳说产品标签上应该标注“各地制造”。

迪拜是卡纳愿景里的一个经典案例。迪拜多达90%的人口都生于国外，这个比例是纽约的两倍。低税率、对移民的开放态度和四通八达的便利交通让世界各地的人们聚集到迪拜发展。迪拜的情况在世界其他地方越来越多见。卡纳激动地说：“各种东西的供应可以满足任何的需求；任何东西或任何人都可以去到几乎任何一个地方。”

对那些认为这个世界正变得太过封闭的人来说，《连接力地图》描绘了一个让人耳目一新的乐观前景。（对不喜欢迪拜的人而言，未来似乎会有些凄惨。）但喜欢与否都不重要。这近乎于卡通的全球化想象与现实并没有多少联系。卡纳这样的人可以坐上飞机到任何地方去达成交易，而大部分人没有这么幸运。数百万逃离叙利亚的难民完全没有被纳入任何全球供应链。作者热情高涨地谈论“全球侨居游牧部落”，但他自己的数据显示移民占全球人口的比重较之50年前基本没有升高。书中众多地图中的一幅展示

了遍布非洲大陆的铁轨、公路和电缆，暗示非洲的交通和贸易都畅通无阻。现实并非如此。

《连接力地图》一书几乎没有注意到最近的发展趋势。金融危机以来，全球贸易增长放缓。卡纳还无视了一个经济学家们经常讨论的趋势：对政局不稳的担忧加剧，加之中国的成本变得过高，某些经济活动会“回流”到富裕国家。书中对“跨太平洋伙伴关系”（The Trans-Pacific Partnership，可能在美国和其他11国之间达成的开放贸易协议）给予盛赞，但并未讨论协议谈判的曲折过程，仅说了故事的一半。供应链并非简单地凌驾于政府之上。只要问问俄罗斯和乌克兰就知道了，边界纠纷已让两国切断了经济往来。

看好未来的夸张论点在一篇短文中可以接受，但此书厚达400多页，充满了笼统甚至怪诞的说法（“中国想要成为巨型德国”，或“试着想象一下现在埃塞俄比亚近一亿的人口没有了中国的投资会如何”），且满篇堆砌术语。卡纳在致谢部分用9页的篇幅列出了400多人，感觉他似乎从每个人那里都拿来了一些观点。

可能书中最有说服力的观点是关于政策方案的。卡纳称，要想成为全球供应链的一部分，就必须投资基础设施。尤为突出的是中国，它已经在全球建立起一个囊括港口、运河等基础设施的庞大网络以获取并输送自然资源。相反，富裕国家，尤其是美国为了降低公共开支，对资本品投资不足。这种短期的克扣预示着未来发展不利。提醒人们基础设施的重要性还算有用，但卡纳大部分的观点都不成熟。■



Travel security

Risky business

International SOS is the biggest player in a fast-growing industry

AT THE centre of a large office in west London sits a raised circular platform with several seats. Screens in front carry international news superimposed on a huge atlas. From here rescue missions are co-ordinated by International SOS (ISOS), the world's largest travel-security firm, which counts nearly two-thirds of the Fortune Global 500 companies as clients. It operates 26 other centres across the world. The firm says they have never been busier.

ISOS has responded to emergencies large and small. They range from giving timely advice to the parents of a child in Nigeria who had swallowed a coin to evacuating corporate and NGO clients from Burundi during last year's coup attempt. Torn between a medical airlift and potentially risky surgery in a local hospital, the child's parents were counselled by ISOS doctors to let nature take its course, which it duly did. The Burundi operation was trickier.

"When the president [Pierre Nkurunziza] started talking about serving an unconstitutional third term," explains Tim Willis, a former army officer who is the firm's European security director, "we thought 'look out' and began sending alerts to our members. When the balloon went up in May, their families had got out and they were prepared." A nurse was embedded with one client, a local security provider was told to stand by with vehicles and an ISOS manager flew to neighbouring Rwanda to co-ordinate the operation.

Next a handful of people were moved into a secure hotel. Then, once the road to the border was declared viable, they made their way out. A plane

was being chartered in Nairobi meanwhile to collect another 73 employees of a client from the airport at Bujumbura, the capital, and fly them to Rwanda's capital, Kigali. For Mr Willis it showed how managing efforts close to the action results in a "boring evacuation, which is what we want".

Globalisation (ever-increasing business travel and tourism), political instability (spreading in an arc from the Gulf to sub-Saharan Africa) and fear of terrorism in places previously thought safe (such as Istanbul, Jakarta, Paris and Brussels) are all drivers of the business. So too is China's expanding international footprint. This year China will overtake America as the biggest spender on business travel. Last year ISOS saw its "outbound" China business grow by 46%, thanks in part to Beijing's commitment to building a "new silk road" from Central Asia to the Mediterranean.

Founded over 30 years ago to provide emergency medical care for Europeans working in South-East Asia, ISOS has become a global business. When the Arab Spring got going in 2011, it had the resources to carry out large-scale evacuations from Egypt (1,250 people) and then Libya (1,500).

Since 2001 ISOS has grown from revenues of \$250m a year and 2,500 employees to \$1.5 billion and a staff of 11,000, which includes over 5,000 medical professionals and 200 security specialists. Operating from around 1,000 locations in 90 countries, it takes nearly 5m assistance calls every year. However, while it is large-scale evacuations at times of crisis that grab attention, the biggest risks that business travellers face are more prosaic. According to a survey of its European customers in 2015, 11% said they had experienced terrorism as a threat to their safety compared with 34% who cited petty crime and 33% traffic accidents.

Whatever the emergency, knowing exactly where your people are when something bad happens is the first part of any plan to help them. After the terrorist attacks of September 11th 2001, ISOS introduced travel-tracking

technology that provides real-time data about employee movements. Now, apps on phones using GPS can establish virtual secure areas—so called “geo-fencing”. A panic button on the phone sends SMS and e-mail alerts with location information if someone leaves or enters designated perimeters.

Although support when an emergency strikes is what gives clients reassurance, ISOS and its smaller rivals, such as Annapolis-based iJet and Anvil Group, a British firm, emphasise that risk mitigation starts with understanding where and how threats arise and knowing how to avoid or deal with them. That matters not just for practical reasons but for legal ones too. Employers have a duty of care and so can be sued if staff have not been adequately prepared or properly informed about dangerous situations they might find themselves in. One more reason why ISOS and its ilk need not worry too much about falling demand. ■



旅行安全

此行有风险

国际SOS是一个飞速发展的行业里的最大玩家

在西伦敦一间大办公室的中央，有一个升高的圆形平台和几个座位。前方多个屏幕播放着国际新闻，叠映在一幅巨大的世界地图上。国际SOS（International SOS，ISOS）就是从这里协调安排救援任务。它是世界上最大的旅行安全公司，财富全球500强公司里有近三分之二是它的客户。它在世界各地还设有26个中心。该公司称其从来没有像现在这么繁忙。

国际SOS对于大小紧急事件均有响应——小到给尼日利亚一名吞了硬币的孩子的父母提供及时的建议，大到在去年布隆迪未遂政变中撤离公司和NGO客户。孩子的父母本来左右为难，不知是要空运医疗还是在当地医院接受可能有风险的手术，国际SOS的医生建议他们顺其自然，结果硬币果然随大便排出。布隆迪的行动则更棘手。

“当（布隆迪）总统（皮埃尔·恩库伦齐扎 [Pierre Nkurunziza]）开始谈起违宪的第三次连任时，”前陆军军官、公司现任欧洲安全主管蒂姆·威利斯（Tim Willis）解释说，“我们就觉得‘要当心了’，并且开始向我们的会员发送警报。到五月事态严重时，他们的家人已经撤离，自己也准备好了。”每位客户配有一名护士，公司通知当地安保公司准备好车辆待命，另有一位国际SOS经理飞至邻国卢旺达协调行动。

紧接着少数人被转移到一间安全的旅馆。之后，通往边境的道路一宣布开通，他们就设法逃了出来。同时公司在内罗毕租了一架飞机，从布隆迪首都布琼布拉（Bujumbura）机场接应一位客户的另外73名雇员，将他们送至卢旺达首都基加利（Kigali）。对于威利斯来说，这显示出贴近行动的管理工作如何“造就了一场波澜不惊的撤离行动，而这正是我们想要的”。

全球化（不断增长的商务旅行和观光）、政局不稳定（从海湾地区到撒哈

拉以南非洲呈弧形分布)以及人们之前认为安全的地区(如伊斯坦布尔、雅加达、巴黎和布鲁塞尔)对恐怖主义的担忧,都成为这一行业发展的推动力。中国不断拓展的全球布局也是推动力之一。今年中国将取代美国成为在商务旅行上花费最多的国家。去年国际SOS从中国出发的业务增长了46%,部分原因是北京承诺要打造一条从中亚到地中海的“新丝绸之路”。

国际SOS于三十多年前成立,最初是为在东南亚工作的欧洲人提供紧急医疗救护,现已成为一家全球公司。2011年当阿拉伯之春爆发时,它拥有的资源实现了大规模撤离行动,先是在埃及(撤离1250人),后是在利比亚(撤离1500人)。

自2001年以来,国际SOS从年收入2.5亿美元、雇员2500人,成长为年收入15亿美元、雇员达到11000人的公司,其中包括5000多名医学专业人士以及200名安保专家。公司在90个国家设有约1000个营业点,每年接到的求助电话近500万次。不过,尽管危机时刻的大型撤离行动吸引人们注意,商务旅行者面临的重大威胁则要平淡得多。2015年公司对欧洲客户的调查显示,11%的客户称他们经历过威胁到自身安全的恐怖主义,而遇到过轻微犯罪的有34%,遭遇过交通事故有33%。

无论是何种紧急事件,当坏事发生时,任何救助计划的第一步都是确切知道你的人员身在何处。2001年911恐怖主义袭击后,国际SOS引入旅行追踪技术,用以提供雇员的实时行动数据。现在,使用GPS的手机应用能够建立虚拟安全区域,即所谓的“地理围墙”。一旦有人离开或进入指定范围,手机上的应急开关就会启动,发送带有地点信息的警告短信和电子邮件。

尽管在紧急事件袭来时,让客户安心的是支持,但国际SOS和它规模较小的竞争对手,如位于马里兰州安纳波利斯的iJet和英国公司Anvil集团,都强调规避风险始于对威胁的了解,要了解威胁在哪里、怎样产生,并且要知道如何避免或应对它们。这一点很重要,不仅出于实际原因,也有法律上的理由。雇主有照顾员工的职责,因此对于员工可能面临的危险处境,如果没有为他们做好充分准备,或者没有恰当地告知他们,雇主可能会被起诉。这也是国际SOS和它的同行不用太担心需求下降的另一个原因。■



Political consultants

Risk premiums

Policy wonks win big when the going gets tough

MERELY keeping up with fevered events in Brazil has proved a challenge of late. The president suspended from office pending impeachment over dodgy government accounting; a caretaker administration left to tackle the worst recession since the 1930s; all amid an operatic bribery scandal with twists and turns that make Brazil's *telenovelas* (soap operas) look logical. Staying ahead, as investors and businesses often need to, can seem a forlorn hope.

Luckily, help is at hand. From niche boutiques to big strategy consultants, a growing number of outfits offer to make sense of it all. Swathes of Brazil's economy may lie idle, but political-risk advisers report being busier than ever.

In fact, the risk business is booming everywhere, not just Brazil. With the Middle East in flames, Russia in adventurist mood and China paving over disputed reefs, geopolitics is again a concern of bosses everywhere. The threat of Brexit and the migrant crisis make even dull European countries appear too exciting, if anything. In America, meanwhile, the prospect of a President Trump invites probing.

Helpfully for political-risk analysts, the latest surge in global uncertainty has coincided with the maturing of their industry. In its current form it dates to the mid-1990s. Back then pitches to clients would elicit bemusement, recalls Ian Bremmer, founder of Eurasia Group, a veteran purveyor of real-time political science with headquarters in New York. Stratfor, which has been flogging geopolitical foresight for two decades from its base in Austin, Texas, recently notched up a record 550,000

subscribers. “We no longer have to justify our existence,” says Mr Bremmer gleefully.

Demand for such analysis got a fillip with the financial crisis, as multinationals pared back in-house strategy departments charged with providing it (among other things). These have shrunk by half, reckons Joel Whitaker of Frontier, an adviser based in Washington DC. He puts this down to boards’ growing short-termism and pressure to cut costs. Reliance on outside counsel has risen as a result.

Financial firms, which tend to read political scenarios the same way (broadly: sell statist, buy pro-business), were early adopters of generic subscription forecasts first offered by Stratfor and Eurasia. They still use these, but ever more bosses want assessments of company-specific risks too. That is a boon to firms such as Brazil’s Prospectiva, which has been demystifying the country’s confused trade and industrial policies for 14 years. It has grown by 20% to 30% a year since 2012, says Ricardo Mendes, a partner. Bespoke advice now makes up a fifth of Frontier’s revenues, up from nothing 18 months ago. At Stratfor it has outpaced subscriptions in the past five years and accounts for a third of sales.

Larger consultancies are dabbling too. Britain’s Control Risks has 100 political analysts in dozens of offices around the world, up from 30 in London ten years ago; they supplement its main business advising companies on how to keep workers safe and fight fraud. Giant management-consulting firms, such as McKinsey, are bundling political-risk analysis with other prescriptions for corporate betterment. Like the risks themselves, then, risk advisers are becoming more diverse. As important, they no longer simply assist Western firms thinking of investing in exotic places. Eurasia opened an outpost in São Paulo, its first outside the rich world, in late 2014—in principle to cater to Brazilian companies spying opportunities in other markets. In practice it helps perplexed

Brazilian bosses make sense of the political crisis at home.

“Political risk” is not something you say out loud in China, yet Chinese companies increasingly feel the need to factor it into their investment decisions—including in developed nations facing new troubles. So do other multinationals. To firms such as Bimbo, a large Mexican baker which Frontier is advising as it looks to expand north, “the US is an emerging market”, notes Mr Whitaker. And it is just as uncertain. ■



政治顾问

风险溢价

当形势棘手时，政策专家成了大赢家

近来巴西发生的连串火热事件简直让人应接不暇。总统因政府会计舞弊而遭停职，面临弹劾程序，留下一个临时政府应对上世纪30年代以来最严重的经济衰退。这期间中还出了场一波三折的贿赂丑闻大戏，连巴西的肥皂剧看起来都不那么荒诞了。投资者和公司通常都需要把握先机，但如今这似乎希望渺茫。

幸运的是，援助近在咫尺。无论是小型精品咨询公司还是大型战略咨询公司，帮你搞清楚这一切的机构越来越多。巴西经济或许大面积停滞不前，但据称政治风险咨询师的生意却从来没有这么好过。

实际上，不只是在巴西，风险行业在各地都蓬勃发展。中东遍地战火，俄罗斯试图冒进，中国正在有争议的岛礁填海，地缘政治再次受到各地老板的关注。“英国脱欧”（Brexit）的威胁和移民危机甚至让相对无事的欧洲国家看起来都十分刺激。而在美国，特朗普当选总统的前景引人探究。

对于政治风险分析人士而言，好消息是最新一轮全球不确定性的激涨恰逢其行业的成熟。这一行业目前的形式可以追溯到上世纪90年代中期。总部设在纽约的老牌实时政治科学服务商欧亚集团（Eurasia Group）的创始人伊恩·布雷默（Ian Bremmer）回忆道，当时向客户推销这些会让人感到困惑甚至可笑。总部位于得克萨斯州奥斯丁的Stratfor公司大力宣传地缘政治预测长达二十年，近来该公司的订阅用户达到创纪录的55万。布雷默笑道：“我们再也用不着去证明我们存在的意义了。”

金融危机提振了对此类分析的需求，因为跨国公司削减了提供这一服务（以及其他服务）的内部战略部门。位于华盛顿的咨询公司Frontier的乔尔·惠特克（Joel Whitaker）称这些部门已缩减一半。他将这归咎于董事会不断增强的短期主义和成本削减的压力。结果就是对外部咨询的依赖越

来越强。

金融公司倾向于以同样的方式理解政治局面（一般说来是卖出中央集权论者，买亲商业派），很早就开始订阅最早由Stratfor和欧亚集团提供的一般性预测。它们如今依然会用到这些，但更多的老板想要针对公司的风险评估。这对如巴西Prospectiva这样的公司来说是一大福音，该公司14年来一直致力于阐明巴西一团乱麻般的贸易和产业政策。合伙人之一里卡多·门德斯（Ricardo Mendes）说，公司从2012年起每年增长20%到30%。订制咨询如今占到了Frontier收入的五分之一，而这一业务18个月前才起步。在Stratfor，这项业务在过去五年已经超越了订阅业务，占到了总销售额的三分之一。

大型咨询公司也在试水。英国公司化险咨询（Control Risks）有100位政治分析师分布在全球几十间办事处，而十年前仅在伦敦有30位；他们对公司的主营业务——建议客户如何保证员工安全及打击欺诈是一个补充。麦肯锡等管理咨询巨头将政治风险分析和公司改良的其他方案捆绑销售。正如风险本身一样，风险咨询公司也越来越多样化。同样重要的是，它们不再只是简单地协助西方公司考虑在异国他乡投资。2014年底，欧亚集团在圣保罗设立据点，这是它首次在富裕世界之外设点，名义上是为在其他市场上寻觅机会的巴西公司提供服务。实际上它是在帮助迷惘的巴西老板们看懂国内的政治危机。

“政治风险”在中国不是能够高声议论的事，但中国的公司越来越觉得有必要将这一因素纳入到投资决策中——包括在面临新麻烦的发达国家所做的投资。其他跨国公司也深以为然。墨西哥大型烘焙食品生产商Bimbo想要向北部扩展，Frontier正在为其出谋划策。惠特克表示，对于Bimbo来说，“美国是个新兴市场”。那里的变数同样很多。■



Pacific economies

The leeward side of fortune

The economic deck is stacked against the tiny countries of the Pacific

THE phrase “Pacific island” conjures images of white-sand beaches, turquoise seas and cocktails served in halved coconuts. Alas, the reality is not quite so blissful. Most of the countries of the Pacific are poor and poorly run. Their tiny size and remoteness are obstacles enough to prosperity. Now, thanks to global warming, they must also contend with rising seas and increasingly frequent and severe storms.

The biggest regional economies belong to the predominantly Melanesian countries closest to Asia: Fiji, Papua New Guinea (PNG) and Timor-Leste (which considers itself both a Pacific and a South-East Asian country). Fiji’s leading export has long been sugar; sugar cane covers three-quarters of its arable land. But output is falling, and its future is uncertain: for years Fijian sugar has benefited from preferential access to the European Union, but that is scheduled to end next year. Competing on the open market against bigger producers with lower production and transport costs, such as Brazil and India, will be difficult. Fortunately, Fiji has a robust and growing tourism industry and, like many Pacific countries, reliable remittances from overseas workers.

PNG, culturally one of the world’s most diverse states (its 7.5m people speak more than 800 languages), relies on exports of minerals and, since 2014, natural gas. The economy grew by 10% last year as gas production increased. But with commodity prices low, a large gold and copper mine recently closing and drought battering the country’s farms, growth has decreased markedly: the Asian Development Bank predicts a rate of 4.3% this year.

Timor-Leste has tried to insure against such external risks: in 2005, a couple of years after it became fully independent, it passed a law requiring its petroleum and natural-gas revenues to be put into a sovereign-wealth fund. The government, subject to parliamentary approval, is supposed to transfer no more than an “estimated sustainable income” from the fund into its budget each year. But the government has made excess withdrawals to fund budgets every year since 2009, and top-up funds will soon become scarce.

If Timor-Leste can reach an agreement with Australia on how to divide Greater Sunrise, a gasfield in the Timor Sea between the two countries, then its gas will last another 15 years. If not, its known fields will be exhausted in four. Timor-Leste has a tiny private sector; recent growth has come from public spending made possible by money from the petroleum fund and from taxing oil and gas firms. It is among the most oil-dependent countries in the world: the industry accounts for around three-quarters of GDP.

The rest of the region consists of far-flung islands which rely on four main sources of income. One is tourism, though this is less developed than one might expect for an area composed of Elysian islands with pristine beaches and rainbow coral. Second is the sale of fishing rights in the vast stretches of ocean that fall within their territory. Remittances from workers abroad is a third. Finally, improved connectivity has created a modest outsourcing industry, strongest in Fiji, offering services such as call centres and data processing.

The outsourcing business relies on new fibre-optic cables. Flying and shipping goods and people around the region has become cheaper, too. But these only restrain geography rather than vanquish it. Manufacturing will always be limited to a small degree of import-substitution: transport costs are just too high to follow the conventional East Asian path of industrialisation. And Pacific countries suffer from devastating cyclones,

which are likely to grow stronger and more frequent in the years ahead. Eight countries in the region lose an average of 2% or more of GDP each year to storms. In time the low-lying atolls of Kiribati, Vanuatu and Tuvalu may disappear entirely beneath rising seas. ■



亚太经济体

命运的逆风

太平洋小国的经济前路多舛

“太平洋岛国”让人联想到白色的沙滩、湛蓝的大海，还有装在剖开的椰子中的鸡尾酒。哎，现实可没有这么幸福。大多数太平洋国家都很贫穷，经营不善。国土狭小、位置偏远足以成为繁荣的障碍。现在，由于全球气候变暖，它们还必须抗衡海平面上升，以及日益频繁和猛烈的风暴。

最大的区域经济体主要是那些最接近亚洲的美拉尼西亚国家：斐济、巴布亚新几内亚和东帝汶（它认为自己既是太平洋国家又是东南亚国家）。长期以来，斐济的首要出口商品就是糖，甘蔗的种植面积占到了其可耕地的四分之三。然而糖产量正在下滑，未来也飘忽不定：多年来，斐济糖都得益于可以优惠出口欧盟，然而这一政策定于明年年底结束。要是到开放市场上，与巴西和印度等生产和运输成本较低的生产大国竞争将十分困难。幸运的是，斐济有强大而不断增长的旅游业，而且像许多太平洋国家一样，拥有海外劳工的可靠汇款。

巴布亚新几内亚是世界上文化最多元化的国家之一（其750万人口讲超过800种语言）。它依赖于矿产出口，2014年起天然气也成为出口支柱。伴随天然气产量增加，经济在去年增长了10%。但随着大宗商品价格下跌，一家大型金铜矿近期濒临关闭，干旱侵扰该国农场，经济增速明显下降——亚洲开发银行预测今年的增长速度为4.3%。

东帝汶试图为这些外部风险做好准备——2005年时，该国仅完全独立数年，便通过法律，要求其石油和天然气收入均归入一个主权财富基金。经议会批准后，政府应该每年将基金中不超过“预计可持续收入”的部分转入预算。不过，自2009年起，政府每年的提款都超出了基金预算，而补充资金的来源会很快枯竭。

如果东帝汶能与澳大利亚达成协议，确定两国应如何划分帝汶海的“大晨

曦”（Great Sunrise）气田，那么它的天然气还可以再维持15年。如果无法达成协议，其现有气田会在四年内耗尽。东帝汶的私营部门很小，近期的增长均仰仗公共支出，资金则出自石油基金以及对石油和天然气公司的税收。它是世界上对石油依赖度最高的国家之一，石油行业占到了国内生产总值的四分之三。

该地区剩下的都是些偏远岛屿，其主要收入来源有四：一是旅游业，虽然其发展水平与人们心目中拥有纯美海滩和彩虹珊瑚的天堂岛还有些差距。二是出售其广袤领海的捕捞权。国外劳工的汇款是其三。最后，通讯的改善创造了不温不火的外包产业，其中实力最强的斐济提供呼叫中心和数据处理等服务。

外包业务依赖于新建的光缆。在区域内空运和转运货物及人员也变得越来越便宜了。但这些都只是缓解了地理限制，而并未征服它。制造业将始终限制在很小的规模，仅仅能够替代进口：运输成本太高，无法照搬东亚的传统工业化路径。毁灭性的飓风也让太平洋国家苦不堪言，而且在未来几年中还可能变得愈发猛烈和频繁。地区内八个国家平均每年要在风暴中损失GDP的2%以上。伴随着时间的推移，基里巴斯、瓦努阿图和图瓦卢的低洼环礁可能会完全消失在不断上升的海平面之下。■



Artificial intelligence

The return of the machinery question

After many false starts, artificial intelligence has taken off. Will it cause mass unemployment or even destroy mankind? History can provide some helpful clues, says Tom Standage

THERE IS SOMETHING familiar about fears that new machines will take everyone's jobs, benefiting only a select few and upending society. Such concerns sparked furious arguments two centuries ago as industrialisation took hold in Britain. People at the time did not talk of an "industrial revolution" but of the "machinery question". First posed by the economist David Ricardo in 1821, it concerned the "influence of machinery on the interests of the different classes of society", and in particular the "opinion entertained by the labouring class, that the employment of machinery is frequently detrimental to their interests". Thomas Carlyle, writing in 1839, railed against the "demon of mechanism" whose disruptive power was guilty of "oversetting whole multitudes of workmen".

Today the machinery question is back with a vengeance, in a new guise. Technologists, economists and philosophers are now debating the implications of artificial intelligence (AI), a fast-moving technology that enables machines to perform tasks that could previously be done only by humans. Its impact could be profound. It threatens workers whose jobs had seemed impossible to automate, from radiologists to legal clerks. A widely cited study by Carl Benedikt Frey and Michael Osborne of Oxford University, published in 2013, found that 47% of jobs in America were at high risk of being "substituted by computer capital" soon. More recently Bank of America Merrill Lynch predicted that by 2025 the "annual creative disruption impact" from AI could amount to \$14 trillion-33 trillion, including a \$9 trillion reduction in employment costs thanks to AI-enabled automation of knowledge work; cost reductions of \$8 trillion in

manufacturing and health care; and \$2 trillion in efficiency gains from the deployment of self-driving cars and drones. The McKinsey Global Institute, a think-tank, says AI is contributing to a transformation of society “happening ten times faster and at 300 times the scale, or roughly 3,000 times the impact” of the Industrial Revolution.

Just as people did two centuries ago, many fear that machines will make millions of workers redundant, causing inequality and unrest. Martin Ford, the author of two bestselling books on the dangers of automation, worries that middle-class jobs will vanish, economic mobility will cease and a wealthy plutocracy could “shut itself away in gated communities or in elite cities, perhaps guarded by autonomous military robots and drones”. Others fear that AI poses an existential threat to humanity, because superintelligent computers might not share mankind’s goals and could turn on their creators. Such concerns have been expressed, among others, by Stephen Hawking, a physicist, and more surprisingly by Elon Musk, a billionaire technology entrepreneur who founded SpaceX, a rocket company, and Tesla, a maker of electric cars. Echoing Carlyle, Mr Musk warns that “with artificial intelligence, we’re summoning the demon.” His Tesla cars use the latest AI technology to drive themselves, but Mr Musk frets about a future AI overlord becoming too powerful for humans to control. “It’s fine if you’ve got Marcus Aurelius as the emperor, but not so good if you have Caligula,” he says.

| *It’s all Go*

Such concerns have been prompted by astonishing recent progress in AI, a field long notorious for its failure to deliver on its promises. “In the past couple of years it’s just completely exploded,” says Demis Hassabis, the boss and co-founder of DeepMind, an AI startup bought by Google in 2014 for \$400m. Earlier this year his firm’s AlphaGo system defeated Lee Sedol, one of the world’s best players of Go, a board game so complex that

computers had not been expected to master it for another decade at least. “I was a sceptic for a long time, but the progress now is real. The results are real. It works,” says Marc Andreessen of Andreessen Horowitz, a Silicon Valley venture-capital firm.

In particular, an AI technique called “deep learning”, which allows systems to learn and improve by crunching lots of examples rather than being explicitly programmed, is already being used to power internet search engines, block spam e-mails, suggest e-mail replies, translate web pages, recognise voice commands, detect credit-card fraud and steer self-driving cars. “This is a big deal,” says Jen-Hsun Huang, chief executive of NVIDIA, a firm whose chips power many AI systems. “Instead of people writing software, we have data writing software.”

Where some see danger, others see opportunity. Investors are piling into the field. Technology giants are buying AI startups and competing to attract the best researchers from academia. In 2015 a record \$8.5 billion was spent on AI companies, nearly four times as much as in 2010, according to Quid, a data-analysis company. The number of investment rounds in AI companies in 2015 was 16% up on the year before, when for the technology sector as a whole it declined by 3%, says Nathan Benaich of Playfair Capital, a fund that has 25% of its portfolio invested in AI. “It’s the Uber for X” has given way to “It’s X plus AI” as the default business model for startups. Google, Facebook, IBM, Amazon and Microsoft are trying to establish ecosystems around AI services provided in the cloud. “This technology will be applied in pretty much every industry out there that has any kind of data—anything from genes to images to language,” says Richard Socher, founder of MetaMind, an AI startup recently acquired by Salesforce, a cloud-computing giant. “AI will be everywhere.”

What will that mean? This special report will examine the rise of this new technology, explore its potential impact on jobs, education and policy, and

consider its ethical and regulatory implications. Along the way it will consider the lessons that can be learned from the original response to the machinery question. AI excites fear and enthusiasm in equal measure, and raises a lot of questions. Yet it is worth remembering that many of those questions have been asked, and answered, before. ■



人工智能

重提机器问题

多番出师不利后，人工智能发展已经起飞。这会否导致大规模失业，甚至毁灭人类？*汤姆·斯丹迪奇表示，历史可以提供有益的启示*

新型机器将抢走人们的工作，摧毁社会，只有少数人获益，这样的忧虑似曾相识。两个世纪前，随着工业化进程扎根英国，同样的忧虑引发过激烈争论。当时人们不说那是“工业革命”，而称之为“机器问题”。经济学家大卫·李嘉图（David Ricardo）在1821年首创这一名词，它担忧“机器对社会不同阶层利益的影响”，尤其关注“劳动阶层认为机器应用往往有害其利益的观点”。托马斯·卡莱尔（Thomas Carlyle）在1839年对“恶魔般的机器”口诛笔伐，指责其破坏力“颠覆了许许多多工人的生计”。

今天，机器问题以新的面目卷土重来。技术专家、经济学家和哲学家们正热议人工智能（AI）的影响，这一迅速发展的技术使机器能够执行之前只能由人类完成的任务，其影响可能十分深远。从放射科医师到法律文员，这些原本看似不可能被自动化的工作岗位如今都受到了威胁。牛津大学的卡尔·本尼迪克特·弗雷（Carl Benedikt Frey）和迈克尔·奥斯本（Michael Osborne）在2013年发表了一项被广为引用的研究，其中发现美国有47%职位属于快将被“计算机资本取代”的高危岗位。美国美林银行最近预测，到2025年，AI每年造成的“创造性颠覆的影响”可能达到140亿至330亿美元，包括因AI技术令知识工作自动化而减少的90亿美元雇佣成本、制造及医疗保健业降低的80亿美元的成本，以及因使用自动驾驶汽车和无人机提升效率而节省的20亿美元。智库机构麦肯锡全球研究院表示，相比工业革命时期，现在AI技术掀起的变革“速度要快上10倍，规模要大上300倍，影响约扩大3000倍”。

正如两个世纪前的人们那样，现在许多人担心机器会令数百万工人失业，造成不平等和动荡。马丁·福特（Martin Ford）就自动化威胁著有畅销书，他担忧中产职位将消失，经济将不再具有流动性，富豪统治阶层可能“躲在封闭小区或精英城市中，或许还有自动武装机器人和无人机守

卫”。也有人担心AI对人类生存构成威胁，因为超级智能计算机不一定认同人类的目标，有可能转而对抗其创造者。提出过这类担忧的包括物理学家斯蒂芬·霍金，更让人惊讶的是还有创立火箭公司SpaceX及电动汽车公司特斯拉的科技亿万富豪埃隆·马斯克。马斯克同意卡莱尔的观点，警告说“创造出人工智能，我们是在召唤魔鬼”。特斯拉汽车采用最新的AI技术实现自动驾驶功能，但马斯克担心未来的超级AI会强大到人类无法控制。“马可·奥勒留（Marcus Aurelius，罗马皇帝、哲学家）当皇帝很好，但换成卡里古拉（Caligula，罗马暴君——译注）就不那么好了。”他说道。

| 棋局开始

AI领域长久以来都是雷声大雨点小，但近期进展迅猛，引发了上述忧虑。“过去几年完全是爆炸性发展。”德米斯·哈萨比斯（Demis Hassabis）说道，他是AI创业公司DeepMind的老板及联合创始人，该公司在2014年被谷歌以四亿美元收购。今年早些时候，DeepMind的AlphaGo系统击败了世界围棋顶尖选手之一李世石。围棋是极为复杂的智力竞技，之前人们估计计算机至少要再过十年才能掌握。“很长一段时间我是持怀疑态度的，但现在进展摆在面前。成果是真的。技术是可行的。”硅谷风投公司安德森·霍洛维茨（Andreessen Horowitz）的马克·安德森（Marc Andreessen）说道。

特别是被称作“深度学习”的AI技术，能让系统无需明确编程，而是通过消化大量实例来学习和提升。该技术已被用于支持互联网搜索引擎、拦截垃圾邮件、建议电邮自动回复、翻译网页、识别语音指令、检测信用卡欺诈及操控自动驾驶汽车。“这是件大事，”NVIDIA的首席执行官黄仁勋说道，其公司生产的芯片为众多AI系统所用，“我们无须人工编写软件，而是让数据自行编写软件。”

有人看到了危险，也有人看到了机会。投资者纷纷涌入该领域。科技巨头正大举收购AI创业公司，竞相从学术界吸引最优秀的科研人员。数据分析公司Quid称，2015年对AI公司的投资达到破纪录的85亿美元，几乎是2010年的四倍。AI公司获得的投资轮数在2015年同比增长16%，而科技业整体水平则下降了3%，风投公司普雷费尔资本（Playfair Capital）的内森·比纳

什（Nathan Benaich）说道，其基金投资组合中AI领域占25%。创业公司的默认商业模式已从“X领域的优步”变成“X加AI”。谷歌、Facebook、IBM、亚马逊及微软正努力围绕云端提供的AI服务打造生态系统。“从基因到图像再到语言，几乎每个涉及任何数据的行业都将应用到这一技术。”MetaMind的创始人理查德·索切（Richard Socher）说道。这家AI创业公司最近已被云计算巨头Salesforce收购。“AI将无处不在。”

那将意味着什么？本期特别报道将讨论这一新技术的崛起，探讨其对就业、教育及政策的潜在冲击，分析对伦理及监管的影响。同时，本专题将回顾早期人们对于“机器问题”的反应，审视其中的教训。AI激发的恐惧与热情参半，还引发连串疑问。然而，值得注意的是，许多问题之前就已经提出，而且已有了答案。■



Technology

From not working to neural networking

The artificial-intelligence boom is based on an old idea, but with a modern twist

HOW HAS ARTIFICIAL intelligence, associated with hubris and disappointment since its earliest days, suddenly become the hottest field in technology? The term was coined in a research proposal written in 1956 which suggested that significant progress could be made in getting machines to “solve the kinds of problems now reserved for humans...if a carefully selected group of scientists work on it together for a summer”. That proved to be wildly overoptimistic, to say the least, and despite occasional bursts of progress, AI became known for promising much more than it could deliver. Researchers mostly ended up avoiding the term, preferring to talk instead about “expert systems” or “neural networks”. The rehabilitation of “AI”, and the current excitement about the field, can be traced back to 2012 and an online contest called the ImageNet Challenge.

ImageNet is an online database of millions of images, all labelled by hand. For any given word, such as “balloon” or “strawberry”, ImageNet contains several hundred images. The annual ImageNet contest encourages those in the field to compete and measure their progress in getting computers to recognise and label images automatically. Their systems are first trained using a set of images where the correct labels are provided, and are then challenged to label previously unseen test images. At a follow-up workshop the winners share and discuss their techniques. In 2010 the winning system could correctly label an image 72% of the time (for humans, the average is 95%). In 2012 one team, led by Geoff Hinton at the University of Toronto, achieved a jump in accuracy to 85%, thanks to a novel technique known as “deep learning”. This brought further rapid improvements, producing an accuracy of 96% in the ImageNet Challenge in 2015 and

surpassing humans for the first time.

The 2012 results were rightly recognised as a breakthrough, but they relied on “combining pieces that were all there before”, says Yoshua Bengio, a computer scientist at the University of Montreal who, along with Mr Hinton and a few others, is recognised as a pioneer of deep learning. In essence, this technique uses huge amounts of computing power and vast quantities of training data to supercharge an old idea from the dawn of AI: so-called artificial neural networks (ANNs). These are biologically inspired networks of artificial neurons, or brain cells.

In a biological brain, each neuron can be triggered by other neurons whose outputs feed into it, and its own output can then trigger other neurons in turn. A simple ANN has an input layer of neurons where data can be fed into the network, an output layer where results come out, and possibly a couple of hidden layers in the middle where information is processed. (In practice, ANNs are simulated entirely in software.) Each neuron within the network has a set of “weights” and an “activation function” that controls the firing of its output. Training a neural network involves adjusting the neurons’ weights so that a given input produces the desired output (see diagram). ANNs were starting to achieve some useful results in the early 1990s, for example in recognising handwritten numbers. But attempts to get them to do more complex tasks ran into trouble.

In the past decade new techniques and a simple tweak to the activation function has made training deep networks feasible. At the same time the rise of the internet has made billions of documents, images and videos available for training purposes. All this takes a lot of number-crunching power, which became readily available when several AI research groups realised around 2009 that graphical processing units (GPUs), the specialised chips used in PCs and video-games consoles to generate fancy graphics, were also well suited to running deep-learning algorithms. An AI

research group at Stanford University led by Andrew Ng, who subsequently moved to Google and now works for Baidu, a Chinese internet giant, found that GPUs could speed up its deep-learning system nearly a hundredfold. Suddenly, training a four-layer neural network, which had previously taken several weeks, took less than a day. It is a pleasing symmetry, says Jen-Hsun Huang, the boss of NVIDIA, which makes GPUs, that the same chips that are used to conjure up imaginary worlds for gamers can also be used to help computers understand the real world through deep learning.

The ImageNet results showed what deep learning could do. Suddenly people started to pay attention, not just within the AI community but across the technology industry as a whole. Deep-learning systems have since become more powerful: networks 20 or 30 layers deep are not uncommon, and researchers at Microsoft have built one with 152 layers. Deeper networks are capable of higher levels of abstraction and produce better results, and these networks have proved to be good at solving a very wide range of problems.

“What got people excited about this field is that one learning technique, deep learning, can be applied to so many different domains,” says John Giannandrea, head of machine-intelligence research at Google and now in charge of its search engine too. Google is using deep learning to boost the quality of its web-search results, understand commands spoken into smartphones, help people search their photos for particular images, suggest automatic answers to e-mails, improve its service for translating web pages from one language to another, and help its self-driving cars understand their surroundings.

| *Learning how to learn*

Deep learning comes in many flavours. The most widely used variety is “supervised learning”, a technique that can be used to train a system with the aid of a labelled set of examples. For e-mail spam filtering, for example,

it is possible to assemble an enormous database of example messages, each of which is labelled “spam” or “not spam”. A deep-learning system can be trained using this database, repeatedly working through the examples and adjusting the weights inside the neural network to improve its accuracy in assessing spamminess. The great merit of this approach is that there is no need for a human expert to draw up a list of rules, or for a programmer to implement them in code; the system learns directly from the labelled data.

Systems trained using labelled data are being used to classify images, recognise speech, spot fraudulent credit-card transactions, identify spam and malware, and target advertisements—all applications in which the right answer is known for a large number of previous cases. Facebook can recognise and tag your friends and family when you upload a photograph, and recently launched a system that describes the contents of photographs for blind users (“two people, smiling, sunglasses, outdoor, water”). There is a huge reservoir of data to which supervised learning can be applied, says Mr Ng. Adoption of the technology has allowed existing firms in financial services, computer security and marketing to relabel themselves as AI companies.

Another technique, unsupervised learning, involves training a network by exposing it to a huge number of examples, but without telling it what to look for. Instead, the network learns to recognise features and cluster similar examples, thus revealing hidden groups, links or patterns within the data.

Unsupervised learning can be used to search for things when you do not know what they look like: for monitoring network traffic patterns for anomalies that might correspond to a cyber-attack, for example, or examining large numbers of insurance claims to detect new kinds of fraud. In a famous example, when working at Google in 2011, Mr Ng led a project called Google Brain in which a giant unsupervised learning system was

asked to look for common patterns in thousands of unlabelled YouTube videos. One day one of Mr Ng's PhD students had a surprise for him. "I remember him calling me over to his computer and saying, 'look at this,'" Mr Ng recalls. On the screen was a furry face, a pattern distilled from thousands of examples. The system had discovered cats.

Reinforcement learning sits somewhere in between supervised and unsupervised learning. It involves training a neural network to interact with an environment with only occasional feedback in the form of a reward. In essence, training involves adjusting the network's weights to search for a strategy that consistently generates higher rewards. DeepMind is a specialist in this area. In February 2015 it published a paper in *Nature* describing a reinforcement-learning system capable of learning to play 49 classic Atari video games, using just the on-screen pixels and the game score as inputs, with its output connected to a virtual controller. The system learned to play them all from scratch and achieved human-level performance or better in 29 of them.

| *Gaming the system*

Video games are an ideal training ground for AI research, says Demis Hassabis of DeepMind, because "they are like microcosms of the real world, but are cleaner and more constrained." Gaming engines can also generate large quantities of training data very easily. Mr Hassabis used to work in the video-games industry before taking a PhD in cognitive neuroscience and starting DeepMind. The company now operates as an AI research arm for Google, from offices near King's Cross station in London.

DeepMind made headlines in March when its AlphaGo system defeated Lee Sedol, one of the world's best Go players, by 4-1 in a five-game match in Seoul. AlphaGo is a reinforcement-learning system with some unusual features. It consists of several interconnected modules, including two deep neural networks, each of which specialises in a different thing—just like

the modules of the human brain. One of them has been trained by analysing millions of games to suggest a handful of promising moves, which are then evaluated by the other one, guided by a technique that works by random sampling. The system thus combines biologically inspired techniques with non-biologically inspired ones. AI researchers have argued for decades over which approach is superior, but AlphaGo uses both. “It’s a hybrid system because we believe we’re going to need more than deep learning to solve intelligence,” says Mr Hassabis.

He and other researchers are already looking to the next step, called transfer learning. This would allow a reinforcement-learning system to build on previously acquired knowledge, rather than having to be trained from scratch every time. Humans do this effortlessly, notes Mr Hassabis. Mr Giannandrea recalls that his four-year-old daughter was able to tell that a penny-farthing was a kind of bicycle even though she had never seen one before. “Computers can’t do that,” he says.

MetaMind, an AI startup recently acquired by Salesforce, is pursuing a related approach called multitask learning, where the same neural-network architecture is used to solve several different kinds of problems in such a way that experience of one thing makes it better at another. Like DeepMind, it is exploring modular architectures; one of them, called a “dynamic memory network”, can, among other things, ingest a series of statements and then answer questions about them, deducing the logical connections between them (Kermit is a frog; frogs are green; so Kermit is green). MetaMind has also combined natural-language and image-recognition networks into a single system that can answer questions about images (“What colour is the car?”). Its technology could be used to power automated customer-service chatbots or call-centres for Salesforce’s customers.

In the past, promising new AI techniques have tended to run out of steam

quickly. But deep learning is different. “This stuff actually works,” says Richard Socher of MetaMind. People are using it every day without realising it. The long-term goal to which Mr Hassabis, Mr Socher and others aspire is to build an “artificial general intelligence” (AGI)—a system capable of solving a wide range of tasks—rather than building a new AI system for each problem. For years, AI research has focused on solving specific, narrow problems, says Mr Socher, but now researchers are “taking these more advanced Lego pieces and putting them together in new ways”. Even the most optimistic of them think it will take another decade to attain human-level AGI. But, says Mr Hassabis, “we think we know what the dozen or so key things are that are required to get us close to something like AGI.”

Meanwhile AI is already useful, and will rapidly become more so. Google’s Smart Reply system, which uses two neural networks to suggest answers to e-mails, went from being a deep-learning research project to a live product in just four months (though initially it had to be discouraged from suggesting the reply “I love you” to nearly every message). “You can publish a paper in a research journal and literally have a company use that system the next month,” says Mr Socher. There is a steady flow of academic papers from AI companies both large and small; AI researchers have been allowed to continue publishing their results in peer-reviewed journals, even after moving into industry. Many of them maintain academic posts alongside working for companies. “If you won’t let them publish, they won’t work for you,” explains Chris Dixon of Andreessen Horowitz.

Google, Facebook, Microsoft, IBM, Amazon, Baidu and other firms have also made some of their deep-learning software available free on an open-source basis. In part, this is because their researchers want to publish what they are doing, so it helps with recruitment. A more cynical view is that big internet firms can afford to give away their AI software because they have a huge advantage elsewhere: access to reams of user data for training purposes. This gives them an edge in particular areas, says Shivon Zilis of

Bloomberg Beta, an investment fund, but startups are finding ways into specific markets. Drone startups, for example, can use simulation data to learn how to fly in crowded environments. And lots of training data can be found on the internet, says Sam Altman, president of Y Combinator, a startup incubator. He notes that humans can learn from modest amounts of data, which “suggests that intelligence is possible without massive training sets”. Startups pursuing less data-hungry approaches to AI include Numenta and Geometric Intelligence.

| *Pick and mix*

Companies are lining up to supply shovels to participants in this AI gold rush. The name that comes up most frequently is NVIDIA, says Mr Dixon; every AI startup seems to be using its GPU chips to train neural networks. GPU capacity can also be rented in the cloud from Amazon and Microsoft. IBM and Google, meanwhile, are devising new chips specifically built to run AI software more quickly and efficiently. And Google, Microsoft and IBM are making AI services such as speech recognition, sentence parsing and image analysis freely available online, allowing startups to combine such building blocks to form new AI products and services. More than 300 companies from a range of industries have already built AI-powered apps using IBM’s Watson platform, says Guru Banavar of IBM, doing everything from filtering job candidates to picking wines.

To most people, all this progress in AI will manifest itself as incremental improvements to internet services they already use every day. Search engines will produce more relevant results; recommendations will be more accurate. Within a few years everything will have intelligence embedded in it to some extent, predicts Mr Hassabis. AI technology will allow computer interfaces to become conversational and predictive, not simply driven by menus and icons. And being able to talk to computers will make them accessible to people who cannot read and write, and cannot currently use

the internet, says Mr Bengio.

Yet steady improvements can lead to sudden changes when a threshold is reached and machines are able to perform tasks previously limited to humans. Self-driving cars are getting better fast; at some point soon they may be able to replace taxi drivers, at least in controlled environments such as city centres. Delivery drones, both wheeled and airborne, could similarly compete with human couriers. Improved vision systems and robotic technology could allow robots to stack supermarket shelves and move items around in warehouses. And there is plenty of scope for unexpected breakthroughs, says Mr Dixon.

Others are worried, fearing that AI technology could supercharge the existing computerisation and automation of certain tasks, just as steam power, along with new kinds of machinery, seemed poised to make many workers redundant 200 years ago. “Steam has fearfully accelerated a process that was going on already, but too fast,” declared Robert Southey, an English poet. He worried that “the discovery of this mighty power” has come “before we knew how to employ it rightly”. Many people feel the same way about artificial intelligence today. ■



科技

神经网络进化记

旧创意加新发展，成就人工智能繁荣

人工智能技术从一开始就充满了狂妄自大，表现却往往不如人意，如何在突然之间成为当今科技界头号热门领域？“人工智能”（AI）一词由1956年撰写的一份研究计划首先使用，该计划提出，“只要精选一批科学家共同努力一个夏季”，人们在运用机器“解决目前只能由人力处理的问题”上将取得重大进展。现在看来，至少可以说那太过乐观了。尽管偶尔有所进展，AI雷声大雨点小已经出了名。研究人员大多最终避免使用AI这一术语，而是更喜欢谈论“专家系统”或“神经网络”。AI一词的复兴和现在人们对该领域的热情可追溯至2012年一场名为“ImageNet挑战赛”的网络比赛。

ImageNet是一个存有数百万图像的在线数据库，所有图片都由人工标记。对于任意单词（如“气球”或“草莓”），ImageNet都有数百张与之对应的图像。每年一度的ImageNet比赛鼓励业内人士较量及衡量其在运用计算机自动识别和标记图像上取得的进展。他们先以正确标记的图像集对系统进行训练，然后让系统尝试标记之前未曾见过的测试图像。在后续的研讨环节，优胜者会分享并讨论其技术。2010年获胜系统的图像标记准确率为72%（人类的平均准确率为95%）。2012年，由多伦多大学教授杰夫·辛顿（Geoff Hinton）带领的参赛团队凭借名为“深度学习”的新技术令准确率跃升至85%。这带动了新一轮的快速进展，2015年的ImageNet挑战赛上，准确率达到96%，首次超越人类水平。

将2012年的比赛结果视为突破无可非议，但那依赖“把已有的零碎成果结合起来”，蒙特利尔大学的计算机科学家约舒华·本吉奥（Yoshua Bengio）说。他与辛顿等人一道被认为是深度学习领域的先驱。简要来说，这种技术是以庞大的计算能力及海量训练数据来推进AI初期的一个旧创意：所谓的人工神经网络（ANN），也就是仿生人工神经元网络或脑细胞网络。

在生物大脑中，每个神经元接收到其他神经元输出的信息后会被激发，而

它自身的输出又继而激发其他的神经元。简单的ANN具有一个神经元输入层，可把数据输入网络，还有一个呈现结果的输出层，中间则可能有多个处理信息的隐藏层。（实际的ANN完全是用软件模拟的。）网络内的每一个神经元都有一组“权重”及一个“激活函数”来控制发送输出。神经网络的训练涉及调整神经元的权重，令指定输入产生目标输出（见图表）。ANN在上世纪90年代初已开始取得一些有用成果，例如识别手写数字。但在尝试完成更复杂的任务时，ANN遇到了困难。

过去十年中，新技术以及对激活函数的简单改进已令训练深度神经网络成为可能。同时，互联网的兴起带来了数十亿份文档、图片及视频可供训练之用。这一切都需要庞大的数字处理能力。而自从2009年前后，多个AI研究团队意识到PC和电子游戏机中用以生成炫丽图像的图形处理器（GPU）也非常适用于运行深度学习算法之后，如今资源已变得十分容易获得。斯坦福大学的吴恩达（他之后转投谷歌，目前供职于中国互联网巨头百度）带领的AI研究团队发现GPU可使其深度学习系统加速近百倍。突然之间，训练四层结构的神经网络所需时间从原来的数周变为不到一天。GPU制造公司NVIDIA的老板黄仁勋表示，用来给游戏玩家呈现幻想世界的芯片，恰恰可用来帮助计算机通过深度学习解读现实世界，这种对照令人欣喜。

ImageNet竞赛的结果展示了深度学习的能力。人们忽然开始关注这一技术，不仅是AI圈，整个高科技界都聚焦于此。深度学习系统之后变得更为强大：20或30层的深度网络已不稀奇，微软的研究人员已打造出具有152层神经元的神经网络。更深层的网络能处理更抽象的信息并得出更好的结果，实践证明这些网络能有效解决诸多类型的问题。

“人们为此雀跃是因为‘深度学习’这一学习技术可应用于许多不同领域。”谷歌机器智能研究项目负责人、现在掌管其搜索引擎业务的约翰·詹南德雷亚（John Giannandrea）说。谷歌正利用深度学习提升其网络搜索结果的质量，解读向智能手机收到的语音命令，协助人们在其图库中搜寻特定图片，为电子邮件提出自动回复建议，改善网页翻译服务，以及帮助其自动驾驶汽车了解周边环境。

| 学习如何学习

深度学习有多种形式。最广为采用的是“监督式学习”，即在已标记样本数据集的帮助下训练系统的一种技术。比如，要过滤垃圾邮件，可以组建庞大的样本数据库，其中所有的邮件样本都被标记为“垃圾邮件”或“非垃圾邮件”。深度学习系统可利用该数据库进行训练，反复识别样本并调整神经网络内的权重，以此提高识别垃圾邮件的准确度。这一方法的最大优点是无需人类专家制订规则，也无需程序员把规则编写成代码，而由系统直接从已标记数据中学习。

经过已标记数据训练的系统被用来分类图像、识别语音、发现信用卡欺诈交易、辨别垃圾邮件和恶意软件、定向投放广告——所有这些应用都通过大量先例得出正确答案。Facebook能在你上传照片时识别并标记你的亲友，最近更推出一套可为盲人用户描述图片内容的系统（“两个人，面带微笑，太阳镜，户外，水”）。吴恩达说，可使用监督式学习的数据极其庞大。现在金融服务、计算机安全及市场营销等方面的企业在采用该技术后都可给自己贴上AI公司的新标签。

另一种“非监督式学习”技术，则训练网络处理大量样本，却不指明搜寻目标。相反，网络会学习自己分辨特征并归类相似实例，继而在数据中发掘隐藏的群组、联系或模式。

非监督式学习可用于搜索形态未知的事物：比如用于监控网络流量模式，排查可能是网络攻击引起的异常情况，或从大量保险索赔个案中查探新型欺诈模式。一个著名案例是，2011年吴恩达在谷歌工作时曾主管名为“谷歌大脑”的项目，其中一个大型非监督式学习系统要从成千上万无标记的YouTube视频中找出共同图案。有一天，吴恩达的博士生给他传来了惊喜消息。吴恩达回忆道，“我记得他把我叫到他的计算机前，然后说，‘看这个’”。屏幕上是一毛茸茸的一张脸，那是从数以千计的视频样本中提取出来的。系统从中发现了猫。

强化学习介乎监督式学习和非监督式学习之间。它训练神经网络与特定环境互动，仅偶尔以奖励的形式提供反馈。基本上，这种训练会调整网络的

权重来寻找一种可持续产生更多奖励的策略。DeepMind公司专精此道。2015年2月，该公司在《自然》杂志上发表文章，介绍了一套能学习玩49款雅达利经典电子游戏的强化学习系统，仅需以屏幕上的像素和游戏得分作为输入数据，系统输出则与虚拟控制器相连。该系统能从零开始，学会玩所有这些游戏，并在29款游戏中达到或超出人类玩家的水平。

| 游戏练级

DeepMind的德米斯·哈萨比斯（Demis Hassabis）表示，电子游戏是AI研究的理想训练场，因为“这些游戏就像是现实世界的缩影，但更加干净，约束也更多。”游戏引擎也可以轻易生成大量训练数据。哈萨比斯曾在电子游戏行业工作，之后取得了认知神经科学博士学位并创立了DeepMind。公司如今为谷歌旗下的AI研究机构，办公室位于伦敦国王十字（King's Cross）车站附近。

今年三月，DeepMind的AlphaGo系统在韩国首尔的五番棋比赛中以四胜一负击败了世界顶尖棋手李世石，引来各界瞩目。AlphaGo是一个强化学习系统，还有一些不同寻常的特点。它由多个相互连接的模块构成，包括两个深度神经网络，各自专注不同任务，如同人类大脑的不同部分一样。其中一个模块以分析数百万盘棋局作为训练，可建议出胜算较高的几着走法，然后由另一模块在利用随机抽样的技术引导下进行评估。该系统因而结合了仿生技术和非仿生技术。AI研究者对于哪一种方法更为优越已争论多年，但AlphaGo同时运用了两者。“这是一个混合系统，因为我们认为，单凭深度学习解决不了智能问题。”哈萨比斯说道。

他和其他研究人员已着眼下一步——“迁移学习”。这使强化学习系统可在先前获得的知识基础上进行拓展，而不必每次都从头开始训练。哈萨比斯指出，人类可以毫不费力地做到这一点。詹南德雷亚回想起他四岁的女儿尽管从没见过前轮大后轮小的老式自行车，但她会知道那是自行车的一种。“计算机做不到这一点。”他说。

最近被Salesforce收购的AI创业公司MetaMind正在研发相关方法，名为“多任务学习”。在该方法下，系统在一个任务中获得的经验可以提升做另一

任务时的表现。如此一来，同样的神经网络架构可以用来处理多种不同类型的问题。和DeepMind一样，该公司正在探索模块化架构；其中一种名为“动态记忆网络”的架构可完成多种任务，包括读取一系列语句，然后回答有关问题，推导语句之间的逻辑关系（克米特是青蛙；青蛙是绿色的；所以克米特是绿色的）等。MetaMind也把自然语言及图像识别网络结合到同一个系统中，使系统可回答关于图像的问题（“这辆车是什么颜色的？”）。其技术可用于Salesforce公司的自动客服聊天机器人或电话客服中心。

过去，前景大好的AI新技术往往很快就失去动力。但深度学习与此不同。“这东西真的能用。”MetaMind的理查德·索切（Richard Socher）说道。人们每天都在不知不觉地使用这一技术。哈萨比斯及索切等人的长远目标是要打造一套“通用人工智能”系统（AGI，即可以完成各种不同任务的系统），而不必为每个问题都新建一个AI系统。索切表示，AI研究多年来一直专注于解决小范围的具体问题，但如今研究人员正“把这些更先进的乐高积木以新方式组合起来”。连他们当中最乐观的人也认为AGI要在十年后才能达到人类的水平。但哈萨比斯说：“我们认为我们已经知道，要进一步研发像AGI这样的东西，必需的十来个关键技术是什么。”

同时，AI已经投入实用，且用途将迅速扩大。谷歌的智能回复系统运用两个神经网络为电邮提供建议回复，这一系统从深度学习的研究项目到成为实际产品仅花了四个月时间（虽然最初需要告诫系统不要给每一封邮件都回复“我爱你”）。“你在研究期刊上发表一篇论文，然后下个月就真的有公司用上那套系统了。”索切说道。大小AI公司发表的学术论文源源不绝；AI研究学者即便投身产业界也可继续在同行评审期刊上发表成果。他们当中许多人在效力企业的同时保留了学术职位。“如果你不让他们发表文章，他们就不愿意为你工作。”风投公司安德森·霍洛维茨（Andreessen Horowitz）的克里斯·迪克森（Chris Dixon）说道。

谷歌、Facebook、微软、IBM、亚马逊、百度等公司已通过开源方式免费提供了它们的一些深度学习软件。这部分是因为其研究人员希望向外界发布自己正在研发的内容，便于招徕人才。更冷眼地看，大型互联网企业不

惜公开其AI软件是因为它们在其他方面可以享受巨大利益：得到庞大的用户数据供训练系统之用。投资基金Bloomberg Beta的施梵·斯里思（Shivon Zilis）表示，这使它们在特定领域取得优势，但创业公司也正想方设法打入专业市场。例如，无人机创业公司可利用模拟数据学习如何在拥挤的环境中飞行。而且在互联网上可以找到大量的训练数据，创业孵化器Y Combinator的总裁山姆·奥特曼（Sam Altman）表示。他指出，人类可以通过少量的数据训练学习，这“表明无须大量的训练数据集也可成就智能”。研究训练数据量需求较低的方法的创业企业包括Numenta及“几何智能”（Geometric Intelligence）。

| 挑选并组合

企业纷纷准备为投身这番AI淘金热的人士提供铁锹。迪克森说，最常被提及的公司是NVIDIA，似乎所有AI创业企业都在用该公司的GPU芯片来训练神经网络。亚马逊和微软的云服务也提供GPU运算能力的租用服务。同时，IBM和谷歌正在设计能更快更高效运行AI软件的新型专用芯片。而且谷歌、微软及IBM正免费提供在线语音识别、句法分析及图像分析等AI服务，创业企业可结合这些基础模块打造新的AI产品和服务。IBM的古鲁·巴纳瓦尔（Guru Banavar）表示，来自各个行业的300多家企业已经运用IBM的沃森平台打造出各种AI应用，完成从筛选应聘者到挑选葡萄酒等各种任务。

对大多数人来说，AI所有这些进展都会体现在日常使用的互联网服务的点滴进步上。搜索引擎会展现相关度更高的结果，建议将更为精准。哈萨比斯预计，在几年内，各种产品都会在一定程度上有人工智能嵌入其中。AI技术会使计算机界面变得更有对话性和预测性，而非仅仅由菜单及图标操控。无法读写文字以及目前无法使用互联网的人可以通过与计算机对话来操纵它们，本吉奥说道。

然而，稳步改善累积至临界点时就会引发突变，机器将可以执行之前仅限于人类完成的任务。自动驾驶汽车正迅速改进，也许很快就能取代出租车司机，至少在城市中心这类受控环境中是如此。轮式及空中快递无人机同样可与人类快递员竞争。视觉系统及机器人技术的改进令机器人可以堆放

超市货架并在仓库中搬运货物。迪克森表示，还有充分空间来实现意想不到的突破。

其他人则担心AI技术会加剧某些任务现有的计算化及自动化程度，会像200年前蒸汽动力和新型机械致使众多工人失业那样。“蒸汽让已经发生的进程惊人地加速，但太快了。”英国当时一位诗人罗伯特·骚塞（Robert Southey）宣称。他担心“这种强大力量被开发出来”，而“我们还不知道如何正确运用它”。今天，许多人对于人工智能也有同感。■



The impact on jobs

Automation and anxiety

Will smarter machines cause mass unemployment?

SITTING IN AN office in San Francisco, Igor Barani calls up some medical scans on his screen. He is the chief executive of Enlitic, one of a host of startups applying deep learning to medicine, starting with the analysis of images such as X-rays and CT scans. It is an obvious use of the technology. Deep learning is renowned for its superhuman prowess at certain forms of image recognition; there are large sets of labelled training data to crunch; and there is tremendous potential to make health care more accurate and efficient.

Dr Barani (who used to be an oncologist) points to some CT scans of a patient's lungs, taken from three different angles. Red blobs flicker on the screen as Enlitic's deep-learning system examines and compares them to see if they are blood vessels, harmless imaging artefacts or malignant lung nodules. The system ends up highlighting a particular feature for further investigation. In a test against three expert human radiologists working together, Enlitic's system was 50% better at classifying malignant tumours and had a false-negative rate (where a cancer is missed) of zero, compared with 7% for the humans. Another of Enlitic's systems, which examines X-rays to detect wrist fractures, also handily outperformed human experts. The firm's technology is currently being tested in 40 clinics across Australia.

A computer that dispenses expert radiology advice is just one example of how jobs currently done by highly trained white-collar workers can be automated, thanks to the advance of deep learning and other forms of artificial intelligence. The idea that manual work can be carried out by machines is already familiar; now ever-smarter machines can perform

tasks done by information workers, too. What determines vulnerability to automation, experts say, is not so much whether the work concerned is manual or white-collar but whether or not it is routine. Machines can already do many forms of routine manual labour, and are now able to perform some routine cognitive tasks too. As a result, says Andrew Ng, a highly trained and specialised radiologist may now be in greater danger of being replaced by a machine than his own executive assistant: “She does so many different things that I don’t see a machine being able to automate everything she does any time soon.”

So which jobs are most vulnerable? In a widely noted study published in 2013, Carl Benedikt Frey and Michael Osborne examined the probability of computerisation for 702 occupations and found that 47% of workers in America had jobs at high risk of potential automation. In particular, they warned that most workers in transport and logistics (such as taxi and delivery drivers) and office support (such as receptionists and security guards) “are likely to be substituted by computer capital”, and that many workers in sales and services (such as cashiers, counter and rental clerks, telemarketers and accountants) also faced a high risk of computerisation. They concluded that “recent developments in machine learning will put a substantial share of employment, across a wide range of occupations, at risk in the near future.” Subsequent studies put the equivalent figure at 35% of the workforce for Britain (where more people work in creative fields less susceptible to automation) and 49% for Japan.

Economists are already worrying about “job polarisation”, where middle-skill jobs (such as those in manufacturing) are declining but both low-skill and high-skill jobs are expanding. In effect, the workforce bifurcates into two groups doing non-routine work: highly paid, skilled workers (such as architects and senior managers) on the one hand and low-paid, unskilled workers (such as cleaners and burger-flippers) on the other. The stagnation of median wages in many Western countries is cited as evidence that

automation is already having an effect—though it is hard to disentangle the impact of offshoring, which has also moved many routine jobs (including manufacturing and call-centre work) to low-wage countries in the developing world. Figures published by the Federal Reserve Bank of St Louis show that in America, employment in non-routine cognitive and non-routine manual jobs has grown steadily since the 1980s, whereas employment in routine jobs has been broadly flat (see chart). As more jobs are automated, this trend seems likely to continue.

And this is only the start. “We are just seeing the tip of the iceberg. No office job is safe,” says Sebastian Thrun, an AI professor at Stanford known for his work on self-driving cars. Automation is now “blind to the colour of your collar”, declares Jerry Kaplan, another Stanford academic and author of “Humans Need Not Apply”, a book that predicts upheaval in the labour market. Gloomiest of all is Martin Ford, a software entrepreneur and the bestselling author of “Rise of the Robots”. He warns of the threat of a “jobless future”, pointing out that most jobs can be broken down into a series of routine tasks, more and more of which can be done by machines.

In previous waves of automation, workers had the option of moving from routine jobs in one industry to routine jobs in another; but now the same “big data” techniques that allow companies to improve their marketing and customer-service operations also give them the raw material to train machine-learning systems to perform the jobs of more and more people. “E-discovery” software can search mountains of legal documents much more quickly than human clerks or paralegals can. Some forms of journalism, such as writing market reports and sports summaries, are also being automated.

Predictions that automation will make humans redundant have been made before, however, going back to the Industrial Revolution, when textile workers, most famously the Luddites, protested that machines and steam

engines would destroy their livelihoods. “Never until now did human invention devise such expedients for dispensing with the labour of the poor,” said a pamphlet at the time. Subsequent outbreaks of concern occurred in the 1920s (“March of the machine makes idle hands”, declared a *New York Times* headline in 1928), the 1930s (when John Maynard Keynes coined the term “technological unemployment”) and 1940s, when the *New York Times* referred to the revival of such worries as the renewal of an “old argument”.

As computers began to appear in offices and robots on factory floors, President John F. Kennedy declared that the major domestic challenge of the 1960s was to “maintain full employment at a time when automation...is replacing men”. In 1964 a group of Nobel prizewinners, known as the Ad Hoc Committee on the Triple Revolution, sent President Lyndon Johnson a memo alerting him to the danger of a revolution triggered by “the combination of the computer and the automated self-regulating machine”. This, they said, was leading to a new era of production “which requires progressively less human labour” and threatened to divide society into a skilled elite and an unskilled underclass. The advent of personal computers in the 1980s provoked further hand-wringing over potential job losses.

Yet in the past technology has always ended up creating more jobs than it destroys. That is because of the way automation works in practice, explains David Autor, an economist at the Massachusetts Institute of Technology. Automating a particular task, so that it can be done more quickly or cheaply, increases the demand for human workers to do the other tasks around it that have not been automated.

There are many historical examples of this in weaving, says James Bessen, an economist at the Boston University School of Law. During the Industrial Revolution more and more tasks in the weaving process were automated, prompting workers to focus on the things machines could not do, such as

operating a machine, and then tending multiple machines to keep them running smoothly. This caused output to grow explosively. In America during the 19th century the amount of coarse cloth a single weaver could produce in an hour increased by a factor of 50, and the amount of labour required per yard of cloth fell by 98%. This made cloth cheaper and increased demand for it, which in turn created more jobs for weavers: their numbers quadrupled between 1830 and 1900. In other words, technology gradually changed the nature of the weaver's job, and the skills required to do it, rather than replacing it altogether.

In a more recent example, automated teller machines (ATMs) might have been expected to spell doom for bank tellers by taking over some of their routine tasks, and indeed in America their average number fell from 20 per branch in 1988 to 13 in 2004, Mr Bessen notes. But that reduced the cost of running a bank branch, allowing banks to open more branches in response to customer demand. The number of urban bank branches rose by 43% over the same period, so the total number of employees increased. Rather than destroying jobs, ATMs changed bank employees' work mix, away from routine tasks and towards things like sales and customer service that machines could not do.

The same pattern can be seen in industry after industry after the introduction of computers, says Mr Bessen: rather than destroying jobs, automation redefines them, and in ways that reduce costs and boost demand. In a recent analysis of the American workforce between 1982 and 2012, he found that employment grew significantly faster in occupations (for example, graphic design) that made more use of computers, as automation sped up one aspect of a job, enabling workers to do the other parts better. The net effect was that more computer-intensive jobs within an industry displaced less computer-intensive ones. Computers thus reallocate rather than displace jobs, requiring workers to learn new skills. This is true of a wide range of occupations, Mr Bessen found, not just in

computer-related fields such as software development but also in administrative work, health care and many other areas. Only manufacturing jobs expanded more slowly than the workforce did over the period of study, but that had more to do with business cycles and offshoring to China than with technology, he says.

So far, the same seems to be true of fields where AI is being deployed. For example, the introduction of software capable of analysing large volumes of legal documents might have been expected to reduce the number of legal clerks and paralegals, who act as human search engines during the “discovery” phase of a case; in fact automation has reduced the cost of discovery and increased demand for it. “Judges are more willing to allow discovery now, because it’s cheaper and easier,” says Mr Bessen. The number of legal clerks in America increased by 1.1% a year between 2000 and 2013. Similarly, the automation of shopping through e-commerce, along with more accurate recommendations, encourages people to buy more and has increased overall employment in retailing. In radiology, says Dr Barani, Enlitic’s technology empowers practitioners, making average ones into experts. Rather than putting them out of work, the technology increases capacity, which may help in the developing world, where there is a shortage of specialists.

And while it is easy to see fields in which automation might do away with the need for human labour, it is less obvious where technology might create new jobs. “We can’t predict what jobs will be created in the future, but it’s always been like that,” says Joel Mokyr, an economic historian at Northwestern University. Imagine trying to tell someone a century ago that her great-grandchildren would be video-game designers or cybersecurity specialists, he suggests. “These are jobs that nobody in the past would have predicted.”

Similarly, just as people worry about the potential impact of self-driving

vehicles today, a century ago there was much concern about the impact of the switch from horses to cars, notes Mr Autor. Horse-related jobs declined, but entirely new jobs were created in the motel and fast-food industries that arose to serve motorists and truck drivers. As those industries decline, new ones will emerge. Self-driving vehicles will give people more time to consume goods and services, increasing demand elsewhere in the economy; and autonomous vehicles might greatly expand demand for products (such as food) delivered locally.

| *Only humans need apply*

There will also be some new jobs created in the field of AI itself. Self-driving vehicles may need remote operators to cope with emergencies, or ride-along concierges who knock on doors and manhandle packages. Corporate chatbot and customer-service AIs will need to be built and trained and have dialogue written for them (AI firms are said to be busy hiring poets); they will have to be constantly updated and maintained, just as websites are today. And no matter how advanced artificial intelligence becomes, some jobs are always likely to be better done by humans, notably those involving empathy or social interaction. Doctors, therapists, hairdressers and personal trainers fall into that category. An analysis of the British workforce by Deloitte, a consultancy, highlighted a profound shift over the past two decades towards “caring” jobs: the number of nursing assistants increased by 909%, teaching assistants by 580% and careworkers by 168%.

Focusing only on what is lost misses “a central economic mechanism by which automation affects the demand for labour”, notes Mr Autor: that it raises the value of the tasks that can be done only by humans. Ultimately, he says, those worried that automation will cause mass unemployment are succumbing to what economists call the “lump of labour” fallacy. “This notion that there’s only a finite amount of work to do, and therefore that if

you automate some of it there's less for people to do, is just totally wrong," he says. Those sounding warnings about technological unemployment "basically ignore the issue of the economic response to automation", says Mr Bessen.

But couldn't this time be different? As Mr Ford points out in "Rise of the Robots", the impact of automation this time around is broader-based: not every industry was affected two centuries ago, but every industry uses computers today. During previous waves of automation, he argues, workers could switch from one kind of routine work to another; but this time many workers will have to switch from routine, unskilled jobs to non-routine, skilled jobs to stay ahead of automation. That makes it more important than ever to help workers acquire new skills quickly. But so far, says Mr Autor, there is "zero evidence" that AI is having a new and significantly different impact on employment. And while everyone worries about AI, says Mr Mokyr, far more labour is being replaced by cheap workers overseas.

Another difference is that whereas the shift from agriculture to industry typically took decades, software can be deployed much more rapidly. Google can invent something like Smart Reply and have millions of people using it just a few months later. Even so, most firms tend to implement new technology more slowly, not least for non-technological reasons. Enlitic and other companies developing AI for use in medicine, for example, must grapple with complex regulations and a fragmented marketplace, particularly in America (which is why many startups are testing their technology elsewhere). It takes time for processes to change, standards to emerge and people to learn new skills. "The distinction between invention and implementation is critical, and too often ignored," observes Mr Bessen.

What of the worry that new, high-tech industries are less labour-intensive than earlier ones? Mr Frey cites a paper he co-wrote last year showing that

only 0.5% of American workers are employed in industries that have emerged since 2000. “Technology might create fewer and fewer jobs, while exposing a growing share of them to automation,” he says. An oft-cited example is that of Instagram, a photo-sharing app. When it was bought by Facebook in 2012 for \$1 billion, it had tens of millions of users, but only 13 employees. Kodak, which once employed 145,000 people making photographic products, went into bankruptcy at around the same time. But such comparisons are misleading, says Marc Andreessen. It was smartphones, not Instagram, that undermined Kodak, and far more people are employed by the smartphone industry and its surrounding ecosystems than ever worked for Kodak or the traditional photography industry.

| *Is this time different?*

So who is right: the pessimists (many of them techie types), who say this time is different and machines really will take all the jobs, or the optimists (mostly economists and historians), who insist that in the end technology always creates more jobs than it destroys? The truth probably lies somewhere in between. AI will not cause mass unemployment, but it will speed up the existing trend of computer-related automation, disrupting labour markets just as technological change has done before, and requiring workers to learn new skills more quickly than in the past. Mr Bessen predicts a “difficult transition” rather than a “sharp break with history”. But despite the wide range of views expressed, pretty much everyone agrees on the prescription: that companies and governments will need to make it easier for workers to acquire new skills and switch jobs as needed. That would provide the best defence in the event that the pessimists are right and the impact of artificial intelligence proves to be more rapid and more dramatic than the optimists expect. ■



就业冲击

自动化与焦虑

更智能的机器会否导致大规模失业？

在旧金山的办公室里，Enlitic公司的首席执行官伊戈尔·巴拉尼（Igor Barani）在屏幕上调出一些医学扫描影像。Enlitic是把深度学习（deep learning）应用于医学的众多创业公司之一，首先从分析X光及CT扫描影像入手。这项技术显然可以用在这里。深度学习技术因在特定形式的图像识别上具有超凡的能力而名声大振，这方面也有大量已标记的训练数据可供使用，而且它在让医疗更精准高效方面具有极大的潜力。

巴拉尼博士（曾为肿瘤学家）指着某位病人肺部三个不同角度的CT影像。屏幕上的红色光斑闪烁，这是Enlitic的深度学习系统正在检查对比所见影像究竟是血管、无害伪影还是恶性肺部结节。系统最后突出显示了某一特征以供进一步检查。三位放射科专家曾合力与Enlitic系统比试，在分级恶性肿瘤方面，Enlitic系统的准确度高出50%，且假阴性率（即癌症漏诊率）为零，而人类专家的漏诊率则为7%。通过分析X光影像检测手腕骨折的另一Enlitic系统同样轻松打败了人类专家。该公司的技术目前正在澳大利亚各地的40家诊所进行测试。

由于深度学习及其他形式人工智能技术的发展，目前由训练有素的白领劳动者从事的工作可能会被自动化取代，上述能提供专家级影像诊断意见的计算机系统仅仅是其中一例。体力工作可由机器代劳，这是人们早已熟悉的概念；如今，愈加智能的机器甚至可以完成脑力劳动者的工作。专家表示，工作性质为体力还是脑力劳动并不能决定这份工作会否会被自动化，是不是常规性工作才是决定因素。机器已经能够从事多种形式的常规性体力劳动，现在还可以完成一些常规的认知型任务。所以，吴恩达表示，如今一名资深专业放射科医师被机器取代的可能性比他自己的行政助理还要大：“她要处理那么多不同的事情，我想短期内不会有机器能自动化处理她所有的工作。”

那么，哪些工作最容易受到冲击呢？在2013年发表的一项备受关注的研究中，卡尔·本尼迪克特·弗雷（Carl Benedikt Frey）和迈克尔·奥斯本（Michael Osborne）审视了702种职业被计算机取代的可能性，发现美国47%就业者的工作极可能被自动化。他们特别警告说，运输物流（如出租车和货运司机）和办公辅助（如前台接待员及保安）的大部分岗位“很可能被计算机资本所取代”，销售及服务业从业员（如收银员、柜台及租赁店员、电话推销员、会计人员）同样是被计算机取代的高危人群。其结论认为“机器学习近期的发展将在不久的未来威胁到许多行业中的相当一部分职位。”之后的同类研究得出英国的数字是劳动人口的35%（有更多人在受自动化威胁较低的创意领域工作），日本的数字则为49%。

经济学家们已开始担心出现“工作两极化”现象，即中等技术职位（如制造业职位）减少，但低技术及高技术职位增多。实际上，就业大军中有两类从事非常规性工作的群体：一端是高收入高技能就业者（如建筑师及高级经理人），另一端是低收入低技能就业者（如清洁工和快餐店员工）。多个西方国家的工资中位数停滞不前，被视为是自动化已经造成影响的例证——不过其中离岸外包的影响有多大也很难计算，因为这把许多常规性工作（包括制造业及呼叫中心的岗位）转移到了薪酬较低的发展中国家。圣路易斯联邦储备银行（Federal Reserve Bank of St Louis）公布的数据显示，在美国，非常规性脑力工作及非常规性体力工作的就业人数自上世纪80年代以来持续上升，而常规性工作的就业人数则基本持平（见图表）。随着越来越多工作实现自动化，这一趋势似乎会延续下去。

而这仅仅是开端。“我们看到的只是冰山一角。没有哪份文职工作稳如磐石。”斯坦福大学以研发自动驾驶汽车著称的人工智能专家塞巴斯蒂安·特龙（Sebastian Thrun）教授说道。斯坦福大学另一位学者杰里·卡普兰（Jerry Kaplan）声称，如今的自动化进程“才不管你的领子是什么颜色”。他著有《人工智能时代》（Humans Need Not Apply）一书，预测劳动力市场将产生剧变。最悲观的要数软件企业家及畅销书《机器人的崛起》（Rise of the Robots）的作者马丁·福特（Martin Ford）。他警告“失业前景”的威胁，指出大部分工作可以分解成机器愈发能胜任的一系列常规性任务。

在此前的自动化浪潮中，劳动者可选择从一个行业的常规工作转投另一行业的常规工作。但现在，企业用以改善营销和客服工作的“大数据”技术也为其提供了用于训练机器学习系统的原材料，使得越来越多人力的工作都可由机器完成。在海量法律文件中搜寻资料时，电子查询软件（E-discovery）比人类文员或律师助理要快得多。某些类型的新闻报道撰写也正实现自动化，例如市场报告及比赛综述。

然而，之前也有人预言自动化将使人们失业，这可以追溯到工业革命时期。当时的纺织工人，尤其是卢德派分子（Luddites），抗议机器及蒸汽机会摧毁他们的生计。当时一份小册子上写道：“人类史无前例地创制出这么些取巧的工具来抛弃穷人劳工。”之后，类似的恐慌分别在上世纪20、30、40年代爆发。1928年《纽约时报》一篇文章标题赫然写道《机器迈进，人手成闲》（March of the machine makes idle hands），30年代时约翰·梅纳德·凯恩斯（John Maynard Keynes）创造了“技术性失业”（technological unemployment）一词，到了40年代，《纽约时报》称此种忧虑再现是“旧事重提”。

随着计算机开始出现在办公室，机器人出现在工厂车间，上世纪60年代，美国总统约翰·肯尼迪宣布当时国内主要挑战是“在自动化.....逐渐取代人力的时代保持充分就业”。1964年，被冠以“三重革命特设委员会”之名的一群诺贝尔奖得主向当时的美国总统林登·约翰逊（Lyndon Johnson）发出一份备忘录，提醒他小心“计算机及自动自调节机器结合”将触发一场革命。他们表示，生产会因此步入新时代，“人类劳动力需求将逐步减低”，并威胁社会，导致其分裂为高技能精英和低技能底层人群两极。80年代，个人电脑的出现更是引发人们对于职位可能流失的连番争论。

然而，在过去，科技最终创造的职位总是比破坏的要多。那是因为自动化的实际运作方式，麻省理工学院的经济学家大卫·奥特尔（David Autor）解释道。某一特定任务实现自动化后，效率提升或成本下降，完成与该任务相关但未被自动化的其他工作的人力需求也随之增加。

纺织业有大量这样的历史实例，波士顿大学法学院的经济学家詹姆斯·贝

森（James Bessen）说道。在工业革命期间，越来越多的纺织工序实现自动化，令工人转而专注于机器无法完成的事情上，比如操作一台机器及照管多台机器，让它们平稳运转。这使产出呈爆发性增长。在19世纪，美国一位纺织工人每小时粗布产量增加至原来的50倍，而生产每码布料所需的劳动力则下降了98%。这使布料价格降低，需求随之上升，继而为纺织工人创造更多的就业机会：1830年至1900年间纺织工数量翻了两番。换言之，科技逐渐改变了纺织工人的工作性质及其所需的技能，而非完全取代了人力。

自动柜员机（ATM）则是一个近期的例子。ATM被认为会接管银行柜员的一些常规工作，宣判这些职位的终结。的确，美国的银行柜员人数从1988年时平均每个网点20人下降至2004年时的13人，贝森提道。因此节约下来的运营开支令银行可以开设更多网点应对客户需求。美国城市里银行网点的数量在同一时期增加了43%，员工总数也因而上升。ATM并未摧毁职位，而是改变了银行员工的工作任务构成，从常规任务转向机器无法胜任的销售及客服工作。

各行各业在应用计算机后也出现了同样的发展模式，贝森表示，自动化并没有摧毁工作岗位，而是通过降低成本并刺激需求的方式重新定义了工作。最近，在针对美国1982年至2012年间劳动力市场情况的一项分析中，他发现较多运用计算机的职业（比如平面设计）就业增长更显著，自动化加快了工作的某一部分，让员工可更好地完成其他部分。其净效应是行业中计算机应用程度较高的职位替换了应用程度较低的职位。因此，计算机并非取代工作，只是重新分配了工作，要求劳动者学习新技能。贝森发现，这不仅发生于软件开发等计算机相关领域，医疗及其他许多行业也是如此。他表示，在所研究的时间段里，只有制造业职位的增长慢于整体就业，但那更多是因为商业周期及对中国的离岸外包，而非技术发展的缘故。

到目前为止，运用人工智能的领域似乎也有同样的情况。例如，运用可分析大量法律文件的软件后，在案件的“证据开示”阶段充当人类搜索引擎的法务文员及律师助理的人数估计将减少。而实际上，自动化降低了证据开

示的成本，加大了其需求。“法官们现在更愿意批准证据开示，因为成本变低，也更简便了。”贝森说道。2000至2013年间美国的法务文员人数年增1.1%。同样，电子商务实现了自动化购物，加上更准确的导购推荐，令人们购买更多产品，提高了零售业整体就业。巴拉尼教授表示，在放射学科领域，Enlitic的技术让从业人员如虎添翼，把普通医师变成了专家。科技没有让他们失业，而是提高了他们的能力，这或许有助于改善发展中国家专家短缺的状况。

不难预见有些领域自动化将取代人力，而较不明确的是科技会在哪些行业创造新职位。“我们无法预测未来会有什么新职位出现，但一向都是如此。”美国西北大学的经济史学家乔尔·莫基尔（Joel Mokyr）说。他提出，想像一下在100年前告诉某人他的曾孙将成为电子游戏设计师或是网络安全专家。“过去没有人能预测这些工作的出现。”

同样，正如今天人们担心自动驾驶汽车带来的可能冲击，一个世纪前人们也担忧汽车取代马车的影响，奥特尔指出。与马匹相关的职位减少，但服务驾车人士和货车司机的汽车旅馆及快餐业兴起，创造出全新的职位。随着这些行业的衰落，新行业又会出现。自动驾驶车辆将使人们有更多时间消费商品和服务，扩大其他经济领域的需求；自动驾驶车辆也可能加大大地配送产品（如食品）的需求。

| 只聘人类

人工智能本身也将创造出一些新职位。自动驾驶汽车也许需要远程操作员应付意外情况，或要随车人员下车敲门递送包裹。打造、训练企业聊天机器人和人工智能客服以及为其编写对话都需要人类完成，据说人工智能企业正忙着聘请诗人。这些机器人及系统需要经常更新维护，就像今天的网站一样。无论人工智能变得多先进，在某些工作领域，人类总是更胜一筹，特别是涉及同理心或社交互动的工作。医生、治疗师、发型师及私人教练都属于这个类别。咨询公司德勤对英国劳动力市场的一项分析显示了过去二十年就业倾向的深刻变化，“关爱型”职位日益增多：护理助理、助教、护工的人数分别增加了909%、580%、168%。

如果只关注职位流失，那是没有把握“自动化影响劳动力需求的核心经济原理”，奥特尔指出：自动化提高了那些必须人力完成的工作的价值。他表示，担忧自动化将引致大规模失业的观点最终陷入了经济学家所说的“劳动总量固定”的谬论。“这一概念认为社会只存在有限的工作，如果其中一部分被自动化，人类可做的工作就会变少，但这完全是错误的。”他说。那些发声警告技术性失业的人“实际是忽视了自动化引发的经济反应”，贝森说道。

但这次会不一样吗？正如福特在《机器人的崛起》一书中指出的，这一次，自动化的冲击涉及面更广：两个世纪前，并非所有行业受到影响，但如今各行各业都在使用计算机。他认为，在之前的自动化浪潮中，劳动者可以从一种常规性工作转换到另一种常规性工作；但这次，许多就业者需要从常规性低技能工作转换至非常规性高技能工作，才能避免自动化冲击。帮助劳动者更快获得新技能因而变得更重要。奥特尔说，但至今，“没有什么证据”显示人工智能对就业有任何显著不同的新影响。莫基尔则表示，虽然大家都对人工智能心存疑虑，但更多的职位是被海外廉价劳动力取代的。

另一区别是，农业向工业的转移往往需时数十年，而部署软件则快得多。谷歌开发出智能回复功能（Smart Reply），数月之后便有数百万用户使用。即便如此，大部分公司应用新技术的行动往往较慢，很多是出于非技术性原因。例如，Enlitic及其他开发医药领域人工智能系统的公司必须与复杂的法规及分散的市场角力，尤其是在美国（所以很多创业公司选择在别处测试技术）。改变流程、出台标准、人们学习新技能，这一切都需要时间。贝森观察发现，“发明和应用之间的区别是关键，但这往往被忽略。”

还有一种担忧是，新兴的高科技行业与之前相比，劳力密集程度降低了，对此又怎么看？弗雷引用其去年参与撰写的论文，指出美国仅有0.5%的劳动者受雇于2000年后出现的行业。他说：“科技创造的职位可能越来越少，被自动化的职位却越来越多。”一个常被引用的例子是照片分享应用 Instagram。2012年被Facebook以十亿美元收购时，Instagram拥有数千

万用户，而仅有13名员工。一度有14.5万名员工的摄影器材公司柯达则大约在同一时期破产。但这样的比较具有误导性，马克·安德森（Marc Andreessen）表示。击溃柯达的不是Instagram，而是智能手机，并且与柯达公司或是传统摄影产品行业相比，智能手机产业及其周边生态系统雇用的人数要多得多。

| 这次会不一样吗？

那么谁是对的？是认为这次与以往不同，机器真的会抢走所有人饭碗的悲观主义者（多为科技界人士），还是坚称科技最终创造的职位会多过所破坏职位的乐观主义者（多为经济学家和历史学家）？事实可能介乎两者之间。人工智能不会造成大规模失业，但和以往科技变革一样将加速目前计算机带来的自动化趋势，破坏劳动力市场，劳动者则要比以往更快地学习新技能。贝森预言将出现的是“艰难过渡”而非“历史剧变”。虽然众说纷纭，但大家在应对办法上存在共识：企业和政府需要创造条件方便就业者学习新技能并按需转换工作。万一悲观主义者猜对了，人工智能的冲击将比乐观主义者的估计更迅猛、更剧烈，这一方法也会是最佳的防御。■



Education and policy

Re-educating Rita

Artificial intelligence will have implications for policymakers in education, welfare and geopolitics

IN JULY 2011 Sebastian Thrun, who among other things is a professor at Stanford, posted a short video on YouTube, announcing that he and a colleague, Peter Norvig, were making their “Introduction to Artificial Intelligence” course available free online. By the time the course began in October, 160,000 people in 190 countries had signed up for it. At the same time Andrew Ng, also a Stanford professor, made one of his courses, on machine learning, available free online, for which 100,000 people enrolled. Both courses ran for ten weeks. Mr Thrun’s was completed by 23,000 people; Mr Ng’s by 13,000.

Such online courses, with short video lectures, discussion boards for students and systems to grade their coursework automatically, became known as Massive Open Online Courses (MOOCs). In 2012 Mr Thrun founded an online-education startup called Udacity, and Mr Ng co-founded another, called Coursera. That same year Harvard University and the Massachusetts Institute of Technology got together to form edX, a non-profit MOOC provider, headed by Anant Agarwal, the head of MIT’s artificial-intelligence laboratory. Some thought that MOOCs would replace traditional university teaching. The initial hype around MOOCs has since died down somewhat (though millions of students have taken online courses of some kind). But the MOOC boom illustrated the enormous potential for delivering education online, in bite-sized chunks.

The fact that Udacity, Coursera and edX all emerged from AI labs highlights the conviction within the AI community that education systems need an overhaul. Mr Thrun says he founded Udacity as an “antidote to the ongoing

AI revolution”, which will require workers to acquire new skills throughout their careers. Similarly, Mr Ng thinks that given the potential impact of their work on the labour market, AI researchers “have an ethical responsibility to step up and address the problems we cause”; Coursera, he says, is his contribution. Moreover, AI technology has great potential in education. “Adaptive learning”—software that tailors courses for each student individually, presenting concepts in the order he will find easiest to understand and enabling him to work at his own pace—has seemed to be just around the corner for years. But new machine-learning techniques might at last help it deliver on its promise.

| *Adapt and survive*

At the moment, adaptive-learning techniques work best in areas where large numbers of pupils have to learn the same material and a lot of data can be collected, says Mr Ng. Geekie, a Brazilian adaptive-learning startup, guides pupils through the high-school syllabus in thousands of the country’s schools. Other startups working in this area include Knewton, Smart Sparrow and DreamBox. Education giants are also paying attention. McGraw-Hill bought ALEKS, another adaptive-learning system, in 2013; Pearson recently announced an expansion of its partnership with Knewton. In a report published in February, Pearson suggests that AI could make learning “more personalised, flexible, inclusive and engaging”. Such systems do not replace teachers, but allow them to act as mentors rather than lecturers.

Even outside the AI community, there is a broad consensus that technological progress, and artificial intelligence in particular, will require big changes in the way education is delivered, just as the Industrial Revolution did in the 19th century. As factory jobs overtook agricultural ones, literacy and numeracy became much more important. Employers realised that more educated workers were more productive, but were

reluctant to train them themselves because they might defect to another employer. That prompted the introduction of universal state education on a factory model, with schools supplying workers with the right qualifications to work in factories. Industrialisation thus transformed both the need for education and offered a model for providing it. The rise of artificial intelligence could well do the same again, making it necessary to transform educational practices and, with adaptive learning, offering a way of doing so.

“The old system will have to be very seriously revised,” says Joel Mokyr of Northwestern University. Since 1945, he points out, educational systems have encouraged specialisation, so students learn more and more about less and less. But as knowledge becomes obsolete more quickly, the most important thing will be learning to relearn, rather than learning how to do one thing very well. Mr Mokyr thinks that education currently treats people too much like clay—“shape it, then bake it, and that’s the way it stays”—rather than like putty, which can be reshaped. In future, as more tasks become susceptible to automation, the tasks where human skills are most valuable will constantly shift. “You need to keep learning your entire life—that’s been obvious for a long time,” says Mr Ng. “What you learn in college isn’t enough to keep you going for the next 40 years.”

Education will therefore have to be interwoven with full-time work.

“People will have to continuously learn new skills to stay current,” says Mr Thrun. Hence his firm’s focus on “nanodegrees” which can be completed in a few months, alongside a job. Studying for a nanodegree in, say, data science or website programming costs \$200 a month, but students who complete a course within 12 months get a 50% refund. A host of websites now offer courses in all kinds of skills, from user-experience design to project management to leadership. Some, like Udacity, charge by the course; others, like Lynda.com, which is owned by LinkedIn, a business-networking site, charge a monthly fee for access to all courses. (It is not

difficult to imagine LinkedIn comparing the skill sets of its users against those required to apply for a particular job—and then offering users the courses necessary to fill the gaps.) Users and their potential employers sometimes find it difficult to tell which ones offer good value. More co-operation between government, training providers and employers over certification would help.

America and other developed countries should also put more emphasis on vocational and technical education, as Germany does, rather than encouraging everyone to go to university, says David Autor at MIT. But that does not simply mean offering more apprenticeships, which typically involve five to seven years of training. “That doesn’t make sense if the skills you need are changing every three to five years,” says James Bessen at the Boston University School of Law. So the traditional apprenticeship model will have to be tweaked. Community colleges are setting up all kinds of schemes that combine education with learning on the job, says Mr Bessen. For example, Siemens, a German industrial giant, has launched a four-year “earn and learn” programme for apprentices at its wind-turbine factory in Charlotte, North Carolina. Apprentices graduate with a degree in mechatronics from a local community college, certification from the local department of labour—and no student debt.

As on-the-job skills come and go, having a solid foundation of basic literacy and numeracy skills will become even more vital. But teaching “soft” skills, too, will be increasingly important. In a paper published in 2013, James Heckman and Tim Kautz of America’s National Bureau of Economic Research argue for more emphasis on “character skills” such as perseverance, sociability and curiosity, which are highly valued by employers and correlate closely with employees’ ability to adapt to new situations and acquire new skills. Character is a skill, not a trait, they say, and schemes that teach it are both lasting and cost-effective.

| *Basic attraction*

Concerns about AI and automation have also led to calls for a stronger safety net to protect people from labour-market disruption and help them switch to new jobs. In particular, many AI commentators support the idea of a universal basic income: a dramatic simplification of the welfare system that involves paying a fixed amount (say, \$10,000 a year) to everyone, regardless of their situation, and doing away with all other welfare payments. Similar ideas were touted during the Industrial Revolution by Thomas Paine and John Stuart Mill, among others. Its chief merit, say its supporters, is that people who are not working, or are working part-time, are not penalised if they decide to work more, because their welfare payments do not decline as their incomes rise. It gives people more freedom to decide how many hours they wish to work, and might also encourage them to retrain by providing them with a small guaranteed income while they do so. Those who predict apocalyptic job destruction see it as a way to keep the consumer economy going and support the non-working population. If most jobs are automated away, an alternative mechanism for redistributing wealth will be needed.

Compared with the complexity of overhauling the education system, a basic income appears to offer a simple, attractive and easily understood solution. The idea enjoys broad support within the technology industry: Y Combinator, a startup incubator, is even funding a study of the idea in Oakland, California. Sam Altman, its president, argues that in a world of rapid technological change, a basic income could help ensure “a smooth transition to the jobs of the future”. The idea seems to appeal to techie types in part because of its simplicity and elegance (replacing existing welfare and tax systems, which are like badly written programming code, with a single line) and in part because of its Utopianism. A more cynical view is that it could help stifle complaints about technology causing disruption and inequality, allowing geeks to go on inventing the future unhindered.

Mr Altman says that in his experience the techies who support basic income do so for “fairly charitable reasons”.

Though it is an attractive idea in principle, the devil is in the details. A universal basic income that replaced existing welfare budgets would be steeply regressive. Divide existing spending on social, pension and welfare schemes (excluding health care) equally, and each citizen would get a basic income of around \$6,000 a year in America and \$6,200 in Britain, for example (at purchasing-power parity). Compared with existing welfare schemes, that would reduce income for the poorest, while giving the rich money they do not need. But means-testing a basic income risks undermining its simplicity, and thus its low administrative cost. Funding a basic income that would provide a reasonable living would require much higher taxes than at present. Negative income taxes, or schemes such as earned-income tax credits, might be a less elegant but more practical approach.

Many countries, notably Finland and the Netherlands, are planning to experiment with limited forms of basic income next year. A big concern among economists is that a basic income could actually discourage some people from retraining, or indeed working at all—why not play video games all day?—though studies of previous experiments with a basic income suggest that it encourages people to reduce their working hours slightly, rather than giving up work altogether. Another problem is that a basic income is not compatible with open borders and free movement of workers; without restrictions on immigration or entitlement it might attract lots of freeloaders from abroad and cause domestic taxpayers to flee.

This points to another area where policymakers may have to grapple with the impact of advancing automation: its geopolitical implications as it benefits people in some countries more than others. Automation could have a much bigger impact in developing economies than in rich ones, says

Mr Autor, because much of what they provide is essentially embodied labour: cheap goods made by low-wage workers, cheap services such as operating call-centres, or doing domestic and construction work overseas. If automation makes rich countries more self-sufficient in these areas, they will have less need for the products and services that have been driving exports and growth in the developing world. Automation could “erode the comparative advantage of much of the developing world”, says Mr Autor. Another worry, he says, is that rich countries own the technologies and patents associated with robots and AI, and stand to benefit if they cause a surge in productivity. For the developing world, “it’s not clear that they are on the winning side of the bargain” if machines end up outperforming humans in a wide range of activities.

The risk is that automation could deny poorer countries the opportunity for economic development through industrialisation. Economists talk of “premature deindustrialisation”; Dani Rodrik of Harvard University notes that manufacturing employment in Britain peaked at 45% just before the first world war, but has already peaked in Brazil, India and China with a share of no more than 15%. This is because manufacturing is much more automated than it used to be. China recently overtook America as the largest market for industrial automation, according to a report by Citi, a bank, and Oxford University’s Martin School. Industrial automation may mean that other emerging economies, such as those in Africa and South America, will find it harder to achieve economic growth by moving workers from fields to factories, and will need to find new growth models. Without manufacturing jobs to build a middle class, observes Tyler Cowen, an economist at George Mason University, such countries “may have high income inequality baked into their core economic structures”.

During the Industrial Revolution, John Stuart Mill wrote that “there cannot be a more legitimate object of the legislator’s care” than looking after those whose livelihoods are disrupted by machines. At the moment it is mostly

rich countries that worry about the effects of automation on education, welfare and development. But policymakers in developing countries will increasingly need to consider them t ■



教育与政策

再教育丽塔

人工智能将影响教育、福利及地缘政治决策

身兼多职的斯坦福大学教授塞巴斯蒂安·特龙（Sebastian Thrun）于2011年7月在YouTube上发布了一则短视频，宣布他和同事彼特·诺维格（Peter Norvig）将在网上免费推出“人工智能入门”课程。当年10月开课之际，已有来自190个国家的16万人注册听讲。同时，另一位斯坦福教授吴恩达也在网上免费发布了一门关于机器学习的课程，吸引了10万人注册。两门课程都为期10周，最终2.3万人完成了特龙的课程，1.3万人完成了吴恩达的课程。

这类在线课程具有简短的授课视频、学生讨论板和自动作业评分系统，日后被称为大型开放式网络课程（MOOC）。2012年，特龙创建了一家网络教育创业公司——优达学城（Udacity），吴恩达则与他人共同创立了Coursera。同年，哈佛大学和麻省理工学院合作建立了非盈利性MOOC平台edX，由麻省理工人工智能实验室的负责人阿纳特·阿加瓦尔（Anant Agarwal）牵头负责。有人认为MOOC将替代传统的大学教学。最初针对MOOC的热烈炒作逐渐冷却（不过已有数百万的学生听取过各种网上课程），但其辉煌说明了在网上提供易于接受的小单元教学内容具有巨大潜力。

优达学城、Coursera和edX都源自人工智能（AI）实验室这一事实凸显出AI界的一个信念——教育系统需要变革。特龙说AI革命需要劳动者在整个职业生涯中不断学习新技能，而他建立的优达学城是“现行AI革命的一副解毒剂”。同样，吴恩达也认为，鉴于AI研究者所做工作对劳动力市场的潜在影响，他们“有道义上的责任挺身而出，解决自己造成的问题”。他说，Coursera就是他所做出的贡献。另外，AI技术在教育上具有巨大潜力。“自适应学习”是为每个学生量身设计课程的软件，以学生个人最容易理解的方式呈现概念，让其能按照自己的节奏进行学习。多年来这种软件一直看似呼之欲出，但机器学习技术也许最终将助其变成现实。

| 适者生存

吴恩达说，自适应学习技术目前最适合那些大量学生要学习同样内容并可以采集大量数据的领域。巴西一家自适应学习创业公司Geekie在该国数千所学校通过高中教学计划引导学生学习。这一领域的其他创业公司包括Knewton、Smart Sparrow和DreamBox。教育巨头也在关注这一领域。麦格劳-希尔集团（McGraw-Hill）2013年收购了另一个自适应学习系统ALEKS；培生集团（Pearson）最近宣布将扩大其与Knewton的合作。培生集团在今年二月发布的一份报告中提出，AI可能会让学习“更个性化、更灵活、更包容，也更具参与度”。这种系统不会取代老师，但能让他们的角色从授课者转变为指导者。

即使在AI界之外，也存在一种广泛共识，认为技术进步，尤其是人工智能领域的进步，将要求提供教育的方式进行重大转变，就像工业革命在十九世纪所产生的影响那样。随着工业就业超过了农业就业，阅读和计算能力变得愈发重要。雇主意识到教育水平越高的工人的生产效率也越高，但因为害怕工人跳槽，自己不愿开展培训。这就促成了工厂模式的普及性公立教育的引入，由学校为工厂提供合格的工人。由此，工业化既改变了对教育的需求，也给出了提供教育的模式。人工智能的兴起很可能重复这一幕，让变革教育方式成为必要，并且通过自适应学习提供新的教育模式。

美国西北大学的乔尔·莫克（Joel Mokyr）说，“旧体系将必须认真调整。”他指出，1945年以来，教育体系一直鼓励专业化发展，学生在日益细分的专业领域里越钻越深。但在知识过时越来越快的环境中，最重要的是学会再学习，而不是只把一件事做精。莫克认为，目前的教育过多地将人们视作陶土——“对其塑形、烘烤，让其定型”——而不是可以重新塑形的油灰。未来，由于越来越多的工作有可能被自动化，人的技能至关重要的工作将不断发生变化。“你需要终身学习——这一点很久以来都明白无疑。”吴恩达说，“在大学里学到的东西不足以帮助你应对未来四十年的挑战。”

因此教育将与全职工作密不可分。特龙说：“人们必须不断学习新技能才

能跟上时代。”所以他的公司专注于“纳米学位”，在工作之余，几个月就可完成学习。如果要修读一个数据科学或网站编程的纳米学位，每个月学费为200美元。但如果学员能在12个月内完成，可以获得50%的退款。现在有许多网站提供各种课程，从用户体验设计、到项目管理、再到领导力，所涉及的技能林林总总。有些平台，比如优达学城，按课程收费；其他则按月收费，课程任选，如商业社交网站领英（LinkedIn）旗下的Lynda.com。（不难想象领英会将其用户所具备的技能与申请某项工作所需技能进行对比，然后为用户提供相应课程，弥补差距。）用户及其潜在雇主有时难以辨别哪种形式更物有所值。政府、培训机构和雇主在认证方面扩展合作将会有所帮助。

麻省理工学院的大卫·奥特尔（David Autor）认为，美国及其他发达国家也应该像德国那样更多重视职业及技术教育，而不是鼓励人人都去上大学。但那并不意味着提供更多的学徒课程，此类课程一般需要五到七年的培训时间。波士顿大学法学院的詹姆斯·贝森（James Bessen）说：“如果你所需的技能可能三到五年就要发生变化，花那么长时间进行学徒学习就不合理了。”因此传统的学徒模式亟需调整。贝森说，社区大学正在设置各种课程，将教育与在职学习相结合。例如，德国工业巨头西门子为其在美国北卡罗来纳州夏洛特市（Charlotte）风力涡轮机工厂的学徒推出了一个为期四年的“边赚边学”项目。学徒可以从当地社区大学获得机械电子学学位和当地劳工部门的认证，而且无需担负学生贷款。

由于职业技能需求不断变化，在基本阅读和计算能力方面打下坚实基础将变得更为关键，但教授“软”技能也将变得日益重要。美国国家经济研究局（National Bureau of Economic Research）的詹姆斯·赫克曼（James Heckman）和蒂姆·考茨（Tim Kautz）2013年发表的一篇论文认为，应该更加重视“性格技能”，如坚毅、善于社交及好奇心。雇主非常看重这些技能，也与雇员适应新环境、获得新技能的能力紧密相关。他们认为性格是一种技能，而非品质，教授这一技能的课程效果持久且性价比高。

| 基本收入的吸引力

对AI和自动化的担忧还让更多人呼吁建立一个更加牢固的安全网，保护人

们不受劳动力市场颠覆的影响，并帮助他们走上新岗位。尤其可以看到的是，很多AI评论者都支持一个普及基本收入的理念：即大大简化福利体系，不论个人情况如何，都向每个人发放固定的收入（比如一年一万美元），摒弃其他各种福利支出。工业革命时期也有很多人鼓吹过类似的想法，如托马斯·潘恩（Thomas Paine）和约翰·斯图亚特·密尔（John Stuart Mill）。支持者认为其主要好处是那些没有工作或兼职工作的人不会因为决定要多做些活而蒙受损失，因为他们的福利所得不会因收入增加而减少。这将给予人们更多自由来决定他们想要工作的时间，还可以向其提供一笔有保证、但金额不大的收入来鼓励他们进行再培训。那些预言未来就业将面临末日般毁灭的人则认为，这是推动消费经济继续发展、供养那些不工作人群的一个办法。如果大多数岗位将被自动化，那么就需要另外一种再分配财富的途径。

与复杂的教育体系全面变革相比，基本收入制度看似是一个简单、具吸引力且容易理解的方案。这一理念得到了科技业的广泛支持：创业孵化器公司Y Combinator甚至正在资助一项在美国加州奥克兰的研究。该公司总裁山姆·阿尔特曼（Sam Altman）辩称，在技术变革迅猛的世界里，基本收入制度有助于保障“向未来的工作岗位顺利过渡”。这一理念似乎非常受到科技人士的青睐，原因之一是其既简单又优雅（现有的福利和税制体系就像是写得很烂的程序，而基本收入制度只用一行代码就可以替代它们），另一个原因则是其乌托邦色彩。更加愤世嫉俗的观点认为基本收入制度有助于抑制对技术导致的工作岗位颠覆和不平等的抱怨，让极客可以继续不受阻碍地创造未来。阿尔特曼说以他的经验来看，技术人员对基本收入制度的支持“基本上是由于慈善原因”。

尽管从原则上看这一理念颇具吸引力，但魔鬼藏身于细节之中。取代现有福利预算的普遍基本收入制度会是一个严重倒退。如果将现有社会、养老和福利计划（不包括医疗）方面的支出平均分配，每个美国公民每年可以获得约6000美元的基本收入，在英国则是6200美元（根据购买力平价计算）。与现有福利体制相比，这会减少最穷困人口的收入，而给富人一笔他们并不需要的钱。但在基本收入制度中加入经济状况审查（means testing，指鉴定福利申请者是否符合获得某项服务资格的过程）有可能会

破坏其简洁的优点，也会因而抵消其低行政成本。实行能够保障合理生活水平的基本收入制度所需的税收水平比现行水平高出很多。负所得税，或者像劳动所得税减免（earned-income tax credits）这样的税务制度可能没那么优雅，但更加实用。

很多国家，尤其是芬兰和荷兰，正在计划明年试用有限的基本收入制度。经济学家的一大担忧是基本收入制度可能会让人们缺乏接受再培训的动力，或者干脆就不工作了——为什么不整天打游戏呢？——尽管对以往基本收入制度试验的研究发现，人们会因此略微减少工作时数，但不会彻底放弃工作。另外一个问题是基本收入制与开放边境和劳动者自由流动不相容；在没有移民限制或权利限制的情况下，可能会吸引很多揩油的外国人，造成国内纳税人逃离。

这就又指出另一个决策者必须努力应对自动化进程影响的领域：基本收入制度在一国对国民的好处可能大于另一国，因而会产生地缘政治方面的影响。奥特尔说，自动化在发展中国家的影响可能要比在发达国家大很多，这是因为发展中国家提供的大部分实际上是具体劳动：低薪工人制造的廉价产品，以及运作呼叫中心、在海外从事家政和建筑工作等诸如此类的廉价服务。如果自动化让富国在这些领域更加自给自足，它们对这些一直以来推动发展中国家出口和增长的产品及服务的需求便会降低。奥特尔说自动化可能会“削弱很多发展中国家的比较优势”。他认为还有另一种担忧，即富国拥有与机器人和AI相关的技术和专利，一旦这些能够极大提升生产力，富国将会受益。对发展中国家来说，如果机器最终在广泛领域的表现超过人类，“还不确定它们能否得到好处。”

这其中的风险是自动化有可能剥夺较贫穷国家通过工业化实现经济发展的机会。经济学家经常谈到“过早去工业化”。哈佛大学的丹尼·罗德里克（Dani Rodrik）指出，英国制造业人数占总就业人数之比在一次世界大战之前就已达到45%的峰值，但在巴西、印度和中国还没到15%就已见顶，这是因为如今制造业的自动化程度提高了许多。花旗银行和牛津大学马丁学院的一项报告指出，中国最近超过美国成为世界最大的工业自动化市场。工业自动化可能意味着其他像非洲和南美等地的新兴经济体将更难通

过将农业人口推向工厂而实现经济增长，因而需要寻求新的增长模式。美国乔治梅森大学（George Mason University）的经济学家泰勒·科文（Tyler Cowe）认为，如果不能利用制造业的就业机会培育中产阶级，此类国家的“核心经济结构中可能会深深打上收入极不平等的烙印”。

约翰·斯图尔特·密尔在工业革命期间写道，相比那些生计被机器破坏的人们，“不可能有更合法的目标需要立法者的关切”。目前，主要是富国在担心自动化对教育、福利和发展的影响，但发展中国家的决策者也将需要更多地考虑这些问题。 ■



Ethics

Frankenstein's paperclips

Techies do not believe that artificial intelligence will run out of control, but there are other ethical worries

AS DOOMSDAY SCENARIOS go, it does not sound terribly frightening. The “paperclip maximiser” is a thought experiment proposed by Nick Bostrom, a philosopher at Oxford University. Imagine an artificial intelligence, he says, which decides to amass as many paperclips as possible. It devotes all its energy to acquiring paperclips, and to improving itself so that it can get paperclips in new ways, while resisting any attempt to divert it from this goal. Eventually it “starts transforming first all of Earth and then increasing portions of space into paperclip manufacturing facilities”. This apparently silly scenario is intended to make the serious point that AIs need not have human-like motives or psyches. They might be able to avoid some kinds of human error or bias while making other kinds of mistake, such as fixating on paperclips. And although their goals might seem innocuous to start with, they could prove dangerous if AIs were able to design their own successors and thus repeatedly improve themselves. Even a “fettered superintelligence”, running on an isolated computer, might persuade its human handlers to set it free. Advanced AI is not just another technology, Mr Bostrom argues, but poses an existential threat to humanity.

The idea of machines that turn on their creators is not new, going back to Mary Shelley's “Frankenstein” (1818) and earlier; nor is the concept of an AI undergoing an “intelligence explosion” through repeated self-improvement, which was first suggested in 1965. But recent progress in AI has caused renewed concern, and Mr Bostrom has become the best-known proponent of the dangers of advanced AI or, as he prefers to call it, “superintelligence”, the title of his bestselling book.

His interest in AI grew out of his analysis of existential threats to humanity. Unlike pandemic disease, an asteroid strike or a supervolcano, the emergence of superintelligence is something that mankind has some control over. Mr Bostrom's book prompted Elon Musk to declare that AI is "potentially more dangerous than nukes". Worries about its safety have also been expressed by Stephen Hawking, a physicist, and Lord Rees, a former head of the Royal Society, Britain's foremost scientific body. All three of them, and many others in the AI community, signed an open letter calling for research to ensure that AI systems are "robust and beneficial"—ie, do not turn evil. Few would disagree that AI needs to be developed in ways that benefit humanity, but agreement on how to go about it is harder to reach.

Mr Musk thinks openness is the key. He was one of the co-founders in December 2015 of OpenAI, a new research institute with more than \$1 billion in funding that will carry out AI research and make all its results public. "We think AI is going to have a massive effect on the future of civilisation, and we're trying to take the set of actions that will steer that to a good future," he says. In his view, AI should be as widely distributed as possible. Rogue AIs in science fiction, such as HAL 9000 in "2001: A Space Odyssey" and SKYNET in the "Terminator" films, are big, centralised machines, which is what makes them so dangerous when they turn evil. A more distributed approach will ensure that the benefits of AI are available to everyone, and the consequences less severe if an AI goes bad, Mr Musk argues.

Not everyone agrees with this. Some claim that Mr Musk's real worry is market concentration—a Facebook or Google monopoly in AI, say—though he dismisses such concerns as "petty". For the time being, Google, Facebook and other firms are making much of their AI source code and research freely available in any case. And Mr Bostrom is not sure that making AI technology as widely available as possible is necessarily a good thing. In a recent paper he notes that the existence of multiple AIs "does not guarantee

that they will act in the interests of humans or remain under human control”, and that proliferation could make the technology harder to control and regulate.

Fears about AIs going rogue are not widely shared by people at the cutting edge of AI research. “A lot of the alarmism comes from people not working directly at the coal face, so they think a lot about more science-fiction scenarios,” says Demis Hassabis of DeepMind. “I don’t think it’s helpful when you use very emotive terms, because it creates hysteria.” Mr Hassabis considers the paperclip scenario to be “unrealistic”, but thinks Mr Bostrom is right to highlight the question of AI motivation. How to specify the right goals and values for AIs, and ensure they remain stable over time, are interesting research questions, he says. (DeepMind has just published a paper with Mr Bostrom’s Future of Humanity Institute about adding “off switches” to AI systems.) A meeting of AI experts held in 2009 in Asilomar, California, also concluded that AI safety was a matter for research, but not immediate concern. The meeting’s venue was significant, because biologists met there in 1975 to draw up voluntary guidelines to ensure the safety of recombinant DNA technology.

| *Sci-fi scenarios*

Mr Bostrom responds that several AI researchers do in fact share his concerns, but stresses that he merely wishes to highlight the potential risks posed by AI; he is not claiming that it is dangerous now. For his part, Andrew Ng of Baidu says worrying about superintelligent AIs today “is like worrying about overpopulation on Mars when we have not even set foot on the planet yet”, a subtle dig at Mr Musk. (When he is not worrying about AIs, Mr Musk is trying to establish a colony on Mars, as an insurance policy against human life being wiped out on Earth.) AI scares people, says Marc Andreessen, because it combines two deep-seated fears: the Luddite worry that machines will take all the jobs, and the Frankenstein scenario that AIs

will “wake up” and do unintended things. Both “keep popping up over and over again”. And decades of science fiction have made it a more tangible fear than, say, climate change, which poses a much greater threat.

AI researchers point to several technical reasons why fear of AI is overblown, at least in its current form. First, intelligence is not the same as sentience or consciousness, says Mr Ng, though all three concepts are commonly elided. The idea that machines will “one day wake up and change their minds about what they will do” is just not realistic, says Francesca Rossi, who works on the ethics of AI at IBM. Second, an “intelligence explosion” is considered unlikely, because it would require an AI to make each version of itself in less time than the previous version as its intelligence grows. Yet most computing problems, even much simpler ones than designing an AI, take much longer as you scale them up.

Third, although machines can learn from their past experiences or environments, they are not learning all the time. A self-driving car, for example, is not constantly retraining itself on each journey. Instead, deep-learning systems have a training phase in which neural-network parameters are adjusted to build a computational model that can perform a particular task, a number-crunching process that may take several days. The resulting model is then deployed in a live system, where it can run using much less computing horsepower, allowing deep-learning models to be used in cars, drones, apps and other products. But those cars, drones and so on do not learn in the wild. Instead, the data they gather while out on a mission are sent back and used to improve the model, which then has to be redeployed. So an individual system cannot learn bad behaviour in a particular environment and “go rogue”, because it is not actually learning at the time.

| *The black-box problem*

Amid worries about rogue AIs, there is a risk that nearer-term ethical and

regulatory concerns about AI technologies are being overlooked. Facial-recognition systems based on deep learning could make surveillance systems far more powerful, for example. Google's FaceNet can determine with 99.6% accuracy whether two pictures show the same person (humans score around 98%). Facebook's DeepFace is almost as good. When the social-network giant recently launched an app called Moments, which automatically gathers together photos of the same person, it had to disable some of its facial-recognition features in Europe to avoid violating Irish privacy laws.

In Russia, meanwhile, there has been a recent outcry over an app called FindFace, which lets users take photos of strangers and then determines their identity from profile pictures on social networks. The app's creators say it is merely a way to make contact with people glimpsed on the street or in a bar. Russian police have started using it to identify suspects and witnesses. The risk is clear: the end of public anonymity. Gigapixel images of a large crowd, taken from hundreds of metres away, can be analysed to find out who went on a march or protest, even years later. In effect, deep learning has made it impossible to attend a public gathering without leaving a record, unless you are prepared to wear a mask. (A Japanese firm has just started selling Privacy Visor, a funny-looking set of goggles designed to thwart facial-recognition systems.)

Deep learning, with its ability to spot patterns and find clusters of similar examples, has obvious potential to fight crime—and allow authoritarian governments to spy on their citizens. Chinese authorities are analysing people's social-media profiles to assess who might be a dissident, says Patrick Lin, a specialist in the ethics of AI at Stanford Law School. In America, meanwhile, police in Fresno, California, have been testing a system called "Beware" that works out how dangerous a suspect is likely to be, based on an analysis of police files, property records and social-media posts. Another system, called COMPAS, provides guidance when sentencing

criminals, by predicting how likely they are to reoffend. Such systems, which are sure to be powered by deep learning soon if they are not already, challenge “basic notions about due process”, says Mr Lin. ■



伦理

科学怪人的回形针

技术人员不相信人工智能会失控，但另有其他伦理方面的担忧

世界末日并未到来，听起来也不怎么吓人。“回形针收集者”是一个由牛津大学的哲学家尼克·博斯特罗姆（Nick Bostrom）提出的思维实验。他在实验中提出，假设一个人工智能决定要收集尽可能多的回形针。它将自己所有的能量都用于获取回形针，并不断改进自己以便找到收集回形针的新方法，同时还要抵制使其偏离目标的任何尝试。最终，它“开始改造整个地球，然后把太空的一部分也用于回形针工厂”。设想出这个看似傻傻的场景是为了引出一个很严肃的观点，即人工智能（AI）不需要类似人的目的或心智。它们可能可以避免某些人类的错误和偏见，但可能也会犯其他错误，比如执着于收集回形针。尽管它们的目标刚开始看似无伤大雅，但如果它们可以设计自己的继任者，并不断重复改进自己，就可能很危险了。即使运行在一台孤立计算机上，“受到限制的超级智能”也可能说服人类操作者把它释放出来。博斯特罗姆主张，先进AI不仅仅只是另一项技术而已，而是对人类存亡构成了威胁。

机器背叛其创造者的想法并不新颖，可以追溯到玛丽·雪莱（Mary Shelley）的《科学怪人》（Frankenstein，1818年出版）甚至更早的作品。AI通过反复自我改进而经历“智能爆炸”的概念也并非今天才有，早在1965年就有人首次提出了。但AI近期的发展再一次引发了人们的担忧。博斯特罗姆已经成为最知名的先进AI威胁的鼓吹者，他将AI称之为“超级智能”——这是他一本畅销书的名字。

他对AI的兴趣源于他对人类存亡威胁的分析。与流行疾病、小行星撞击或巨型火山不同，超级智能的出现在人类的控制之下。博斯特罗姆的书促使埃隆·马斯克宣布AI“可能比核武器还危险”。物理学家斯蒂芬·霍金和英国最重要的科学机构英国皇家协会前任会长里斯勋爵（Lord Rees）也对AI的安全性表达了担忧。他们三人和AI界其他很多人联名签署了一封公开信，呼吁展开研究以确保AI系统“稳固且有益人类”——也就是说，别变

坏。发展AI需要对人类有益，这一点很少会有异议，但应该怎么做却比较难以达成共识。

马斯克认为开放是关键。他是2015年12月成立的OpenAI的联合创始人之一，这个新成立的研究机构拥有超过10亿美元的经费用于开展AI研究，并将研究结果全部公之于众。他说，“我们认为AI将对文明的未来产生巨大影响，我们正在试图采取一系列行动，将这个未来朝着好的方向引导。”在他看来，AI应该尽可能广泛分布。科幻作品里的流氓AI——如《2001太空漫游》中的HAL 9000和系列电影《终结者》中的“天网”——都是大型集中化结构的机器，一旦变坏就十分危险。马斯克认为，更分布化的方法将能保证AI的益处可以惠及所有人，并且一旦一个AI变坏，后果也不至于那么严重。

并非所有人都认同这一观点。有人认为马斯克真正的担忧是市场集中——Facebook或谷歌这样的公司垄断AI业，尽管马斯克认为这种看法是出于“小人之心”。目前，谷歌、Facebook和其他公司已经将其大部分AI源代码和研究免费分享。博斯特罗姆不太确定让大家都可获取AI技术就一定是件好事。在最近的一篇论文中他提出分散AI的存在“不一定能保证它们会以人类利益为先或在人类掌控之下”，这种技术的广泛传播可能反而会令其更难以掌控和监管。

在AI研究的前沿，人们对AI邪恶转身的恐惧并不普遍。“很多耸人听闻的言论都来自于非AI研究第一线的人，所以他们更多想到的是科幻场景。”DeepMind的德米斯·哈萨比斯（Demis Hassabis）说道。“我认为讨论这一问题的时候不应该使用过于煽情的词汇，因为这样会让人产生臆想。”哈萨比斯觉得回形针场景“不切实际”，但认为博斯特罗姆突出AI动机问题是正确之举。他说，如何为AI明确规定正确的目标和价值观，并确保其不会随时间而转移是个很有意思的研究课题。（Deepmind最近刚与博斯特罗姆的人类未来研究所联合发表了一篇论文，讨论给AI系统加装“制动开关”的问题）。2009年在美国加州爱斯洛马尔市（Asilomar）召开的AI专家会议也得出结论，认为AI安全是具有研究意义的课题，但并非迫在眉睫。此次会议的举办地也意义非凡，因为1975年一群生物学家曾在此聚

首，共同起草了确保重组基因技术安全的自愿指导方针。

| 科幻场景

博斯特罗姆回应说，的确有几位AI研究人员表达了类似的担忧，但强调他仅仅想凸显AI可能带来的潜在风险，而非认为AI现在就能造成危险。在百度的吴恩达看来，现在担心超级智能的AI“就像是在还没有踏足火星时就担心火星会人口过多”，这算是对马斯克的一番小小挖苦。（在担心AI之余，马斯克正尝试在火星上建立人类居住点，作为人类在地球遭遇毁灭的保险措施。）马克·安德森（Marc Andreessen）认为，AI令人害怕是因为它结合了人类两大至深的恐惧：卢德派担忧（认为机器将抢走所有工作机会）和科学怪人的场景（AI将会“觉醒”，做出计划之外的事情），这两种恐惧“不时在人们心底涌现”。几十年来的科幻作品让这些担忧变得比更具威胁的气候变化更加真实。

AI研究人员指出了几个技术原因说明为什么对AI的恐惧是过分夸大，至少依其目前的形势来看是这样。首先，吴恩达说，智能不等同于知觉或意识，尽管这三者常常被混为一谈。在IBM从事AI伦理工作的弗兰杰西卡·罗西（Francesca Rossi）说，认为机器会“总有一天醒过来，对自己的目标改变心意”根本不切实际。第二，“智能爆炸”被认为可能性不大，因为这要求一个AI随着智能增强，每次更新自己版本的时间都要比之前更短。然而大多数计算问题，即使是比设计一个AI要简单得多的问题，在规模增长时所花的时间都会迅速增加。

第三，尽管机器可以从过去的经验或环境中学习，它们也并非一直在学习。以一部自动驾驶汽车为例，它并不会在每次行程中都不断重新训练自己。相反，深度学习系统有一个训练阶段，期间会调整神经网络的参数以建立一个针对某项任务的计算模型，这样一个数据计算过程要耗时数日。然后把得出的模型部署在一个在线系统上，用少得多的计算能力即可运行起来，从而可使深度学习模型用于汽车、无人机、手机应用和其他产品中。但那些汽车、无人机等在野外时并不进行学习。相反，它们会把执行任务时所收集的数据传输回去来以改进模型，然后再重新部署。所以单个系统不会在某一特定环境下习得不良行为，然后就“变坏了”，因为它当时

实际上并没有在学习。

| 黑盒问题

对恶魔AI的种种担忧之中，有一种危险是人们忽略了近期内关于AI技术伦理和监管的担心。比如，基于深度学习的面部识别系统可能会让监视系统变得比现在强大得多。谷歌的FaceNet能够以99.6%的准确度确定两张照片是否为同一个人（人类的准确度为98%左右），Facebook的DeepFace表现几乎一样好。这家社交网络巨头最近发布了一项名为Moments的新应用，可自动收集同一人的不同照片，但它必须在欧洲禁用一些面部识别功能以避免违反爱尔兰的隐私保护法。

同时，俄罗斯有一款叫做“FindFace”的应用受到谴责，这一应用可以让用户拍摄陌生人的照片，然后根据社交网络上个人介绍中的照片来确定此人的身份。这一应用的开发者说这只是创造了一种与街上或酒吧有过一面之缘的人建立联系的方式。俄罗斯警方已经开始利用该应用来确认嫌疑人和目击者的身份。其风险很明显：这意味着公共场合匿名的完结。几百米外对一大群人拍摄一张十亿像素的照片，经过分析便可确定谁参加了游行或示威，甚至数年后仍然可以做到。事实上，深度学习让一个人想参加一次公共集会而不留痕迹变为不可能，除非你做好了带面罩的准备。（一家日本公司已经开始销售Privacy Visor，一副外型奇特、用于阻碍面部识别系统的眼镜。）

因为深度学习具有找出模式和相似事例集群的能力，它很明显具有打击犯罪的潜力，同时也让威权政府得以监视其公民。斯坦福大学法学院的AI伦理专家帕特里克·林（Patrick Lin）说，中国政府通过分析人们在社交媒体上的主页来评估哪些人有可能是持不同政见者。而在美国，加州弗雷斯诺市（Fresno）警方一直在测试一个叫“Beware”的系统，该系统通过警方文件、财产记录和社交媒体上的发帖来分析一个嫌疑犯的危险程度。另一个叫做“COMPAS”的系统则通过预测罪犯再次犯案的可能性为量刑提供指导。林说，这些系统就算现在还没有使用深度学习，将来很快也会用上，而这是对“正当程序的基本概念”的挑战。■



Conclusion

Answering the machinery question

Glimpses of an AI-enabled future

THE ORIGINAL MACHINERY question, which had seemed so vital and urgent, eventually resolved itself. Despite the fears expressed by David Ricardo, among others, that “substitution of machinery for human labour...may render the population redundant”, the overall effect of mechanisation turned out to be job creation on an unprecedented scale. Machines allowed individual workers to produce more, reducing the price of many goods, increasing demand and generating a need for more workers. Entirely new jobs were created to oversee the machines. As companies got bigger, they required managers, accountants and other support staff. And whole new and hitherto unimagined industries sprang up with the arrival of the railways, telegraphy and electrification.

To be sure, all this took time. Industrialisation caused pervasive labour-market upheaval as some jobs vanished, others changed beyond recognition and totally new ones emerged. Conditions in factories were grim, and it took several decades before economic growth was reflected in significant wage gains for workers—a delay known as “Engels’ pause”.

Worries about unemployment gave way to a much wider argument about employment conditions, fuelling the rise of socialist and communist ideas and creating the modern labour movement. By the end of the 19th century the machinery question had faded away, because the answer was so obvious. In 1896 Arthur Hadley, an American economist, articulated the view of the time when he observed that rather than destroying jobs, mechanisation had brought about “a conspicuous increase of employment in those lines where improvements in machinery have been greatest”.

What does all this tell us today? Historical analogies are never perfect, but they can be informative. Artificial intelligence is now prompting many of the same concerns as mechanisation did two centuries ago. The 19th-century experience of industrialisation suggests that jobs will be redefined, rather than destroyed; that new industries will emerge; that work and leisure will be transformed; that education and welfare systems will have to change; and that there will be geopolitical and regulatory consequences.

In many ways, the two big debates about AI—whether it will destroy jobs, and whether it might destroy humanity—are really arguments about the rate of change. If you believe that AI is improving so rapidly that human-level artificial general intelligence (AGI) is just around the corner, you are more likely to worry about unexpected and widespread job losses and the possibility that the technology may suddenly get out of control. It seems more probable, however, that AI will improve steadily, and that its impact over the next decade or two, while significant, will not be on the same scale as the epochal shift from a mostly agricultural to a mostly industrial economy.

AGI is probably still a couple of decades away, perhaps more, so the debate about what it might or might not be able to do, and how society should respond to it, is still entirely theoretical. This special report has therefore focused on the practical effects of AI in the nearer term. These are likely to be a broadening and quickening of the spread of computers into the workplace and everyday life, requiring people to update their skills faster and more frequently than they do at the moment. Provided educational systems are upgraded and made more flexible, which is beginning to happen, that should be entirely feasible.

So far the debate has been dominated by the gloomy possibilities of massive job losses and rogue AIs. More positive scenarios, in which AI dramatically changes the world for the better, tend to attract less attention.

So here are three examples. First, AI could transform transport and urban life, starting with self-driving vehicles. Being able to summon one at will could remove the need to own a car, greatly reduce the number of vehicles on the roads and all but eliminate road deaths. Urban environments will enjoy a renaissance as pollution declines and space previously devoted to parking is reallocated to parks, housing and bicycle paths.

Second, AI could soon enable people to converse with a wide range of things: their home and their car, most obviously, just as people talk to a disembodied computer in “Star Trek”, but also AI avatars of companies and other organisations, information services, AI advisers and tutors. A host of AI-powered personal assistants, such as Alexa, Cortana, Siri and Viv, are already jostling for position, and could become an important new way to interact with computers and access information, like the web browser and touchscreen before them. Speech alone is not always the best way to interact with a computer, so such conversations will often be accompanied by graphics (perhaps in the form of “augmented reality” overlays on people’s vision). AI also has huge potential to help humans talk to one another, by facilitating real-time translation between people using different languages. Basic versions of this technology exist today, and will get better.

| *The indefatigable helper*

Third, AI could make a big difference by turbocharging scientific and medical research. “The thing that excites me the most is using AI to help speed up scientific breakthroughs,” says Demis Hassabis of DeepMind. An AI could act as a relentless research assistant, he reckons, in fields from cancer research to climate change, helping solve problems by sifting through data, reading thousands of scientific papers and suggesting hypotheses or pointing out correlations that might be worth investigating. IBM is already working in this area, using its Watson AI technology to

analyse large volumes of medical data. Deep learning will be used to analyse the data from the “100,000 Genomes” project now under way in England’s National Health Service; the same techniques can help physicists sift reams of data from particle colliders for new discoveries.

After years of frustration with AI’s slow rate of progress, it is ironic that many now think it is moving too quickly. Yet a sober assessment suggests that AI should be welcomed, not feared. In the 1840s John Stuart Mill wrote that “the proof of the ultimate benefit to labourers of mechanical inventions...will hereafter be seen to be conclusive.” A future economist may say the same of the benefits of AI, not just for labourers but for everyone. ■



结论

回答机器问题

拥有人工智能的未来一瞥

最初的机器问题曾看似那么地重要和紧迫，最终自己解决了。曾有很多人，如大卫·李嘉图（David Ricardo）表达过担忧，“机器替代劳动力……可能会让人变得冗余无用。”然而机械化的总体结果实际上创造了史无前例的大量就业机会。机器让每个工人的产量提高，降低了众多商品的价格，从而提升了需求，需要的工人也更多了。人们为管理机器创造出了全新的岗位。随着企业规模变大，需要更多管理者、会计和其他支持人员。铁路、电报和电气化的到来也催生了众多以前从未想象过的全新行业。

诚然，这些都非一日之功。工业化导致了广泛的劳动力市场剧变，一些工作岗位消失，另一些岗位完全改头换面，还有一些全新岗位出现。工厂条件堪忧，经济增长的成果在数十年后才体现为工人薪酬的大幅提高——这一延迟被称为“恩格斯停顿”。

对失业问题的担忧转而让位于对就业条件更广泛的争论，这刺激了社会主义和共产主义理念的兴起，也造就了现代工人运动。到19世纪末，机器问题已逐渐淡化，因为答案显而易见。1896年，美国经济学家亚瑟·哈德利（Arthur Hadley）对当时的观点做了明确的阐述，他观察到机械化不仅没有削减就业机会，反而“在机械带来改变最大的行业里”带来了“就业机会的显著增加”。

这在今天对我们有什么启示呢？历史从来都不完全相似，但仍可资镜鉴。人工智能在今天所引发的很多担忧与两个世纪前人们对机械化的担忧如出一辙。19世纪工业化的进程显示，工作岗位将被重新定义，而不是被毁灭；新行业将会诞生；工作与休闲方式将脱胎换骨；教育和福利体系必将随之改变；地缘政治和监管也都会受到影响。

在很多方面，对人工智能（AI）的两大争论——它是否会削减就业，是否

会毁灭人类——事实上是对于改变速度的争论。如果你认为AI发展速度飞快，堪比人类智力的通用人工智能（AGI）即将实现的话，你就更容易担心意想不到并且广泛发生的失业，以及技术也许会突然失控。然而，看起来更可能的情况是AI将会稳步发展，其在未来一二十年产生的影响虽大，却不可与社会从以农业为主转向以工业为主的划时代转变同日而语。

AGI很可能还要一二十年才能实现，也许更久。因此，对它也许能做什么、也许不能做什么以及人类社会应该如何应对的争论还完全停留在理论上。所以本期特别报道主要关注较近期AI的实际影响。这些影响可能是电脑更广泛、更快速地进入工作场所和日常生活，要求人们比现在更快更频繁地提升技能。如果教育体系得以升级并愈加灵活——这个进程已经开始——那么以上的变化是完全可以适应的。

目前，争论中占优势的观点比较悲观，认为未来可能出现大范围失业和恶魔AI。更乐观的可能——AI可显著改善我们的世界——往往较少引人注目。这里举三个例子：首先，AI可以改变交通和城市生活，这会从无人驾驶汽车开始。如果随时都能招到一部车，人们就无需自己拥有汽车，极大地减少路上行驶车辆的数量，基本消除道路交通事故死亡。污染水平也会降低，以前用于停车场的空间可以重新改造成公园、住房和自行车道，城市环境将焕发新生。

其次，AI很快可以让人们与各式各样的物品对话，最明显的就是他们的家和汽车，就像电影《星际迷航》中人们与一台没有实体的电脑对话一样，而且还能与企业及其他组织的AI化身、信息服务、AI顾问和家教等进行交流。各种AI驱动的个人助理——如Alexa、Cortana、Siri和Viv——已经开始搏位争宠，并有可能和它们之前的浏览器和触屏技术一样，成为与计算机互动和获取信息的重要新途径。仅通过语音与计算机互动并不总是最好的方式，所以这种人机对话往往伴以图形（可能是以叠加在视野上的“增强现实”形式）。同时，通过为使用不同语言的人们提供实时翻译，AI还具有促进交流的巨大潜力。这项技术的基础版本已经存在，未来还将不断完善。

| 不知疲倦的助手

第三，AI可以助力科学和医疗研究，产生巨大影响。Deepmind的德米斯·哈萨比斯（Demis Hassabis）说：“最让我感到振奋的是利用AI帮助我们加速取得科学突破。”他认为，从癌症研究到气候变化的各个领域里，AI都可担任不知疲倦的研究助理，通过筛选数据、阅读成千上万的科研论文、提出假设或指出值得研究的关联关系，帮助科学家解决问题。IBM已在这一领域展开工作，利用其沃森（Watson）AI技术分析大量医疗数据。深度学习将被用于分析英格兰国民保健署（NHS）中正在进行的“十万基因组”项目中的数据。同样的技术还可以帮助物理学家筛选粒子对撞机中的海量数据，以便获得新的发现。

过去多年里AI进展缓慢，令人倍感挫败，讽刺的是如今许多人却认为它发展太快了。然而清醒的认识应该是欢迎AI，而非惧怕它。在18世纪40年代，约翰·斯图尔特·密尔（John Stuart Mill）写道：“机械发明最终让劳工受益的证据……从今以后将被视为确凿无疑。”对于AI带来的好处，未来的某位经济学家也许会说同样的话，而且不只是对劳工，而是对每一个人。■



India's economy

Two stumbles forward, one back

The government takes a long, winding path towards reform

LAST November, two days after India's ruling party suffered a drubbing at local polls in the state of Bihar, the government unexpectedly opened a dozen new industries to foreign direct investment (FDI). A gushing official called it "the biggest path-breaking and the most radical changes in the FDI regime ever undertaken".

On June 20th, two days after Raghuram Rajan, the respected governor of India's central bank, abruptly announced that he would soon step down, the government covered its embarrassment with another impromptu salute to FDI. The slim package of enticements, amounting to a slight lowering of barriers in some of the same industries, has made India "the most open economy in the world for FDI," said the office of Narendra Modi, the prime minister.

Hyperbole is not unexpected from a government keen to burnish its liberalising credentials. But it has not lived up to its cheery slogans ("Startup India", "We Unobstacle", "Minimum Government, Maximum Governance"). Two years after clinching a sweeping electoral mandate, and with the opposition in disarray, Mr Modi's reform agenda should be in full swing. Instead, as with previous governments, his ill-focused initiatives have run up against India's statist bureaucracy.

To be fair, much of what has been done is useful. Corruption has been stemmed, at least at ministerial level. A vital bankruptcy law has been approved. Yet for all the evidence that Mr Modi's team is doing a better job running the existing economic machinery, it has shown limited appetite for overhauling it.

Pessimists see Mr Rajan's departure as evidence of a further wilting of ambition. After all, as a former chief economist of the IMF, he is an enthusiastic advocate of structural reform. Then again, at the central bank he has focused chiefly on bringing down inflation. Optimists hope he is being eased out because of his habit of speaking his mind, thereby occasionally contradicting the government line, rather than to pave the way for retrograde policies.

Thanks to a mix of lower oil prices and prudent fiscal policies (and perhaps also flawed statistics) the economy grew by 7.9% in the first quarter, compared with the same period the year before, the fastest pace among big economies. Ministers think further acceleration is possible.

That may prove difficult. India's public-sector banks, which hold 70% of the industry's assets, are stuffed with bad loans; the central bank reckons that some 17.7% are "stressed". That Mr Rajan forced them to disclose this fact will not have endeared him to politically connected tycoons now being badgered to repay the banks. Bank shares rose after he said he was leaving, presumably in the hope that his successor will go easy on them. Rating agencies fret that they will still need recapitalising, blowing a hole in the government's finances. In the meantime, credit to industry has all but ground to a halt.

India's overweening bureaucracy is another drag on growth. Copious red-tape and poor infrastructure put India 130th out of 189 countries in the World Bank's "Ease of doing business" rankings. Getting permits to build a warehouse in Mumbai involves 40 steps and costs more than 25% of its value, compared with less than 2% in rich countries. It takes 1,420 days, on average, to enforce a contract.

A slew of liberalising reforms in 1991, when India was in far worse shape than now, were left unfinished as the economy gradually recovered.

Whereas product markets were freed from the “licence Raj”, which no longer dictates how much of what each factory can produce, inputs such as land, labour and capital are still heavily regulated. Having once sought to prise those open, the Modi government now encourages state governments to take the lead with their own reforms.

One result is that there is no proper market for land: businesses that want to set up shop are best off wooing state governments to provide some. Chief ministers with a presidential approach (a model Mr Modi espoused in his previous job running Gujarat) scurry around scouting for plots on behalf of the private sector in a manner that would have seemed familiar to the central planners of yore.

That India is pro-business but not necessarily pro-market is a frequent refrain. “The government wants to create jobs, not the environment in which job-creation flourishes,” says one investor. Special economic zones are set up as sops, sometimes to entice single companies. Even big foreign investors are essentially told what to do: Walmart can only open cash-and-carry stores closed to the general public, Amazon must sell mostly other merchants’ goods rather than its own, and so on.

If businesses cannot get things done themselves, even the most energetic politician will struggle to set up enough factories to generate jobs for the 1.1m Indians joining the labour market every month. Most will end up in the informal sector, where nearly nine in ten Indians now work. The problems snowball from there: informal wages are just a tenth of those in the formal sector, and tax-dodging is rampant. India has just 49m income-tax payers out of a population of 1.2 billion.

Evidence of the mistrust of markets is abundant. Indian farmers need more fertiliser, but imports are taboo and price controls discourage investment in new factories. No matter: the government has leaned on Coal India and a

power utility, of all companies, to try their hand at it. If venture capitalists are wary of funding Indian startups, the state will do it in their stead, badly. A government fund launched five months ago for this purpose has so far made just one investment (each requires the approval of several ministers).

Hopes that privatisation might return the commanding heights of India's economy, nationalised in the 1960s, to private hands have dimmed. Aside from dominating banking and insurance the government also owns an airline, hotels, utilities, a maker of photographic film and, until May, several watch-making factories. Ministers run industries rather than regulate them. In June your correspondent witnessed an audience-member at a public event ask the telecoms minister why his (state-supplied) broadband connection was so slow. The minister promised to look into it. It would have been better, surely, to pass the buck to the private sector. ■



印度经济

挪两步，退一步

印度政府走了一条漫长曲折的改革之路

去年11月，在印度执政党于比哈尔邦（Bihar）地方选举中惨败之后两天，政府出人意料地向外国直接投资（FDI）开放了十几个新行业。一位热情洋溢的官员称之为“FDI体系中迄今最具开创性和最重大的变革”。

6月20日，在备受尊敬的印度央行行长拉古拉迈·拉詹（Raghuram Rajan）突然宣布自己即将离任后的两天，政府为掩饰尴尬，再次临时出台支持FDI计划。这些微薄的诱惑（相当于些微降低了上述某些行业的壁垒）使印度成为“世界上对FDI最开放的经济体”，印度总理莫迪的办公室如是说。

对于一个急于展示自己自由化政绩的政府而言，夸大其辞并不意外。但印度政府还没能实践它所喊的那些振奋人心的口号（“创业印度”，“我们无障碍”、“最小的政府，最大的治理”）。在选举大胜两年之后，反对党又正陷入混乱，莫迪的改革议程本应全面展开。相反的是，与以前的政府一样，他缺乏重点的举措遭遇了印度国家主义的官僚体制。

公平地说，许多已经完成的工作颇为有用。腐败至少在部级层面已被遏止。一项重要的破产法已获批准。然而，尽管所有的证据都表明莫迪团队在管理现存经济机构方面做得不错，但他们全面改革的意愿不大。

悲观主义者将拉詹的离任视为改革决心进一步受挫的证据。毕竟，作为国际货币基金组织的前首席经济学家，他是结构性改革的热情倡导者。不过在执掌央行时，他的重心主要集中在降低通胀上。乐观主义者希望他的退位是因为他习惯于直言不讳，因而偶尔会触及政府的底线，而不是为政策开倒车铺路。

多亏油价走低，再加上稳健的财政政策（以及可能注水的统计数字），印

度经济第一季度同比增长7.9%，是各大经济体中增长最快的。部长们认为还有可能进一步加速。

而这实际上可能很困难。印度国有银行拥有全行业70%的资产，却充满了坏账；印度央行估计其中有约17.7%是“问题贷款”。拉詹迫使银行披露这一事实，此举不会令他受到有政治关系的商业大亨们的欢迎——银行正催着这些人归还贷款。他宣布辞职后银行股上涨，大概是希望他的继任者能放松银行管制。评级机构担心银行仍然需要重新注资，让政府财政再添上一个窟窿。同时，对产业的信贷几乎陷于停滞。

印度唯我独尊的官僚制度是经济增长的另一个拖累。繁文缛节众多、基础设施薄弱，这使印度在世界银行对189个国家“经商便利度”的排名中仅名列第130位。在孟买获准建造一个仓库要经过40个步骤，成本超过投资的25%，而相比之下，富裕国家的这一比例小于2%。在印度强制执行一个合同平均需要1420天。

印度在1991年的情况远比现在更糟，当时随着经济逐步复苏，大量的自由化改革都未进行到底。然而，尽管产品市场脱离了“牌照制度”（licence Raj），不再规定每个工厂可以生产什么、生产多少，但土地、劳动力和资本等投入仍然受到严格监管。莫迪政府曾试图开放这些管制，现在则鼓励各邦政府牵头推进各自的改革。

一个结果就是，没有合理的土地市场：企业想要开店的话，最好的做法是求着各邦政府提供一些土地。大权在握的首席部长们（莫迪之前治理古吉拉特邦时就是如此行事）四处奔波为私营部门寻找地块，这种做法似乎很为昔日的中央规划者们所熟悉。

印度很亲商但不一定很亲市场，这已是老生常谈了。一位投资者说：“政府想要创造就业，而不是创造一个不断产生就业机会的环境。”经济特区的建立是为了施以小恩小惠，有时只是为了吸引单个公司。就连大型的外国投资者也基本上被告知要做什么：沃尔玛只能开不向零售大众开放的现购自运店（cash-and-carry stores），亚马逊则必须主要销售其他商户的

商品而非自营商品，等等。

如果商业不能自行运转，精力再旺盛的政治家也难以建立足够的工厂，为每月加入劳动力市场的110万印度人提供就业岗位。大多数人最终会进入非正规行业工作，目前占就业的近十分之九。问题由此就如滚雪球般越滚越大：非正规行业的工资只有正规部门的十分之一，而且逃税现象猖獗。印度的12亿人口中仅有4900万人缴纳所得税。

不信任市场的证据很多。印度农民需要更多的化肥，但进口已被禁止，价格管制阻碍了对新工厂的投资。没关系：政府在所有公司中选中了印度煤炭公司（Coal India）和一家电力公司来一试身手。如果风投对印度创业公司的融资持谨慎态度，政府将拙劣地越俎代庖。5个月前为此目的推出的一只政府基金迄今只做过一项投资（每一项投资都需要几位部长的批准）。

有人希望，私有化可能会把上世纪60年代被收归国有的印度经济制高点还回私人手中，但这种希望已十分渺茫。除了统治银行业和保险业外，政府还拥有一家航空公司、几家酒店和公用事业公司、一家摄影胶片制造厂，而且在五月前还有几家手表制造厂。部长们是在经营行业而不是监管行业。六月，记者在一场公共活动中亲眼目睹了一位观众询问电信部长，为什么他的（由国家提供的）宽带连接速度如此之慢。部长答应进行调查。当然，这时候要是能把责任推给私营部门就更好了。 ■



The AIIB

The infrastructure of power

Reasons to be enthusiastic about China's answer to the World Bank

CHINA's growing global clout can be unsettling for the incumbents who must make room for it. At the same time, China's recent financial tumult has been unnerving for the investors exposed to it. This combination of vastness and vulnerability has left some people afraid of China and others afraid for it. Both groups have found reason to worry about the Asia Infrastructure Investment Bank (AIIB), which has just held its initial annual meeting in Beijing and approved its first \$509m-worth of projects.

The AIIB reflects China's new eagerness to institutionalise its official lending abroad, which has been generous but contentious. Another example is the sprawling "one-belt, one-road" initiative, which aims to revivify trade routes across and around the Eurasian landmass. Harking back nostalgically to the Silk Road, it envisages a web of bilateral agreements between China and the beneficiaries of its largesse. The AIIB is more modern and multilateral in character. It is billed as China's "21st-century" answer to lenders like the World Bank (always led by Americans) and the Asian Development Bank (dominated by Japan).

To its critics, the AIIB is early evidence of China's determination to work around existing institutions rather than through them. Where some see aggression, others see hubris. The AIIB was conceived when China's foreign-exchange reserves seemed headed inexorably towards \$4 trillion. Since then, China's yuan has fallen and capital has fled. Having lost over \$500 billion of hard-currency reserves in 11 months, can China really afford to lend dollars to Tajikistan?

Neither fear stands up to scrutiny. China's financial commitment to the

AIIB is equivalent to less than one percent of its remaining reserves. Almost 70% of the institution's \$100 billion of capital is drawn from its other 56 participants. It will also raise money by issuing bonds of its own. Far from being a fair-weather folly, the AIIB appears well-timed. Global capital has retreated from emerging markets, leaving a gap the AIIB will help fill. By the same token, the retreating dollars are sheltering in safe assets, such as the highly rated bonds the AIIB proposes to sell.

Unlike the World Bank, which is pulled hither and thither by its members, the AIIB will keep a tighter focus on infrastructure. It has no sitting board or permanent branch offices in borrowing countries. It is also quick, approving four projects within six months of its launch date. More established multilateral lenders can take a year or two to do the same. Some fear the AIIB will deviate from prevailing norms in other, more troubling ways—undercutting environmental standards, say. But of its first four projects, three are joint ventures with existing institutions, subject to their protocols. Its \$217m project to improve slum-life in 154 Indonesian cities, led by a veteran of the World Bank, seems alert to the dangers of soil erosion and groundwater pollution. Likewise, its road-improvement plan in Tajikistan, administered by the European Bank for Reconstruction and Development, will tactfully relocate a monument to Avicenna, a Persian polymath who memorised the Koran by the age of ten.

Any assessment of the AIIB's safeguards must also consider the alternative. If the new institution did not exist, China would presumably lend the money bilaterally, escaping any scrutiny by its peers. It has instead invited outside participation, precisely because it wants the respectability such partnerships confer.

But if China is happy for its new bank to work with existing lenders, why not simply work within them? One reason is that they have been painfully slow to accommodate it. The IMF, for example, agreed in 2010 to give

emerging economies a bigger say. But by the time America's Congress ratified the deal five years later, China's economy had grown by 80% (and Japan's had shrunk by a quarter) in dollar terms. If international financial institutions make room for China, it may bypass them anyway, but if they do not, it definitely will. The AIIB's first solo venture will bring electricity to 2.5m rural homes in Bangladesh. That is not the only kind of power distribution that needs modernising. ■



亚投行

权力的基础设施

为何看好中国回应世行的举动

中国日益增长的全球影响力可能会使必须有所退让的大国坐立不安。同时，中国近期的金融动荡一直让涉足其中的投资者们心神不宁。庞大而又脆弱的中国让一些人心生恐惧，也让另一些人忧心忡忡。这两种人都有理由为亚洲基础设施投资银行（简称亚投行，AIIB）感到担心。亚投行刚刚在北京召开了首次年会，批准通过的首批项目价值5.09亿美元。

中国的官方海外借款一直都十分慷慨却备受争议，而亚投行则体现了中国将其制度化的新渴望。另外一个例子就是规模不断扩大的“一带一路”，旨在重振横跨及环绕欧亚大陆的贸易通道。中国怀念往日丝绸之路的荣光，设想了一个由中国和受益于其慷慨手笔的国家之间双边协议构成的网络。亚投行的特点是更加现代、更加多边。它被视为中国对世界银行（一直由美国人领导）和亚洲发展银行（由日本主导）等贷款机构所给出的“21世纪”回应。

对批评者来说，亚投行是中国决心绕过、而非通过现有机制来解决问题的初步证据。一些人眼中的强势在另一些人看来则是狂妄自大。亚投行的构想提出时，中国外汇储备似乎将不可逆转地突破4万亿美元大关。然而从那时起，人民币开始贬值，资本也出现外逃。在11个月内流失了5000亿美元的硬通货储备后，中国真的还能再给塔吉克斯坦之类的国家贷款吗？

不过这两种担忧都经不起推敲。中国在亚投行的出资额还不到其现存外汇储备的百分之一。亚投行1000亿美元资本中近70%都来自其他56个成员国，还将自行发行债券融资。亚投行绝不是顺境时的荒唐之举，它的到来显得恰逢其时。全球资本都已从新兴市场撤离，亚投行将有助于填补其留下的空白。出于同样的原因，撤走的资本也在寻求安全资产的庇护，比如亚投行打算销售的高评级债券。

与被成员国牵着鼻子走的世界银行不同，亚投行将更加侧重于基础设施。它没有常务董事会，在借款国也没有永久分支机构。它行动迅速，启动6个月以来已批准了四个项目。更老牌的多边贷款机构可能要一两年才能批准这么多项目。有人担心亚投行会在其他更让人担忧的方面偏离通行标准，比如降低环境标准。但在其首批批准的四个项目中，三个是与现有机构合作的项目，要受制于它们的条款。其中一个投资2.17亿美元的项目意欲改善印度尼西亚154个城市中贫民窟的生活水平。该项目由世界银行一名资深专家牵头，似乎对水土流失和地下水污染高度关注。同样，其在塔吉克斯坦的道路改善项目由欧洲复兴开发银行管理，将很巧妙地重新安置阿维森纳（Avicenna）的雕像（阿维森纳是波斯一位博学之士，十岁就能熟背《可兰经》）。

对亚投行保障措施的任何评价都必须考虑如果没有亚投行会怎样。如果这个新的机构不存在，中国可能会通过双边协议贷款，免于任何同类机构的监督。但中国不但不回避监督，反而邀请外部参与，恰恰是因为中国想要得到这种合作伙伴关系所带来的地位。

然而，如果中国乐于让其新银行与现有国际贷款机构合作，为什么不直接就在这些机构内来运作呢？原因之一是这些机构动作之慢令人痛苦。比如，国际货币基金组织（IMF）在2010年就答应给予新兴市场国家更大的发言权。但等到五年后美国国会批准这一方案时，中国的经济按美元计算已经增长了80%，日本经济则缩水四分之一。如果国际金融机构给中国更多空间，中国可能还是会绕过它们，但如果不给，中国就肯定会另起炉灶。亚投行首个独立项目将为孟加拉国的250万农村家庭带去电力。不过需要现代化的不仅仅是电力分配，还有权力分配。 ■



Free exchange

The consensus crumbles

The economists who foresaw the backlash against globalisation

AFTER the second world war, the leaders of the Western world tried to build institutions to prevent the horrors of the preceding decades from recurring. They sought to foster both prosperity and interdependence, to “make war not only unthinkable but materially impossible”. Their work has borne fruit. There has been no armed conflict in western Europe since. Expanded global trade has raised incomes around the world. Yet, as the Brexit vote demonstrates, globalisation now seems to be receding. Most economists have been blindsided by the backlash. A few saw it coming. It is worth studying their reasoning, in order to work out whether a retrenchment is inevitable or might be avoided.

Even economists realise that free trade can be a hard sell politically. The political economy of trade is treacherous: its benefits, though substantial, are diffuse, but its costs are often concentrated, giving those affected a strong incentive to push for protectionism. Since 1776, when Adam Smith published “The Wealth of Nations”, those pressing for global openness have won more battles than they have lost. Yet opposition to globalisation seldom disappears, and often regroups. And a position once considered near-heretical, that globalisation itself seems to create forces that erode political support for integration, is gaining currency.

Dani Rodrik of Harvard University is the author of the best-known such critique. In the late 1990s he pointed out that deeper economic integration required harmonisation of laws and regulations across countries. Differences in rules on employment contracts or product-safety requirements, for instance, act as barriers to trade. Indeed, trade agreements like the Trans-Pacific Partnership focus more on “non-tariff

barriers” than they do on tariff reduction. But the consequences often run counter to popular preferences: the French might find themselves barred from supporting a French-language film industry, for example.

Deeper integration, Mr Rodrik reckoned, will therefore lead either to an erosion of democracy, as national leaders disregard the will of the public, or will cause the dissolution of the nation state, as authority moves to supranational bodies elected to create harmonised rules for everyone to follow. These trade-offs create a “trilemma”, in Mr Rodrik’s view: societies cannot be globally integrated, completely sovereign and democratic—they can opt for only two of the three. In the late 1990s Mr Rodrik speculated that the sovereignty of nation states would be the item societies chose to discard. Yet it now seems that economic integration may be more vulnerable.

Alberto Alesina of Harvard University and Enrico Spolaore of Tufts University presented a different but related view of the trade-offs entailed by global economic integration in “The Size of Nations”, published in 2003. They note that there are advantages to being a large country. Bigger countries can muster more resources for national defence, for instance. They also have large internal markets. But bigness also carries costs. The larger and more heterogeneous a country, the more difficult it is for the government to satisfy its citizens’ political preferences. There is less variation in political views in Scotland, to take one example, than across Britain as a whole. When policy is made by the British parliament (rather than in Edinburgh, Belfast and so on) the average Briton is slightly less satisfied with the result.

Global integration, Messrs Alesina and Spolaore argue, reduces the economic cost of breaking up big countries, since the smaller entities that result will not be cut off from bigger markets. Meanwhile the benefits of separatism, in terms of being able to cater better to the preferences of

voters, are less diminished. So the global reduction in barriers to trade since the second world war, the pair contend, at least partly explains the simultaneous growth in the number of countries, even if national fractures often involve, or lead to, political instability and violence.

And then there is the question of how the benefits of globalisation are shared out. Joseph Stiglitz, a Nobel prizewinner, has warned that rent-seeking companies' influence over trade rules harms workers and erodes support for trade liberalisation. Raghuram Rajan, the head of India's central bank, has argued that clumsy government efforts to compensate workers hurt by globalisation contributed to the global financial crisis, by facilitating excessive household borrowing, among other things. David Autor, David Dorn and Gordon Hanson have documented how the costs of America's growing trade with China has fallen disproportionately on certain cities. And so on.

| *Open and shut*

Branko Milanovic of the City University of New York believes such costs perpetuate a cycle of globalisation. He argues that periods of global integration and technological progress generate rising inequality, which inevitably triggers two countervailing forces, one beneficial and one harmful. On the one hand, governments tend to respond to rising inequality by increasing redistribution and investing in education; on the other, inequality leads to political upheaval and war. The first great era of globalisation, which ended in 1914, gave way to a long period of declining inequality, in which harmful countervailing forces played a bigger role than beneficial ones. History might repeat itself, he warns.

Such warnings do not amount to arguments against globalisation. As many of the economists in question are quick to note, the benefits of openness are massive. It is increasingly clear, however, that supporters of economic integration underestimated the risks both that big slices of society would

feel left behind and that nationalism would continue to provide an alluring alternative. Either error alone might have undercut support for globalisation—and the six decades of relative peace and prosperity it has brought. In combination, they threaten to reverse it. ■



自由交流

共识崩塌

预见到抵制全球化力量的经济学家们

二战之后，西方国家的领袖力图建立一个体系，防止之前数十年里的恐怖重现。他们设法同时促进经济繁荣和各国间的相互依赖，“让战争不仅难以想象，而且实质上也不可能。”他们的工作颇具成效，自那以后在西欧再没有过武装冲突。扩张的全球贸易也提升了世界各国的收入。然而正如英国脱欧公投所显示的，全球化似乎在倒退。大多数经济学家对这一抵制措手不及，少数经济学家则预见到了这种情况的到来。他们的论证过程值得研究，以便了解这种收缩是无法阻挡还是可以避免的。

连经济学家都意识到自由贸易在政治上推行起来会很困难。贸易的政治经济影响险恶难测：其好处虽显著却分散，而代价却往往集中在少数人身上，令受影响者产生强烈的动机来推进贸易保护主义。自1776年亚当·斯密发表《国富论》以来，积极要求全球开放的人士一直胜多负少。然而全球化的反对派却很少会就此销声匿迹，而是常常重整旗鼓。有观点认为全球化自身似乎会创造出一股力量，侵蚀对一体化的政治支持。这一论调一度被视为近乎异端，如今却越传越广。

哈佛大学的丹尼·洛迪克（Dani Rodrik）是此类知名批评文章的作者。在上世纪90年代末，他指出更深层次的经济一体化需要各国法律法规的协调。例如，劳动合同法规或者产品安全要求上的差异就成了贸易壁垒。实际上，像跨太平洋伙伴关系（TPP）这类的贸易协定更多关注非关税壁垒，而非降低关税。但其后果往往与大众的倾向背道而驰：例如法国人可能会发现他们被禁止支持法语电影业。

洛迪克认为，更深入的一体化要么会导致对民主的侵蚀，因为国家领导人漠视民众的意愿；要么造成民族国家的消亡，因为权力转到超民族机构手里，后者获选来制定人人遵循的和谐规则。在洛迪克看来，这些权衡造成了“三难困境”：各国社会无法同时实现全球一体化、完全主权和完全民主

——它们只能三者选其二。在上世纪90年代末期，洛迪克推断各国社会将会选择放弃民族国家的主权。然而现在看来，经济一体化可能更容易被放弃。

哈佛大学的阿尔贝托·艾莱斯那（Alberto Alesina）和塔夫茨大学（Tufts University）的恩里科·斯波劳雷（Enrico Spolaore）在2003年出版的《国家的规模》（The Size of Nations）一书中对全球经济一体化所引起的权衡表达了不同但有关联的观点。他们指出成为一个大国有诸多优势。例如，国家越大就能聚集越多资源用于国防。大国也有更大的国内市场。但大也有代价。国家越大就越多元，政府就越难于满足国民的政治偏好。举个例子，相比整个英国，苏格兰内部的政治观点差异更小些。当英国议会（而不是由苏格兰和北爱尔兰等地方议会）推出一项政策时，普通英国人对这一结果的满意度就会稍微低一些。

艾莱斯那和斯波劳雷提出，全球一体化降低了大国解体的经济成本，因为解体产生的小国不会被大市场排斥。同时，就能更好地迎合选民的偏好而言，分离主义的好处受到的影响较小。两人认为，二战后全球贸易壁垒的减少，至少在一定程度上解释了国家数量的同步增长，虽然国家分裂经常涉及或导致政治不安和暴力。

然后还有全球化的好处如何分配的问题。诺贝尔奖得主约瑟夫·斯蒂格利茨（Joseph Stiglitz）曾经警告说，寻租公司对贸易规则的影响力会伤害工人并侵蚀对贸易自由化的支持。印度央行行长拉古拉迈·拉詹

（Raghuram Rajan）指出，政府为补偿受到全球化伤害的工人所做的拙劣努力促成了全球金融危机，比如这些做法就推动了家庭贷款过度发展等问题。大卫·奥特尔（David Autor）、大卫·多恩（David Dorn）和戈登·汉森（Gordon Hanson）已经说明，随着美国对中国贸易不断增长，其产生的代价不均衡地集中在一些城市。如此种种。

| 开与关

纽约城市大学的布兰科·米兰诺维奇（Branko Milanovic）认为这些代价令全球化的循环永续下去。他提出全球一体化和技术进步的周期导致不平

等不断加剧，而这不可避免地会触发两股对抗力量，一个有益而一个有害。一方面，各国政府往往以加强再分配和提高对教育的投入来应对日益增长的不平等；另一方面，不平等导致政治动荡和战争。全球化的第一个伟大时代结束于1914年，之后的一段很长的时间里，不平等程度减轻，这一时期内有害的抗衡力量比有益的力量发挥了更大的作用。他警告说，历史可能会重演。

这样的警告不等于在反对全球化。许多前文提到的经济学家都会毫不迟疑地承认开放的好处巨大。然而有一点越来越明显，就是经济一体化的支持者低估了两个风险，一是社会中很大一部分群体会感到被抛下，二是民族主义会继续提供另一个诱人的选择。任何一个错误都可能削弱对全球化的支持，以及全球化带来的六十年的相对和平与繁荣。加在一起，这些错误将有逆转全球化之虞。■



Schumpeter

The imperial CFO

Chief finance officers are amassing a worrying amount of power

THE days of imperial CEOs have long gone. Today's chief executives do their best to contain their egos and, instead, project a modest image. They talk about "servant leadership" and make a point of cultivating their "stakeholders". Many bosses leave the limelight to company founders and big-name investors. And yet a new authority figure has emerged within companies, much less exuberant than old-fashioned autocratic CEOs but just as determined to amass power: the imperial CFO.

Chief financial officers barely existed 50 years ago: company accounts were administered by mysterious people called "comptrollers". Today, CFOs are at the heart of all the world's big firms. They are the only corporate officers other than the boss who are able to monitor every corner of an organisation. They are the only executive other than the chief who is feared by everybody: a "no" from the CFO means that your precious project is dead. Russell Reynolds, a search firm, calls them "co-pilots". At one high-profile company, Twitter, the CFO, Anthony Noto, is arguably doing most of the piloting.

Finance chiefs play a growing role in shaping the scope and direction of a company. They no longer wield the red pen just on the basis of what they see in the accounts. They do so through the prism of corporate strategy, which they are deeply involved in setting. They allocate capital with a view to bringing that strategy to life—evaluating how well a particular scheme fits into a firm's long-term vision and counting out the beans accordingly.

CFOs also play a growing role in overseeing corporate operations. Two decades ago, they seldom took their noses out of their spreadsheets. They

now spend much of their time inspecting operations—dropping in here, there and everywhere to see what the accounts mean in practice. This detailed knowledge of the corporate landscape increases their influence.

The other province colonised by CFOs is external relations. They spend plenty of time talking to investors, board directors, regulators and other stakeholders. Analysts will often pay more attention to the views of the finance supremo than to those of the ultimate boss. Ruth Porat, who is currently CFO of Alphabet, Google's parent company, and previously had the same job at Morgan Stanley, a bank, is particularly influential on Wall Street. The same can even be true of boards: Leo Apotheker's days as CEO of Hewlett-Packard were numbered when his CFO, Cathie Lesjak, told the board that she strongly opposed his decision to buy Autonomy, a software company.

These rising powers are well rewarded for their growing clout. In 2014 the median pay for a CFO at an S&P 500 company was \$3.8m. (The highest-paid, Patrick Pichette, Google's CFO until last year, took home \$43.8m.) Though this was lower than the top dog's remuneration, the gap is narrowing, with CFOs winning slightly larger pay increases than their bosses, particularly in bigger companies. CFOs are also gaining power within what might be called the shadow ruling class—a network of boards, chairmanships and quangos that hire the CEOs and mark their report cards. EY, a consultancy, says that in 2012 almost 50% of CFOs at the 350 largest global firms sat on the boards of other companies, compared with a figure of 36% in 2002.

Several things explain the rise of the CFO. The shareholder-value movement played a role in promoting them and giving them a bigger role in setting corporate goals. Andrew Fastow, who was convicted for his role in the demise of Enron, was an ominous early occupant of the co-pilot's seat. The Sarbanes-Oxley legislation that was brought in to clear up that mess codified the CFO's role as the CEO's partner at the top of the corporate

pyramid. The financial crisis of 2008 focused even more attention on managing costs. CFOs also have more powerful tools than ever to monitor what is happening in their organisations. They have access to lots of data and computing power, which allow them to build up a timely picture of what is going on.

It is hard to work out whether an imperial CFO is a good thing. Encouragingly, there is growing diversity and professionalism. Women hold 13% of CFO positions at America's leading companies, against only just under 5% of the top jobs. Today's finance chiefs are better trained than their predecessors, and more likely to have degrees and experience in a broad range of corporate functions. Sarbanes-Oxley and other legislation has forced CFOs to be more careful about following the rules.

| *Emperor's new clothes*

But the example of Mr Fastow should serve as a warning. CFOs have shorter job tenures than CEOs—a little over five years on average at American listed companies, compared with seven years for the boss. They also owe a higher proportion of their pay to performance than any other corporate officer other than the CEO. At the same time they are subjected to a welter of conflicting pressures—acting as spin-doctors and bean-counters as well as corporate strategists and auditors. EY, in a recent report on finance bosses, begins with a warning that “it's become a job that may be too big for any one individual to do well.” The growing number of tools at a CFO's disposal may allow them to measure corporate performance more accurately but it also enables them to shuffle figures to produce the best results.

In 2013 Mr Fastow explained his behaviour on the ground that he thought “that's how the game is played...You have a complex set of rules and the objective is to use the rules to your advantage.” Finance chiefs may expend more of their efforts nowadays satisfying regulations, but they also spend a great deal of time using devices such as “internal charges” (transfer pricing)

to concentrate the company's profits in countries with the lowest taxes. The term "imperial" is never a good thing when applied to a corporate officer—in particular when that individual's principal job is to keep his company on the straight and narrow. ■



熊彼特

霸权CFO

首席财务官抢揽大权，令人忧虑

CEO独揽大权的日子已一去不复返了。今日的首席执行官们尽力避免显得自命不凡，转而展露出一副谦恭形象。他们大谈“仆人式领导力”，又强调扶持“利益相关者”。许多老板把风头让给公司创始人和大牌投资者。然而公司中又浮现出一个新的权威人物——他们不像专横的老式CEO那样独断专行，但揽权之心却同样坚决：霸权CFO。

首席财务官在50年前几乎不存在：公司账目由名为“审计官”的神秘人物管理。如今，CFO已成为全球所有大企业的核心人物。他们是老板以外唯一有权监控公司大小事务的企业高管，也是首席执行官以外唯一令众人诚惶诚恐的人物：CFO一声“不”，你宝贵的项目就此毙命。猎头公司罗盛咨询（Russell Reynolds Associates）称他们为“副驾驶”。在著名的Twitter公司里，CFO安东尼·诺托（Anthony Noto）可以说承担了大部分的“驾驶”工作。

财务负责人在管理公司的业务范围及发展方向上扮演着越来越重要的角色。他们不再单凭账目所见而挥动红笔批核，而是透过企业战略进行考量，他们自己也会深度参与这些战略的制定。他们配置资本时会以贯彻公司战略为依据——评估特定计划是否符合公司的长期愿景，然后分配相应资源。

CFO在监督企业运营上也发挥越来越大的作用。二十年前，他们很少理会财务报表以外的东西。现在，他们会花更多时间检视公司运营——四处巡查业务，了解账目数字对应的实际运作。对企业布局的深入了解让其影响力越来越大。

CFO进驻的另一领域是外部关系。他们花费大量时间与投资者、公司董事、监管机构及其他利益相关者对话。分析师们往往更关注财务掌门人而

非最终老板的意见。谷歌母公司Alphabet目前的CFO鲁斯·波拉特（Ruth Porat，之前在摩根士丹利银行任同样职务）在华尔街尤其影响力。在董事会中更是如此：当惠普的CFO凯西·莱斯加克（Cathie Lesjak）向董事会表示强烈反对CEO李艾科（Leo Apotheker）收购软件公司Autonomy的决定时，李艾科在位的日子就已经屈指可数了。

这些新势力因影响力日益增强而获得丰厚的回报。2014年，标准普尔500指数公司的CFO年薪中位数为380万美元。（截至去年任谷歌CFO的帕特里克·皮切特 [Patrick Pichette] 薪酬最高，将4380万美元收入囊中。）虽然低于CEO的薪酬水平，但差距正在缩窄——CFO的薪酬升幅稍高于CEO，这在较大型企业尤其明显。CFO在所谓的影子统治层（由董事会、主席、半官方机构构成的人脉网，有权聘用CEO并评估其业绩）也权力日增。咨询公司安永表示，2012年，350家大型全球企业的CFO中有近50%兼任其他公司的董事，在2002年时这一数字仅为36%。

CFO的崛起可以从几方面解释。股东价值维权运动有助于推动CFO地位提高，也使其在制订公司目标时扮演更重要角色。在安然公司破产事件中被定罪的安德鲁·法斯托（Andrew Fastow）不幸早早占据了“副驾驶位”。事后为清理乱象而颁布的萨班斯-奥克斯利法案（The Sarbanes-Oxley legislation）把CFO的职能规定为CEO在企业金字塔顶层的搭档。2008年的金融危机让人们进一步关注管理成本，CFO也拥有了前所未有的强大工具来监控组织内发生的一切。他们可以调用大量数据及计算能力，及时了解实际情况。

霸权CFO到底是好是坏尚难下定论。令人欣喜的是，其多样性和专业程度均有所提升。美国主要企业中女性CFO的比例为13%，而在其他高管职位中仅有5%。今天的财务负责人比其前辈更训练有素，更可能拥有对应企业广泛职能的学位及经验。萨班斯-奥克斯利法案等立法已迫使CFO更谨慎地守法行事。

| 皇帝的新衣

然而法斯托的例子应引以为鉴。CFO的任期比CEO短，在美国上市公司中

前者平均为五年多一点，而后者为七年。除CEO外，CFO薪酬中与业绩关联的比例也比其他高管高。同时，他们还承受着诸多相互矛盾的压力——既要为公司公关把关，又要对内锱铢必较，还要担任企业的战略师和审计师。安永最近对财务高管的一份报告开头写道：“这工作的职责已变得太大，靠一人之力恐怕谁也做不好。”CFO可运用的工具越来越多，这也许有助其更准确地衡量公司业绩，但也方便了他们操纵数字来堆砌最佳结果。

2013年，法斯托为自己的行为辩解，理由是认为“游戏就是这样玩的……有这么复杂的一套规则，目标就是要运用规则来服务于自身利益。”如今，财务负责人也许会更费心于合规经营，但他们也花费相当多精力运用“内部往来”（转移定价）之类的手段，把公司利润集中到税率较低的国家。“霸权”一词用于企业高管身上从来就不是件好事——如果这位高管的主要职责是让公司规矩本分的话就更不是了。■



Health care

All about the base

New businesses eye the opportunities in managing genome data

THE project to understand the human genome has long promised to revolutionise the way that diseases are diagnosed, drugs are designed and even the way that medicine is practised. An ability to interpret human genetic information holds the promise of doing everything from predicting which drugs will work on a particular patient to identifying a person's predisposition to develop diseases.

Genomic information is already transforming some medical practices. Sequencing has changed the way that fetuses are screened for Down's syndrome, from a risky invasive test to one where abnormalities in fetal DNA can be picked up from blood drawn from the mother. In time this sort of method will extend to other genetic disorders and other medical applications. One area of promise is treating some types of cancer. Using blood tests to detect genetic changes in tumours could allow doctors to discover more quickly when drugs are no longer effective. This is so promising that there is already speculation that performing such "liquid" biopsies could be a \$11 billion business by 2022.

Realising the vast potential of genomic medicine is a commercial project as well as a scientific one. It relies on a small but growing group of companies that are vying to produce data more cheaply, analyse them more quickly, store them securely and then to translate them all into useful information.

These tasks have proved harder than expected. As genome data have started to be collected and sifted, nuggets of genetic gold are emerging. Yet creating and using this torrent of information is an endeavour of enormous scale and complexity. Each human genome comprises about a hundred gigabytes

of data. The amount gathered is doubling every seven months; by 2025 it could require more storage capacity than for every YouTube video on the planet, or for all the information astronomers have drawn from the heavens.

One firm in particular has been at the heart of this nascent genomic-data industry. Illumina, based in San Diego, is the main provider of the machines that sequence genetic information. Its dominance, and its role in reducing costs (see chart), has led to comparisons with Intel's grip on chipmaking. It controls 70% of a market worth \$3.3 billion in 2015, according to Research and Markets, a research firm. As its customers, now mainly researchers, expand to include medical practitioners, that market could grow to between \$12 billion and \$20 billion by 2020.

Illumina's continued dominance is by no means assured. Pacific Biosciences, based in Menlo Park, California, has developed a machine that does a similar job. It is selling well because it is better at some jobs than Illumina's machines. Thermo Fisher, of Waltham, Massachusetts, is another rival; its machine should appeal to clinics because it is easier to operate and more efficient at targeting those sequences that are likely to be of most interest.

| *Pore man, rich man*

New technologies threaten both Illumina and its current competitors. Oxford Nanopore, a small British company, has pioneered a new method of sequencing. It passes DNA through tiny holes, whose changing electrical resistance is recorded as different molecular "letters", or bases, pass by. Existing methods tag the four letters of DNA with a different marker and then read the sequence of tags.

Using pores is not yet as accurate as using markers, but is allowing sequencing machines to be built that are small, portable and quicker at

reading data. That would eventually allow for new services such as diagnostics in the field and on-the-spot testing for infections. Although it is unclear whether the technology can compete in the business of sequencing entire human genomes, the British minnow does seem to pose a threat. In February Illumina filed two lawsuits against the company for patent infringement.

Once sequenced, genetic data are the raw materials for other business ventures. One flourishing area of activity lies in making sense of it all. Craig Venter, a pioneer of genomics and boss of Human Longevity Inc (HLI), also in San Diego, is assembling the largest and most comprehensive database of genomic and clinical data in order to hunt through it for targets for new drugs.

Understanding the genetic basis of a disease or disorder can be critical in identifying therapies that will fix these problems. With this in mind HLI recently signed a ten-year deal reportedly worth hundreds of millions of dollars with AstraZeneca, a British drug company, to sequence half a million genomes. The potential to find targets for drugs is such that Mr Venter thinks HLI might one day transform itself into a pharmaceutical company.

The race to identify promising targets is likely to encourage more of these partnerships as drugmakers try to get their hands on data that will help them improve their drug pipelines. Indeed, in another deal ten companies, including AbbVie, Biogen, Roche, Takeda and GSK, have partnered with Genomics England, a company set up by the British government to sequence the genomes of 100,000 patients.

Genome data have to be stored as well as analysed. That relies on cloud-computing firms. Mr Venter says his company pays Amazon \$1m a month for computing and storage. This is not yet a big business, but it is growing.

According to one estimate, cloud-computing firms could charge \$1 billion a year by 2018 as the quantities of digital information continue to grow. Firms including Amazon and Google are jostling to become the platform of choice for managing genome sequences.

One way to attract business is for the cloud firms also to offer tools to make sense of the data. In February Microsoft announced a collaboration with Spiral Genetics, which has developed methods for managing and analysing genome sequences. In May Huawei launched China Precision Medicine Cloud which, by including tools from Wuxi NextCODE, an analytics firm, allows thousands of complete human genomes to be analysed in one go. Plenty of other companies are offering ways of slicing and dicing data in the cloud, including DNAnexus, Seven Bridges and Illumina's BaseSpace.

As genetic testing becomes ever cheaper, it will open up new opportunities. Invitae, based in San Francisco, is already trying to set itself up as the Amazon of genome sequencing by making the process of ordering medical-grade tests so easy and cheap that testing for genetically inherited diseases becomes as simple as ordering books online. Other applications stretch beyond medicine. Genome sequencing could be used to check if food is safe to eat, for example, or to clamp down on the illegal trade in wildlife or to monitor the spread of antibiotic resistance.

But profits are not guaranteed to flow quickly. Health-care providers and governments are an obvious source of sales, but they are notoriously slow to spend their money on new forms of testing. And the business of direct-to-consumer genetic testing relies on convincing individuals that such tests are worthwhile and regulators that they are safe and accurate. Genomics has long blended huge promise and practical difficulties. That won't change. ■



医疗保健

关于碱基的一切

新公司注目管理基因组数据的机遇

长久以来，解读人类基因组的计划都承诺会彻底改变疾病诊断、药物设计甚至行医的方式。如果有了解读人类基因信息的能力，从预测哪种药会对某位病人有效，到确定某人罹患疾病的可能性，这一切都有望成为可能。

基因组信息已经改变了一些医疗实践。测序改进了筛检胎儿是否患有唐氏综合症的方法，使其从有风险的侵入性检查，变成通过母体血样就可检测出胎儿的DNA异常。今后这种方法也将扩展到其他遗传病和医疗应用，其中一个有希望的领域是治疗某些癌症。通过验血检测肿瘤的基因变化，药物失效时医生就能更早发现。前景如此光明，已经有人预测，到2022年这类“液体”活检可能会成为价值110亿美元的生意。

实现基因组疗法的巨大潜力既是商业项目也是科学项目。它能依赖的公司很少，但数目却在不断增加。这些公司竞相用更便宜的方法得出数据，更快地进行分析，更安全地存储并且将其全部转化成有用的信息。

事实证明这些任务比预想的更困难。随着人们开始采集并筛选基因组数据，基因金矿逐渐显露。然而，创建并使用这一信息洪流的工作规模宏大且极其复杂。每一套人类基因组数据都有约100吉字节，采集的总量每七个月增加一倍；到2025年它需要的存储空间比地球上所有的YouTube视频加起来还要多，也超过天文学家从太空获取的所有信息。

有家值得一提的公司位于这一新生的基因组数据行业的中心。位于加州圣迭戈的Illumina是基因信息测序仪器的主要供应商。它的统治地位以及在降低成本上起到的作用（见图表）堪比Intel对芯片制造的掌控。根据市场调查公司“研究与市场”（Research and Markets）的数据，2015年在这一价值33亿美元的市场中，Illumina占据了70%的份额。目前它的客户主要是研究人员，随着客户范围向医疗从业人员扩展，到2020年这一市场可能会

增至120亿到200亿美元之间。

但并没有什么能够保证Illumina会继续统领市场。位于加州门洛帕克（Menlo Park）的太平洋生物科学（Pacific Biosciences）也研发出一款类似用途的仪器。这款仪器在某些任务上完成得比Illumina更好，因此十分畅销。Illumina的另一个竞争对手是马萨诸塞州沃尔瑟姆（Waltham）的赛默飞世尔（Thermo Fisher）。该公司的仪器应该会更受诊所青睐，因为它操作更简单，而且能更有效地瞄准那些人们可能最感兴趣的序列。

| 有孔，有钱

新技术对Illumina和它目前的竞争对手都构成了威胁。英国一家小公司“牛津微孔”（Oxford Nanopore）开创出一种新的测序方法。它让DNA通过微小的孔，当不同的分子“字母”或碱基通过时，微孔电阻的变化便会被记录下来。现有的方法是给DNA的四个字母标上不同标志，然后读出标签的顺序。

现在使用微孔来确定DNA序列还没有使用标记那么准确，但这种方法可以把测序仪做得小巧、便携并且可以更快读出数据；有朝一日它也许会带来一些新的服务，例如实地诊断以及现场检测感染。尽管尚不清楚这种技术能否加入整个人类基因组测序行业的竞争，但这条英国小鱼看来的确搅动起了波澜。今年2月Illumina提出两起诉讼，控告该公司专利侵权。

一旦被测序，基因数据就成为了其他商业公司的原材料。弄懂所有这些数据便成为了一个蓬勃发展的活动领域。克雷格·文特尔（Craig Venter）是基因组学的先驱，也是同样位于圣迭戈的人类寿命公司（Human Longevity Inc, HLI）的老板。他正在整合最大最全的基因组和临床数据的数据库，希望通过这一数据库寻找新药的靶标。

了解一种疾病或紊乱的基因基础对于确定解决这些问题的疗法来说至关重要。基于这一点，HLI最近和英国制药公司阿斯利康（AstraZeneca）签下一份为五十万基因组测序的十年协议，据报道价值数亿美元。为新药寻找靶标潜力巨大，因此文特尔认为HLI可能有一天会转型成为制药公司。

制药公司竞相为药物找寻有希望的靶标，这可能会促成更多这样的合作，因为制药厂想要拿到数据，帮它们改善药品的研发储备。确实，在另一个交易中，包括艾伯维（AbbVie）、百健（Biogen）、罗氏（Roche）、武田（Takeda）和葛兰素史克（GSK）等在内的十家公司，都与一家名为 Genomics England 的公司建立了伙伴关系。该公司由英国政府成立，为十多万名患者的基因组测序。

基因组数据不但需要存储，更需要分析，这就要依靠云计算公司。文特尔说他的公司每月会向亚马逊支付一百万美元的计算和存储费用。现在这还不算一门大生意，但它在不断发展。有预测称，随着数字信息量的持续增长，到2018年云计算公司收取的费用估计可达每年10亿美元。包括亚马逊和谷歌在内的公司正在争相成为首选的管理基因组序列的平台。

云公司招揽生意的方式之一是同时提供弄懂数据的工具。2月微软宣布与 Spiral Genetics 合作，该公司已经研发出管理并分析基因组序列的方法。5月华为发布中国精准医学云平台，并采用了分析公司明码生物科技提供的工具，可以一次性分析数千组完整的人类基因组。许多别的公司也在提供种种方式来分析云端数据，其中包括 DNAnexus、Seven Bridges 和 Illumina 旗下的 BaseSpace。

基因测试越来越便宜，这也带来了新的机遇。位于旧金山的 Invitae 已经在试图将自身打造成基因组测序界的亚马逊，它让订购医学级测试的流程变得非常简单便宜，使得测试基因遗传疾病就像网上买书一样便捷。基因测试在医学范畴之外也有广泛的应用。例如，基因组测序可以用来检查食物能否安全食用，也可以用来打击野生动物非法贸易，或者用来监控抗生素耐药性的蔓延情况。

但是利润不一定会很快增长。医疗保健提供商和政府无疑是大买家，不过在花钱采购新型测试上，它们也是出了名地迟缓。如要开展直接面向消费者的基因测试生意，需要说服个人相信这样的测试值得做，并且让监管者确信这些测试安全又准确。一直以来基因组学都有着无限光明的前景，然而实际操作起来却又困难重重。这一点将来也不会改变。■



If China embarked on mass privatisation

The greatest sale on Earth

How China sells its state-owned enterprises matters as much as whether it does

“CHINA must privatise,” insists Chen Zhiwu of Yale University, who serves on the board of PetroChina, the publicly traded arm of the China National Petroleum Corporation, one of the country’s biggest state firms. He cautions that, as long as state-owned enterprises (SOEs) are dominant in an industry, the rule of law suffers as state assets are used to provide benefits to company bosses and political elites. Within the Communist Party hierarchy some state firms’ chairmen have outranked the heads of the regulatory agencies charged with supervising them. The State-owned Assets Supervision and Administration Commission (SASAC), the body responsible for managing big state firms, even engages in an obscene game of round robin whereby it occasionally rotates the bosses of SOEs within an industry—airlines, energy and banks are recent examples—even though these firms are supposed to be commercial rivals. This makes a mockery of competition, as does the fact that China’s state firms are rarely targeted by antitrust authorities.

Forty years after the death of Mao Zedong, who crushed the private sector, China today still has some 150,000 SOEs. Many of its best-known companies, from China Mobile to CITIC, are “red chip” firms. Nearly a fifth of the *Fortune* Global 500 list of the world’s biggest companies are from greater China, and most of these goliaths are in the state sector.

Few Communist Party officials are keen to sell off what they see as crown jewels. Many would resist reforms that would loosen their grip on the economy. However, given the recent financial panics and policy bungling that have set the world on edge about China’s economic health, it is becoming possible to imagine a scenario in which the Chinese leadership

feels compelled to embrace privatisation. Several forces could help to bring this about.

For one thing, it costs a fortune to keep China's lumbering SOEs supplied with subsidies and cheap capital. By one reckoning, the government spent over \$300 billion, in nominal terms, between 1985 and 2005 subsidising the biggest state firms. These firms are also debt bombs waiting to explode (see chart 1). The IMF calculates that the average debt-to-equity ratio at SOEs rose from 1.3 in 2005 to about 1.6 in 2014, whereas the level at private firms in 2014 was below 0.8. Returns on assets at SOEs lag far behind those at private firms, and are dropping (see chart 2). A stalling economy or another financial shock could well force the country's leaders to reconsider their ambivalence about privatisation.

If that happened, how should they go about it? For a start, China should avoid some mistakes. The temptation to move swiftly, as a way of overcoming resistance to reform, carries big risks. In Russia the fire sale of state assets after the collapse of the Soviet Union led to a massive transfer of official wealth to well-connected oligarchs, particularly in the raw-materials industries. Given China's cosy nexus of party and state, there is a great danger that a drive to sell off state assets quickly would merely transfer them to China's version of oligarchs, the "princelings", as the influential descendants of early Communist leaders are known. Scott Kennedy of America's Centre for Strategic and International Studies, a think-tank, insists that "the outcome would be one that Schumpeter would not be proud of...with princelings and others with *guanxi* [political connections] creating enclaves they would dominate."

There are also lessons from Communist China's own previous dalliances with the private sector. China's economic reforms began after 1978 in the countryside, where most people lived in desperate poverty at the time. Officials decided to allow rural entrepreneurs to start businesses; land was

decollectivised and contracted out to farmers; and market prices began to erode the fixed-price system. Many ailing “township and village enterprises” (including Wanxiang, now the world’s biggest independent manufacturer of car parts) were allowed to be run as private firms. This rural “privatisation” drive did at least as much to reduce poverty and to spur economic growth and employment as did China’s subsequent opening to global trade and foreign investment. Alas, in the 1990s the party rolled back almost all of those rural reforms and related financial liberalisation, and opted instead for stronger control over the economy.

Before long, hard times again forced Communist leaders to look to the private sector for salvation. In the late 1990s a wave of privatisation and restructuring saw thousands of smallish state firms disappear and tens of millions of workers lose their jobs. This may seem like an embrace of market discipline, but Yasheng Huang of Massachusetts Institute of Technology argues that it was flawed in two ways.

First, it was stealthy. Asset sales often took place without proper legal and institutional frameworks. As a result, property rights were insecure and assets subject to subsequent state seizure as well as appropriation by insiders. Second, leaders remained wary of market forces, using peripheral privatisations as part of a strategy to retain political control. China’s leadership revealed that the objective of reform was to “grasp the large, release the small”: the chief aim was not to increase the efficiency of the state sector or to boost consumer welfare through competition. Rather, it was to create bigger, more dominant national champions that would remain tightly controlled by the party.

The proof is in the pudding. SASAC saw its asset base (of the biggest state firms) increase from 7.1 trillion yuan in 2003 to 21 trillion yuan in 2009. Count all 150,000-odd SOEs today and that figure rises to over 100 trillion yuan in state assets.

So, to be serious, the effort should be bold, transparent and long-term. For example, a thoughtful plan to wind down holdings in several big industries currently dominated by the state—energy, telecoms and transport, say—in stages over the next decade could give enough time for markets to absorb the inevitable wave of sell-offs, acquisitions and bankruptcies. Successful experience with privatisation in these industries around the world belies the Communist Party’s claim that they are too strategic to be left in private hands.

Insiders will still try to game the system, but this can be made more difficult (as it was in the more sophisticated parts of post-communist eastern Europe) by holding competitive auctions that are open to all, including foreign investors. The government itself has proposed reforms to its foreign-investment laws that would, at long last, put foreign investors and domestic rivals on an equal legal footing. Another measure that would spread the wealth beyond the princelings would be the allocation of shares from any privatisations to government pension schemes. This would ensure a broad ownership of assets and may help win over a sceptical public worried about dodgy dealings.

To ensure that competition flourished, privatisation would need to go hand in hand with an equally ambitious agenda of legal and institutional reform. In a paper for the Paulson Institute, a think-tank, Curtis Milhaupt of Columbia University and Zheng Wentong of the University of Florida argue that China must “transform the role of the state from an active market participant to the designer and arbiter of neutral, transparent rules for market activity.” They are rightly sceptical of the government’s timid plans for “mixed ownership reforms”, which involve selling off bits and pieces of a few SOEs to private investors without yielding management control.

| *Beware of mega-zombies*

They are even more scathing in their critique of the government’s plans to

consolidate the 100 or so biggest SOEs, many of which are lumbering zombies, into just 40 or so mega-zombies: “These massive consolidations will accentuate the role of the state in key sectors and will generate even more rent-seeking activities... [and] additional deadweight loss that would be generated by the creation of monopolies.”

Few know China’s rocky history of market reforms as well as Fred Hu does. He runs Primavera, a prominent investment fund in Hong Kong (which was involved in the bold but, in the end, unsuccessful bid by China’s Anbang Insurance Group for America’s Starwood Hotels & Resorts Worldwide). Previously, he held big China-focused jobs at the IMF and Goldman Sachs. From painful experience, he declares that half-measures like “independent” boards do not work.

He wants President Xi Jinping to embrace a privatisation plan that “sells off all SOEs to the world” over his remaining seven years in office. Sequence the sales carefully, pull in strategic investors and put some shares into the state pension fund, and this veteran China dealmaker thinks this can be done entirely on domestic capital markets. If it really happens, and is accompanied by reform of the rule of law, it would prove transformative to China’s economy. As Mr Hu puts it, “it would be the greatest sale on Earth.” ■



如果中国进行大规模私有化

地球上最大的拍卖

中国出售国有企业的方式与是否出售它们同等重要

“中国必须私有化。”耶鲁大学的陈志武坚持道。陈志武在中国石油担任董事，而中国石油是中国最大的国有企业之一——中国石油天然气集团公司的上市子公司。他告诫说，只要国有企业（SOE）在一个行业占主导地位，法治就将遭到破坏，因为国有资产会被用来给公司老板和政要输送利益。在共产党的级别体系里，一些国有企业董事长的级别比负责监督他们的监管机构领导还要高。负责管理大型国有企业的国有资产监督管理委员会（国资委）甚至还会搞轮换制的肮脏把戏，让一个行业中国有企业的老板轮岗（最近就有航空、能源和银行业的例子），哪怕这些企业本来应该是商业竞争对手。这让竞争变成了儿戏，事实上中国的国有企业很少成为反垄断机构的目标。

在粉碎了私营部门的毛泽东逝世四十年后，中国如今仍然拥有大约15万家国有企业。从中国移动到中信，中国最知名的公司中有很多都是“红筹”公司。《财富》全球500强企业名单中有接近五分之一来自于大中华区，而这些巨人大部分都集中在国有部门。

没有几个共产党的官员热衷于出售他们心目中王冠上的宝石。削弱其对经济掌控力的改革遭到许多人抵制。然而，由于最近的金融恐慌和政策失当，世界对中国的经济健康感到精神紧张。我们越来越可以设想一个中国领导层感到不能不接受私有化的场景。有几股力量可能帮助其变为现实。

一方面，不断为中国步履沉重的国有企业提供补贴和廉价资本要花上一大笔钱。根据一项测算，在1985年至2005年间，按名义价值计算，政府花了超过3000亿美元来补贴最大型的国有企业。这些公司也是随时会爆炸的债务炸弹（见图1）。国际货币基金组织（IMF）计算，国有企业的平均负债权益比从2005年的1.3增长到了2014年的约1.6，而2014年私营企业的水平不到0.8。国有企业的资产收益率远远落后于私营企业，并且仍在下降

（见图表2）。经济失速或其他金融震荡很可能迫使中国领导人重新考虑对于私有化的矛盾心理。

如果发生这种情况，应该怎样走呢？首先，中国应避免犯一些错误。用快刀斩乱麻的方式来克服改革阻力的诱惑有很大的风险。苏联解体后，俄罗斯贱卖国有资产导致官方财富大规模转移到关系紧密的寡头手中，特别是在原材料行业。在中国，党和政府之间关系如此紧密，迅速出售国有资产的做法，很有可能只会将它们转移到中国版寡头——所谓的“太子党”，即早期共产党领导人那些有影响力的后代手中。智库美国战略与国际研究中心的斯科特·肯尼迪（Scott Kennedy）坚持认为，“其结果将是熊彼特不愿意看到的……太子党和其他政治关系户会建立自己统治的国中之国。”

中国共产党自身与私营部门早先的情缘也带来了一些教训。中国的经济改革是1978年从农村开始的，当时农村大多数人都生活在极端贫困中。官员们决定允许农民企业家创业，土地不再由集体共同使用，改为承包给农民，市场价格也开始蚕食固定价格体系。许多状况不佳的乡镇企业（包括如今世界上最大的汽车零部件独立制造商万向集团）被允许按照私营公司运营。这一乡镇“私有化”运动对减少贫困、刺激经济增长和就业的贡献，至少不逊于中国后来开放全球贸易和外国投资的举措。可惜的是，在20世纪90年代，党又撤回了几乎所有的农村改革和相关的金融自由化，反而选择了加强对经济的控制。

没过多久，艰难的形势再次迫使共产党领导人将目光转向私人部门寻求救助。90年代末期的私有化和重组浪潮使数千家不那么大的国有企业消失，数以千万计的工人失去了工作。这似乎是在拥抱市场规律，但麻省理工学院的黄亚生认为，它在两个方面存在缺陷。

首先，它是偷偷摸摸进行的，经常是没有适当的法律和制度框架就把资产出售了。其结果是产权没有保障，资产可能会被国家没收或被内部人士挪用。其次，领导人对于市场力量仍持谨慎态度，外围的私有化只是保持政治控制的一种策略。中国领导层透露，改革的目的是要“抓大放小”：主要目标不在于通过竞争提高国有部门的效率或是增加消费者的福利。相反，

它是为了打造更大、更具统治性的全国霸主，并仍由党牢牢掌控。

还是用事实说话吧。国资委的资产基础（最大的国有企业）从2003年的7.1万亿元增加到了2009年的21万亿元。要是把如今约15万家的国有企业都算上，国有资产的数字就会超过100万亿元。

因此，如果要来真的，就必须有大胆、透明而长期的努力。比如制定周到的计划，逐步减少在目前由国家统治的几大行业（如能源、电信和交通）中的持股。如果这能在未来十年分阶段进行，即可给市场以足够的时间来消化无可避免的抛售、收购和破产潮。共产党声称这些行业战略意义太大，不能掌握在私人手中，然而世界各地私有化的成功经验已经驳斥了这一点。

仍然会有内部人士要钻空子，但是通过举行所有人（包括外国投资者在内）都可参与的竞争性拍卖，钻空子就会变得更难，正如后共产主义东欧较为成熟的国家那样。政府本身也提出改革其外国投资法，这总算是要把外国投资者和国内竞争对手放在平等的法律基础上了。将财富分散到太子党之外的另一项措施，是将全部私有化股权分配给政府养老金计划。这将确保资产的所有权分布广泛，并可能有助于赢得那些持怀疑态度、担心不阳光交易的公众。

为了确保竞争蓬勃发展，私有化需要与同样宏大的法律和机构改革齐头并进。在智库鲍尔森研究所（Paulson Institute）的一篇论文中，哥伦比亚大学的柯蒂斯·密尔豪普（Curtis Milhaupt）和佛罗里达大学的郑文通认为中国必须“将国家角色从活跃的市场参与者，变为中立、透明的市场活动规则的设计者和仲裁者”。他们对政府畏手畏脚的“混合所有制改革”计划存疑合情合理——该计划提到将几家国有企业的零碎部分卖给私人投资者，却不交出管理的控制权。

| 提防巨型僵尸

对于政府将100个左右最大型的国有企业（其中很多都是步履维艰的僵尸）整合成40个左右的巨型僵尸的计划，他们的批判更加严厉：“这种大

规模的整合将在关键行业强化国家的作用，产生更多的寻租活动.....而且会造成垄断，带来更多的无谓损失。”

很少有人能比胡祖六更了解中国市场化改革的坎坷历史了。他经营的春华资本是香港著名的投资基金，参与了安邦保险集团对美国喜达屋酒店与度假村国际集团大胆却最终失败的收购。此前，他在国际货币基金组织和高盛担任重要职务，主要关注中国事务。根据痛苦的经历，他宣称“独立”董事会这样的半调子措施行不通。

他希望习近平在剩下的七年任期内接受一个“将所有国有企业卖给全世界”的私有化计划。应该小心安排销售顺序，引入战略投资者，并把部分股份放入社保基金。这位资深中国交易人认为这些完全可以在国内资本市场上完成。如果真的发生了，并且伴随着法治改革，那对中国经济的影响将是革命性的。正如胡祖六所言，“这将是地球上最大的拍卖。”■



If economists reformed themselves

A less dismal science

Reforming economists' tools, temperament and training could help to mitigate, if not to prevent, the next crisis

BASHING economists is scarcely out of fashion. They are accused of being blinkered by mathematical models, of overestimating their predictive powers and churning out narrow-minded graduates. Some folk see them, rather than bankers, as the real villains behind the global financial crisis, asking, as Queen Elizabeth is said to have done at the London School of Economics, why no one had seen the credit crunch coming.

John Maynard Keynes once said that “if economists could manage to get themselves thought of as humble, competent people on a level with dentists, that would be splendid.” How could they achieve that? Through a strong dose of what they (and this newspaper) often prescribe for others: structural reforms.

To start with, that means tackling what Paul Romer, an economist at the Stern School of Business in New York, calls the profession’s “mathiness”. The mountain of algebra in economic research is supposedly meant for clarification and rigour, but is too often deployed for obfuscation. Used responsibly, maths lends useful structure to economists’ thinking, and weeds out sloppiness. But there needs to be a purge of maths-for-maths’-sake.

Related to mathiness is model-mania. Economists are good at reducing a complicated world to a few assumptions, then adding bells and whistles to make their models more realistic. But problems arise when they mistake the map for the territory. In 2008, on the eve of the financial crisis, Olivier Blanchard, then chief economist of the IMF, published a paper celebrating

the convergence of thought within macroeconomics. Unfortunately, some key assumptions behind that consensus turned out to be wrong. It is now clear that different models of asset bubbles and banking crises would have better prepared policymakers for the Armageddon that ensued.

So economists should treat consensus with suspicion, and remain open to the idea that there might be more than one explanation of what they can see. Financial stability could represent policy success, for example, or it could mean that regulators are becoming complacent and hidden pressures are building. In future, big data and new “machine-learning” techniques could help test the relative power of competing theories. With a better sense of what is influencing behaviour in the economy, economists might become less blinkered by their own theory, and better able to foresee the next crisis. Meanwhile, they would be wise to repeat (daily) the words: “My model is a model, not *the* model.”

New technology points to another desirable reform: the need for better numbers to work with. The main gauge used to measure the size and progress of the economy, GDP, was designed for a different era, and looks increasingly flawed for a modern world of services, apps and bots. Economists have work to do to improve these basic tools of their trade.

Their tendency to look down on other social sciences is ripe for change, too (one study showed that articles in the *American Economic Review* cite the top 25 political-science journals one-fifth as often as articles in the *American Political Science Review* cite the top 25 economics journals). Some of their most influential research—in behavioural economics, for example, which fuses psychology and economics—has come about when they are willing to mix with others. Economists should get out more and mingle with historians and sociologists.

All this needs to start with the way economists are trained—a final area for

reform. Today, graduate economists undergo “maths camp” before being bombarded with lectures. Too little focus is on getting real-world experience: visiting job centres, meeting entrepreneurs, spending time at a central bank or the national statistical agencies. Such work experience would increase the chances of theory being tied to practice. Exams would test critical reflection (for example, awareness of where the results a student is “proving” might not hold true) as much as algebraic prowess.

| *Hedgehogs v foxes*

Economists face two competing criticisms. Either they are lambasted for their arrogance or accused of being unwilling to draw firm conclusions (in exasperation at the hedging of his economic adviser, President Harry Truman requested a one-handed economist). Dani Rodrik of Harvard University, drawing on an idea from Isaiah Berlin, splits economists into two camps: hedgehogs and foxes. Hedgehogs take a single idea and apply it to every problem they come across. Foxes have no grand vision but lots of seemingly contradictory views, as they tailor their conclusions to the situation. More foxlike behaviour will not by itself prevent the next crisis; politicians anyway will still be making the decisions. But it could help policymakers be better prepared. ■



如果经济学家们能重塑自我

一门不再那么沉闷的科学

对经济学家们的研究工具、性情及训练方法进行改革，下一场经济危机即使难以避免，也有可能得以缓和

对经济学家大加挞伐这档事几乎从未过时。人们指责他们被数学模型蒙蔽了双眼，过高估计自己的预判能力，并且制造出大批心胸狭隘的毕业生。在一些民众眼中，经济学家才是全球金融危机背后的罪魁祸首，而不是那些银行家。他们发出了这样的诘问——据说伊丽莎白女王在伦敦政治经济学院也问过同样的问题：为什么就没人预见信贷危机将要发生？

约翰·梅纳德·凯恩斯（John Maynard Keynes）曾经说：“如果经济学家能让民众觉得他们像牙医一样又谦虚又能干，那就太棒了。”经济学家们怎样才能实现这一点呢？那就要用到他们（以及本刊）经常为他人开的那个药方：大剂量的结构改革。

首先要解决的，就是纽约斯特恩商学院（Stern Business School）的经济学家保罗·罗默（Paul Romer）所说的经济行业“数学滥用”（mathiness）。经济学研究中使用海量的代数原本是为了明晰和精确，但太多时候反而是用它来混淆视听了。如果使用得当，数学会经济学家的思考富于条理，避免粗心大意，但现在则需要消灭为数学而数学的情况。

与数学滥用相关的是对模型的狂热。经济学家们很擅长用几个假设概括一个复杂的世界，然后再添加些华而不实的点缀，好让自己的模型更合乎现实。但如果他们将地图当成实际地域本身，那就有问题了。2008年经济危机爆发前夕，时任国际货币基金组织（IMF）首席经济学家的奥利维耶·布朗夏尔（Olivier Blanchard）发表了一篇论文，为宏观经济学领域内大家见解的趋同欢欣鼓舞。不幸的是，人们后来发现实现这种共识的一些关键的假设其实是错的。现在他们清楚地认识到，如果资产泡沫和银行业危机的模型能彼此不同，决策人当初本可能会更好地应对随后发生的灾难。

因此，经济学家们对共识应持怀疑态度，并保持开放的心态，认识到针对他们所能看到的情况也许会有不止一种解释。例如，金融稳定可以代表政策的成功，也可能意味着监管部门正变得自满，隐性的压力正在积聚。将来，大数据和新的“机器学习”技术也许能够帮助检验相互对立的理论中哪一个更有力。更清楚地了解影响经济行为的因素后，经济学家们可能就不太容易为自己的理论所蒙蔽，并能更好地预测下一次危机。与此同时，他们若能（每日）提醒自己“我的模型只是一种模型而已，并不是那唯一正确的模型”，将会是个明智之举。

新科技也使另一项令人向往的变革成为可能：为经济学研究寻得更好的数字。作为衡量经济规模和发展程度的主要标准，GDP已不适用于这个时代。对一个拥有服务业、应用程序和机器人的现代世界来说，这个衡量标准的缺陷越发明显。经济学家们已着手改进行业中这些最基本的研究工具。

他们轻视其他社会科学的倾向也到了该改一改的时候。一项研究表明，《美国经济评论》（American Economic Review）刊登的文章引用排名前25位政治科学期刊的频率，仅有《美国政治科学评论》（American Political Science Review）引用前25位经济学期刊频率的1/5。最具影响力的一些研究，比如在融合了心理学和经济学的行为经济学领域的成果，就是在他们愿意与他人来往之后做出的。经济学家们应该走出自己的天地，多与历史学家和社会学家们交流。

这些变革的实现都需要从改变经济学家的培养方法开始做起——这也是改革的最后一个领域。如今，还在读研究生的经济学家们在参加各种课程之前先要参加“数学训练营”。但对现实世界的体验却没受到足够的重视，如参观职业介绍所，与企业家会面，以及在中央银行或国家统计局待上一阵。这些实践经验可能会为他们增加理论联系实际的机会。考试也会在考察学生代数能力的同时考察他们的批判性反思的能力（例如能意识到自己想“证明”的结果有没有站不住脚的地方）。

| 刺猬还是狐狸

经济学家们要面对两种论调截然相反批评。有人痛斥他们的自大傲慢，也有人指责他们不愿给出明确的结论。哈里·杜鲁门总统因其经济顾问的模棱两可大为恼火（译注：他们总会做出这样的回答：“on the one hand...on the other hand...”），要求找一个“独臂的”（one-handed）经济学家。哈佛大学的丹尼·罗德里克（Dani Rodrik）借鉴了以赛亚·柏林（Isaiah Berlin）的观点，将经济学家分成两类：刺猬和狐狸。刺猬会秉持一种想法，将其用于一切碰到的问题；狐狸则缺乏一种宏大的视野，但有很多看似自相矛盾的观点，因为它们会根据具体情况裁定结论。多像狐狸这样行事并不能避免下一场危机的到来——毕竟政客们总归是要作出决策的，但这也许可以帮助决策者做好准备。■



If computers wrote laws

Decisions handed down by data

Might future law-school graduates look to machines rather than the judges, rules and standards that have underpinned the legal system?

SONIA picked up her hoverboard, put it under her arm and trudged up three flights of stairs illuminated by stained glass to a vast room with old portraits of judges and shelves of dusty books. New students wondered why all this paper existed. All treaties, regulations and court decisions had long since been digitised. The answer for the continued accumulation of paper, students learned, was that the American Bar Association required it. It was by itself a lesson in law, Sonia concluded. Regulation never kept up with reality.

The move to electronic forms of information was briefly believed to be a momentous change in the law. In retrospect it was little more significant than going from a pencil to a pen: different means, same end. The struggle for every student now was to understand how technology was turning the foundations of law upside down. Specific rules and broad standards, the two approaches through which law was applied for thousands of years, were becoming obsolete, along with the judges who weighed in with the last word.

Change was everywhere. On Sonia's scoot to school, streets had been empty so traffic lights were off. Who needed them? Preset rules shifting red to green had been replaced by "micro-directives", really a standard, tied to safety and efficiency. As traffic picked up, lights came on, programmed to optimise the flow. Needs could change in an instant, such as when a car hit a fellow hoverboarder. The micro-directive controlling the lights ensured her ambulance received all green lights to the hospital. That, of course, caused problems for others. A woman in labour was held up by the sudden

red lights and gave birth in the back of a cab. Sonia understood why all the most ambitious third-year students were hoping to get jobs at government agencies vetting the micro-directives that computers put into practice. They determined who got the green lights.

Even hospital treatment was changing. Micro-directives had replaced the broad standard controlling medical care: that a doctor aspire to act in a patient's best interest. Her injured friend was scanned and prodded; then, as she was wheeled into the operating room, screens listed procedures to be done, and one that should be delayed concerned her mangled hand. The computers noted that courts had levied heavy penalties on hospitals when the treatment of a hand resulted in the loss of dexterity, since that had an impact on lifetime earnings. Treatment, the screens said, should await the arrival of a specialist.

It all seemed “reasonable”—that essential legal word—and even smart. But not fun. Over-strict rules could be challenged, standards could be vague but allowed for responsibility and initiative. Not so micro-directives. Among the portraits on the library wall where Sonia studied was one of Potter Stewart, a Supreme Court justice famous for his definition of pornography: he knew it when he saw it. Now, focus groups evaluated a handful of films and television shows in terms of their impression of what might be offensive. The results and the material were then evaluated by computers which rated every production released, or not released, to the public.

When, Sonia wondered, did the system begin to take this effective, but nonetheless oppressive, shape? She had inadvertently spoken out loud, prompting the screen she carried to display the first draft of an academic paper, written in 2015, by two professors, one at the University of Chicago, the other at the University of Toronto*. They envisaged machines able to assemble data and produce predictive outcomes, and then distribute these everywhere, instantly, turning rules and standards upside down and

replacing them with micro-directives that were more responsive to circumstances, and rational.

One of the paper's co-authors had gone so far as to join a startup combining law and machine learning to provide answers about complex areas of tax, such as how to determine if a person is an employee or independent contractor, or whether an expenditure should be treated as current or depreciated—murky stuff that even tax authorities preferred coming from machines. That was novel in 2016. Each year since then it had expanded.

Students aspiring to work in investment management now routinely used machines to assess whether a shareholder in a firm that was sold through a leveraged buy-out would be retrospectively liable for a “fraudulent transfer” if the company subsequently collapsed, a risk that defied being addressed because it was so hard to measure. The entire world of negligence had been transformed. Live in a remote location and it was fine to install a swimming pool. A child moves nearby and a computer sends out a notification that the pool has become an “attractive nuisance” and a fence should be built immediately. The physical topography may not have changed, but the legal one had.

Criminal law once revolved around externally observed facts. Then DNA evidence entered the picture. Now, cases often hinged on data about pulse rates, intoxication and location, drawn from the wristbands that replaced watches. It was much fairer—but creepy, because the facts came from perpetual monitoring.

| *A formula for justice*

The most important introductory course faced by Sonia and her classmates had long ceased to be about contracts or procedure; it was algorithms and the law. One student melded data on work attendance, high-school grades, standardised tests and documented preferences in music into a program

for use by states to determine an individual age of consent for sex and alcohol. She was voted by Sonia's class the most likely to have a portrait added to the library wall—the first of many replacing old judges, who had somehow gained fame for making decisions that now seemed hopelessly devoid of data.

* “The death of rules and standards”, by Anthony J. Casey of the University of Chicago Law School and Anthony Niblett of the University of Toronto ■



如果电脑能制定法律

由数据下达的裁决

将来的法学院毕业生也许要仰仗机器，而不是奠定了法律体系的法官、规则 and 标准？

光从彩色玻璃透进来，照亮了三段楼梯。索尼娅拿起平衡车，夹在腋下，艰难地走了上去。偌大的室内挂着法官们老旧的肖像，一架架的书籍已积满了灰尘。新生们不明白，所有的条约、法规和法庭决议早就都数字化了，为什么还要留着这些纸质书。学生们后来了解到，纸本文件之所以还会不断地堆积起来，是因美国律师协会（American Bar Association）的规定。索尼娅断定，这本身就是法律学习中的一课。法规从来就跟不上现实的步伐。

过去人们曾短暂地相信，将信息转化为电子形式会是法律的重大变革。现在回想起来，其意义并不比将铅笔换成钢笔大多少：手段虽有了变化，但结果并没有两样。现在学生们需要绞尽脑汁弄明白的是，技术何以颠覆了法律的基础。几千年来，法律一直是通过具体细则和概括性标准这两种方式来适用的，但现在这些连同做出最后决议的法官们一道，都在慢慢被淘汰。

变化无处不在。索尼娅冲向学校时，路上很空，交通指示灯都关掉了。谁还需要它们呢？“微指令”（其实是一种基于安全和效率的标准）已取代了红灯变绿灯的预设规则。随着交通量上升，交通灯亮起，并依照程序的设定来优化车流。需求可能会在瞬间发生变化，比如一辆车撞到了同行的平衡车使用者。这时，控制交通灯的微指令就会确保她乘坐的救护在开往医院的路上一路绿灯。当然，这会给其他人会带来麻烦。突然亮起的多个红灯耽搁了一个临产的女人，她只好在出租车后座生产。索尼娅明白了，为什么那些最有抱负的三年级学生，都希望在负责审查电脑实施微指令的政府机构谋得职位——他们能决定给谁开绿灯。

连医院的治疗也在改变。微指令已经取代了用来管理医疗的概括性标准，即医生应尽全力去做对病人最有益的事。索尼娅受伤的朋友接受了初步的

检查；当她被推进手术室时，显示屏上便列出一项项将要进行的治疗步骤，还有一项因患者手部伤情严重要暂缓进行。电脑注意到，在之前的案例中，若治疗导致手部不能灵活运动，法庭会对医院课以重罚，因为这会影响患者一生的收入。屏幕显示道：治疗应等专家到来后再进行。

这一切看上去都可以用一个法律中最基本的词汇“合理”来描述。这甚至很高明，但也很无趣。过度严苛的法规还可能被质疑，标准也许不够明晰，但总还可以允许负责任和积极的做法。但微指令就不是这样了。索尼娅学习的图书馆墙上的肖像中有一幅是最高法院大法官波特·斯图尔特（Potter Stewart）的。他因对色情作品的做出的定义而闻名：（是不是色情作品）我看了就知道了。如今，专门小组对一些影片和电视节目进行评估，根据自身的观感来判定哪些内容不堪入目。接下来，电脑会评估这些结果及材料，并将已向或未向公众发布的所有产品进行分级。

这个体系是什么时候变成了这个模样，这么高效，却又如此压抑？索尼娅暗自思忖。她不禁将这个疑问大声说了出来，导致她手中电子屏上跳出了一篇学术论文的初稿。这篇论文写于2015年，作者是分别来自芝加哥大学和多伦多大学的两位教授。在他们的畅想中，机器能够收集数据及预测结果，随后便可立即将结果发布到各处，颠覆法规及标准，代之以能更快对环境做出反应且更理性的微指令。

论文的一位作者甚至加入了一家将法律与机器学习相结合的创业公司。这家公司为复杂的税务领域问题提供解答，例如怎样区别一个人是雇员还是独立合约员工，或一项支出是按经常性还是折旧处理——连税务部门都宁可让机器去解决这些让人费解的问题。这在2016年还算很新奇，但之后每年这家公司都在扩张。

渴望能在投资管理行业工作的学生们现在会例行使用机器来评估，如果一家公司通过杠杆收购的方式出售后出现崩溃（这一风险程度难以估量，因而很难解决），该公司的股东是否应因“欺诈性转让”而被追责。疏忽大意的情况也有了彻底的改变。如果住在偏远的地方，建造一个游泳池并没什么问题。当一个孩子走到附近，电脑就会发出通知，指出这个泳池已经构

成了“诱惑性损害”（译注：attractive nuisance，如果一个人的物产中某种事物对儿童极具吸引力并有可能危害儿童的人身安全，该事物即成为诱惑性损害。即使儿童是因非法闯入而受伤害，物产所有人也需为此负责）并要求马上立起一道栅栏。实体世界的图景也许并未改变，但法律领域中的已经不同了。

之前刑法关注的重点都是通过观察外部得来的真相，之后才有了DNA证据的介入。如今案件调查通常依赖代替了手表的手环所记录的数据，如脉搏率、醉酒情况及案发地点。这种做法要合理得多，但也很疹人——因为这些事实都源于持续的监控。

| 正义的配方

索尼娅和她的同学们所要面对的基础入门课程早就不再是关于合同与程序，而是算法及法律。有一位同学将考勤记录、高中成绩、标准化测试及音乐偏好的记载这些方面的数据输入一个程序，供各州各自决定合法性行为及饮酒年龄。这位同学被索尼娅的班级选为最有可能把肖像挂到图书馆墙上的人——在许多将替换老法官画像的人中，她是第一个。旧时的法官们曾因他们做出的决定收获盛名，但现在看来，这些决定也太缺乏数据的支持了。

《规则与标准的消亡》，作者为芝加哥大学法学院的安东尼·J·凯西（Anthony J Casey）及多伦多大学的安东尼·尼布莱特（Anthony Niblett）。■



Quicken Loans

A new foundation

One of America's biggest mortgage lenders is not like the others

WELLS FARGO, America's biggest provider of retail mortgages, drums up custom, and cheap funds to lend, through its 6,246 branches. The third- (Bank of America) and fourth-biggest (JPMorgan Chase) providers follow a similar model. But the second-biggest mortgage firm, Quicken Loans, does business completely differently. It does not have any branches, interacting with its customers online and by telephone instead. Nor does it take deposits, relying on wholesale funding to finance its lending. Despite (or perhaps because of) breaking all these conventions, it is the fastest-growing firm in the industry: its new lending has risen from \$12 billion in 2008 to \$79 billion last year.

America's 50 states all have slightly different laws regarding mortgages. Local bylaws in many cities and counties also affect property purchases. Then there are overlapping federal rules, especially regarding mortgages to be securitised and sold through Fannie Mae and Freddie Mac, two government-backed entities. So although mortgages may seem much the same to borrowers across the country, the firms that offer them have long assumed that they need a local presence to conform with the tangle of rules. As a result, the mortgage business is absurdly fragmented. Even Wells has only a 7% market share.

In the late 1990s Dan Gilbert, Quicken's founder, began to question this logic. He was struck by the ease of buying a sofa online; if something so big and cumbersome could be sold without bricks and mortar, then surely an intangible product like a mortgage could, whatever the legal intricacies. He began selling off Quicken's 28 branches in 1998 and ultimately centralised the firm's operations in downtown Detroit. From a growing collection of

grand old buildings, including a former outpost of the Federal Reserve, Quicken began to market mortgages to customers all over the country. Applications are handled by employees schooled in the legal niceties of the relevant jurisdiction, but based in Detroit.

It helps that Quicken can sell its mortgages through Fannie and Freddie, and so does not need a huge balance-sheet to finance them. But because it relies on relatively expensive wholesale funding, it would struggle to compete with other providers on price. Its interest rates are typically 0.25-0.4 percentage points higher than the cheapest alternatives.

Instead Quicken aims to compete on service. It claims customers can fill out an online application and receive a decision on its latest offering, Rocket Mortgage, within eight minutes. The underlying software conducts a quick electronic sweep of the applicant's financial records, along with any available data about the property to be purchased. For customers who are confused or whose applications are unusually complicated, help is available by phone or e-mail.

Quicken tries to ensure good customer service by keeping its own employees happy. Desks and chairs are fancy, adjustable, ergonomic affairs; the bathrooms have televisions set to sports channels. Some workers scoot around the bright open-plan offices on hoverboards. New recruits receive an eight-hour induction from Mr Gilbert and others, built around 19 principles ("isms" in Quicken-speak). They are told that "a penny saved is a penny earned" is terrible advice; that they should only say "no" when they have exhausted the possibility of saying "yes", and so on. Show indifference to a customer and, Mr Gilbert writes, "I will find you... and I will personally root you out."

It is hard to say precisely how well all this works, since Quicken, as a private firm, releases little financial data. But a good test of its values came

last year, when the government sued it, claiming it had fiddled data on mortgages for poorer house-buyers backed by the government, which caused the government losses when the loans went bad. Other financial firms hit with similar complaints have grumbled about a shakedown and settled. Quicken is contesting the lawsuit, saying the government's case rests on 55 mortgages out of 246,000, and that it has got its facts wrong about 47 of those. As with so many things Quicken does, no other big financial firm would have dared behave in that way. ■



快速贷款

新根基

美国最大的按揭贷款机构之一与众不同

美国最大的零售抵押贷款机构富国银行（Wells Fargo）通过6246家支行招揽顾客，并吸收低息资金用以放贷。美国第三大（美国银行）及第四大（摩根大通）贷款机构也采用类似的模式。但第二大贷款公司快速贷款（Quicken Loans）的业务模式则完全不同。该公司不设任何办事处，而是通过网络及电话与顾客互动。它也不吸收存款，完全依靠批发融资为贷款提供资金。尽管（或者是因为）打破了所有这些规则，快速贷款是业内成长最快的公司：其新增贷款已从2008年时的120亿美元上升至去年的790亿美元。

美国50个州有关按揭贷款的法律都略有不同，许多市及郡的地方法规也影响到房产购置。在此之外还要考虑联邦法规，尤其是那些经由政府支持的房利美（Fannie Mae）和房地美（Freddie Mac）证券化并出售的按揭贷款。所以虽然在借款人眼中全国的按揭贷款都大同小异，提供这些贷款的公司一直认为要在各地设立分支，以便满足混乱复杂的法规要求。结果，按揭贷款业务变得异常分散，即便是富国银行也只占了7%的市场份额。

快速贷款的创始人丹·吉尔伯特（Dan Gilbert）在上世纪90年代末便开始质疑这一逻辑。他有感于网上购买沙发的便利——如此笨重的大件物品都能脱离实体店销售，那么不管法律有多复杂，按揭贷款这样的无形产品肯定也行。他从1998年起开始出售快速贷款的28个分支机构，最终把公司的运营集中到底特律市中心。快速贷款占据了一栋又一栋宏伟的旧建筑（包括一座美联储机构的旧址），并开始向全国客户推销按揭贷款。处理贷款申请的雇员熟悉相关司法辖区法律细节，但全部在底特律工作。

快速贷款可通过房利美和房地美销售按揭贷款，所以无需庞大的资产负债表来融资，这一点也有帮助。但因为快速贷款依赖相对昂贵的批发融资，难以在价格上与其他贷款机构竞争。其利率通常比最廉价的对产品高

0.25到0.4个百分点。

相反，快速贷款专注在服务上竞争。公司称，要申请其最新产品“火箭按揭”（Rocket Mortgage），顾客只需在线填写申请表，八分钟之内便可收到审批结果。其基础软件会快速审查申请人的财务记录和所购房产的任何可用数据。如果顾客有疑问，或其申请异常复杂，可通过电话或电子邮件获取帮助。

快速贷款设法让员工保持心情愉悦，以确保客户得到良好的服务。办公桌椅设计精美、可调节且符合人体工学，洗手间装有调至体育频道的电视机。一些员工踩着滑板车在明亮的开放式办公室里穿行。新员工会接受由吉尔伯特等人主持的八小时入职培训，内容围绕19个原则（按快速贷款公司的说法，那是19个“主义”）。员工们被告知，“省一分钱就是赚了一分钱”是糟糕的建议；只有在说“是”的机会用尽之后才能说“不”，如此等等。假如员工对顾客漠然以待，吉尔伯特写道，“我会把你找出来.....然后亲自把你揪出去。”

这一切到底成效如何很难说得清楚，因为快速贷款是一家私营公司，发布的财务数据很少。但公司的价值观在去年底遭受政府起诉时则是经历了一番考验。政府声称，快速贷款公司在为政府担保的低收入购房者提供按揭贷款时伪造了数据，导致贷款出现违约时政府蒙受损失。受到类似指责的其他金融机构都是抱怨几句政府敲诈，然后和解了事。但快速贷款坚持抗辩，称政府的指控是基于24.6万宗贷款中的55宗，而且其中47宗的事实有误。正如快速贷款所做的许多事情那样，其他的大型金融公司中没有哪家敢如此行事。■



Passenger drones

Those incredible flying machines

Personal robotic aircraft are hovering over the horizon

FLYING a helicopter is tricky, especially when hovering. You use your left hand to raise and lower the collective-pitch lever (to climb or descend), your right hand to move the cyclic-pitch joystick (to go forwards, backwards and sideways) and both feet to work the anti-torque pedals (to point the nose). At first it all seems like an impossible dance, but with plenty of practice and careful co-ordination it can be mastered. Flying a drone, by comparison, is easy-peasy. Some can be operated with little or no experience using only a smartphone app. So, it was a matter of time before resourceful folk started to think about building simple-to-operate drones that are large enough for people to fly in.

One passenger drone undergoing flight tests is the Volocopter VC200 (pictured above). With 18 separate rotors it might seem to be an ungainly contraption, but its makers, e-volo, a company based in Karlsruhe, Germany, claim it is more stable than a conventional helicopter. It is certainly more straightforward to fly and can be operated with just one hand. Twisting the joystick makes the Volocopter turn left or right and pushing an “up” or “down” button makes it climb or descend. To land, the pilot needs only to keep his finger pressing the down button until the aircraft is safely on the ground.

The idea behind the Volocopter and similar craft under development is that, like a drone, they are packed with sensors, including gyroscopes, accelerometers and magnetometers which, combined with an on-board computer system, means the aircraft flies largely autonomously. The pilot—or operator as they might more accurately be called—provides only basic commands, leaving the aircraft itself to take care of any necessary

manoeuvres, balancing itself during a hover, automatically holding its position and compensating for changing conditions, such as a sudden cross wind.

The technology is sufficiently advanced that there is nothing to stop passenger drones taking to the air, provided they can meet the same safety standards as other light aircraft and are flown by trained pilots. At a price for a small machine likely to be similar to that of an upmarket car—and a fraction of the cost of a new helicopter—they could prove extremely popular in recreational and sport aviation.

The next step is to persuade aviation authorities that, because the craft are so heavily automated, they can be safely and reliably flown by people with only a little training. Convincing officials of that could take a few years, but it is possible. Aviation authorities have in the past worked with companies and flying enthusiasts to develop special training programmes for other new types of aircraft, such as powered hang-gliders and microlights.

Some envisage going further still, allowing passenger drones to provide autonomous air-taxi services. A bit like using an Uber app to call a cab, a pilotless drone would be summoned to whisk you away to your destination. That raises so many tricky questions, around insurance, infrastructure and public liability, that such services are many years away. But the journey to that destination may well have begun.

Unmanned drones can already be flown under existing guidelines. In late June, America's Federal Aviation Administration (FAA) finalised its rules for civil drones weighing less than 55lbs (25kg). They must be kept in line of sight, below 400 feet (122 metres) and away from people. To use a drone for commercial purposes the operator must undertake an approved training course. Exemptions to the line-of-sight rule will be allowed for some flights, such as those making deliveries. But heavier drones need to be

registered like conventional aircraft and face tougher regulation.

| *Let's twist again*

The attraction of drones is their ease of operation. Unlike most helicopters, hovering drones use multiple rotors. Many drones are based on a design called a quadcopter, which employs four rotors on arms set 90 degrees to each other. Each rotor is directly driven by an electric motor. By turning two of the rotors clockwise and two anticlockwise it counters the twisting effects of torque produced by a single-rotor helicopter (without a tailrotor to push against the torque, a helicopter would spin hopelessly round and round). Moreover, whereas a helicopter needs to vary the pitch of its blades (the angle at which they attack the air) in order to manoeuvre, the multiple rotors on a drone have a fixed pitch. The drone instead manoeuvres by independently changing the speed of one or more of its rotors under computer control. As this set-up requires fewer and less complex moving parts than a helicopter, it makes drones simpler, cheaper to build and maintain, and potentially more reliable.

Ehang, a dronemaker based in Guangzhou, China, is using the quadcopter design for a single-seat drone it is developing, but with an added twist. The Ehang 184 has a total of eight rotors, two on each corner but with one rotor facing up and the other facing down, each powered by its own motor. This builds in an extra margin of safety so that should a motor or rotor fail, the aircraft would still fly. Huazhi Hu, the company's founder, aims to begin flight tests of the 184 in Nevada later this year to obtain an airworthiness certificate from the FAA.

Ehang's eventual intention is that passengers need only enter their destination on the 184's control screen, strap in and let the drone fly them the entire journey autonomously. The craft is designed to nip along at up to 100kph and fly for 23 minutes before its batteries need recharging. With existing battery technology, passenger drones are still a long way from

beating conventional helicopters in both endurance and load-carrying abilities. But batteries are getting better. And even big aerospace companies, such as Airbus, believe that electric and hybrid power systems will be used in future passenger aircraft.

| *Flying chips*

The 18 rotors lifting the Volocopter take the concept further. Ascending Technologies, a German dronemaker bought earlier this year by Intel, a giant chipmaker, gave e-volo a hand with the electronic systems that control them (the craft contains more than 100 microcontrollers). The greater number of rotors provides both more efficiency in lift and higher levels of redundancy in the event of a failure. And, just in case of a big emergency, there is also a parachute—one that will gently carry to the ground the entire drone with its passengers remaining in their seats.

The VC200 gained permission to fly from German authorities earlier this year. It has an all-in weight of 450kg and, in its present form, a flight duration of 30 minutes. After completing a series of flight tests the VC200 should be fully certified by 2017 in a category of aircraft known as an “ultralight”. The company have taken this route because it will get the VC200 into the air sooner and allow valuable flight experience to be built up while discussions continue about creating a possible new class of aircraft for passenger drones.

Apart from recreational flyers, other users might include the emergency services with, say, a paramedic flying directly to an incident without having to rely upon a helicopter and a professional pilot, says Florian Reuter, an e-volo director. A four-seater version, the VC400, is also planned along with hybrid versions that will be fitted with petrol-powered range-extendors. The ultimate aim, adds Mr Reuter, is for Volocopters to provide air-shuttle services in congested places, such as cities. With more experience of operating such flights regulators would be in a position to consider

whether passenger services could enjoy complete autonomy.

A rather different approach is being taken by Malloy Aeronautics, a British company. It is developing a drone you can sit on like a motorbike. The Hoverbike is now in its third incarnation, having begun with two rotors, one at the front and another at the rear, but progressing to four. However, it does not look like a typical quadcopter. Instead, it has a pair of rotors at the front and another pair at the back. Each is slightly offset and partially overlapping. So far, the company is carrying out test flights of the craft as an unmanned drone in order to develop its software and systems fully before fitting a seat and handlebars to produce a passenger version. Malloy has, though, flown a one-third scale remote-controlled prototype with a dummy pilot (see picture below).

The idea behind the Hoverbike is to produce a rugged and simple air vehicle which, because it is oblong rather than square, would be more easily transportable in vehicles or other aircraft, and would be able to operate and land in difficult surroundings, such as on the side of a mountain, says Grant Stapleton, a Malloy director. The company is also working with America's Army Research Laboratory on the Hoverbike concept. It would have basic controls, such as a throttle grip for the right hand—as on a motorbike—with the handlebars used to provide other commands.

The market for passenger drones in their various forms could be huge. Beside military and commercial operations, they would have a large number of leisure uses. They also open up new possibilities for a combination of manned and unmanned flight. Mr Stapleton already knows what he wants to do with his: fly up a mountain, land and snowboard down, with the Hoverbike programmed to meet him at the bottom ready for another go. ■



载人无人机

那些不可思议的飞行机器

个人自动飞行器盘旋于天际

驾驶直升飞机可不简单，尤其是要悬停的时候。你要用左手上提或下放总距杆（控制攀升或下降），用右手操纵周期变距杆（前向、后向或侧向移动），双脚操纵抗扭矩踏板（用以保持航向）。起初，以上操作就像是一个难以完成的舞蹈，但经过大量练习和小心的协调还是能够掌握的。相较之下操纵无人机就属小菜一碟了。一些无人机仅需智能手机应用就能操纵，使用者经验有限甚至毫无经验都不在话下。所以，神通广大的人们开始考虑制造易于操作、大小足够载人的无人机就只是时间问题了。

一个名为Volocopter VC200（见上图）的载人无人机正在进行一系列飞行测试。这个共有18个独立旋翼的奇怪装置也许看似不够精巧，但它的制造者——总部位于德国卡尔斯鲁厄的e-volo称，它比常规直升机要稳定得多。它的操作方式无疑要更简单，一只手就能进行。摇动操作杆可使其左转或右转，按动“上”或“下”按钮可使其攀升或下降。若要着陆，操作者只需按住下降按钮直至机器安全落地。

Volocopter及其他研发中的类似飞行器的设计理念同无人机一样，它们配备有各种传感器，包括陀螺仪、加速计和磁力计，再加上机载电脑系统，意味着这种飞行器大体上都在自动飞行。飞行员（或许称他们为操作员更为准确）只发出基本指令，必要的操控则由无人机自行完成，如悬停时维持平衡、自动保持位置，并对突发侧风等环境变化做出补偿。

无人机技术已有长足发展，因而载人无人机会以不可阻挡之势飞向天空——前提是它们能达到和其他轻型飞行器一样的安全标准，并由受过训练的飞行员操控。这种小巧的机器价格大致与高档汽车相当，成本只相当于一架新直升机的一小部分，从而很可能在休闲航空及航空体育运动中受到追捧。

下一步就是说服航空部门，使之相信由于这种飞行器的高度自动化，人们只需稍加训练便能安全可靠地操纵。让官员们相信这一点也许会花上几年的时间，但总归有实现的可能。航空部门之前就已同航空公司及飞行爱好者们合作开发了针对其他新型飞行器的特别训练项目，比如动力悬挂滑翔机和超轻型飞机。

一些人甚至设想载人无人机会获准提供自动驾驶的空中出租车服务。和使用优步应用叫车有些类似，自动操控的无人机会响应召唤并将乘客迅速带至目的地。这就引发了很多关于保险、基础设施及公众责任的棘手问题，因而这种服务的实现要等很多年。但以此为目的的征程也许已经开始。

不用于载人的无人机已经可以在遵从现有指导方针的条件下使用。六月底美国联邦航空管理局（FAA）发布了55磅（25公斤）以下民用无人机的管理规章。其中规定，无人机必须在操作者视距范围内飞行，高度在400英尺（122米）以下并避开人群。操作者若出于商业目的要使用无人机，必须接受一项获批的训练课程。一些飞行如派送货物可以申请超视距豁免；但重量超过55磅的无人机需和常规飞机一样进行登记，并面临更为严格的监管。

| “让我们再次舞动”

无人机的魅力在于它们操作简便。与大多数直升机不同，悬停中的无人机会用到多个旋翼。很多无人机都基于一种名为四轴飞行器的设计——它有四个旋翼，位于彼此呈90度的机臂上，每个旋翼都直接由一个电动马达控制。单旋翼直升机产生的扭矩会引发扭转效应（没有尾桨对抗扭矩，直升机就只能无望地转个不停），但无人机通过顺时针转动两个旋翼，逆时针转动另外两个，即可抵消这种扭力。此外，直升机飞行时需调整桨距（桨叶击打空气的角度），无人机的多个旋翼桨距则是固定的，飞行时只需依电脑的控制单独变换其中一个或多个旋翼的转速。由于这种设置所需的活动组件比直升机更少且更简单，无人机的生产和维护也会更容易、更经济，还有可能会更安全可靠。

总部位于中国广州的无人机制造商亿航正在研发的单人载人无人机也使用

了四轴飞行器的设计，但增大了扭力。“亿航184”共有8个旋翼，每只机臂各有两个，但一个朝上，一个朝下，每个旋翼都由独立马达驱动。这种设计额外提高了安全系数——即使一个马达或旋翼发生故障，机器仍可飞行。按亿航创始人胡华智的计划，亿航184将于今年晚些时候在内华达州展开飞行测试，以获得FAA颁发的适航性认证。

亿航最终想实现的是，乘客只需在亿航184的控制屏上输入目的地，系好安全带，即可任由无人机载着他们全程自动飞行。这款无人机的设计速度是每小时100公里，电池续航时间23分钟，之后则需充电。以现有的电池技术，若要在耐久性和运载能力方面打败常规直升机，载人无人机还有很长的路要走。但空中客车等大型航空公司都相信，今后的载人无人机将使用电力及混合动力系统。

| 飞翔的芯片

Volocopter的18个旋翼把无人机的概念又向前推进了一步。芯片生产巨头英特尔今年年初收购的德国无人机公司Ascending Technologies，在控制旋翼的电子系统方面向e-volo提供了帮助（这款飞行器装有100多个微控制器）。旋翼数量越多，提供升力就越有效，且会在发生故障时保证更高的冗余度。万一有重大突发状况发生，还有降落伞可以仰仗——有了它，机上乘客只需坐定，完整的无人机连同乘客就能平稳地落地。

VC200今年初已从德国航空部门得到飞行许可。它总重450公斤，在现有状态下，一次能飞行30分钟。完成一系列飞行测试后，VC200应该会在2017年前获得名为“超轻型飞机”这一类别的全面认证。这家公司之所以采取这一路线，原因是这样可以让VC200尽快升空，并使公司得以积累宝贵的飞行经验。毕竟，为载人无人机创建一个合适的新类别尚处于讨论的阶段。

e-volo的一位负责人弗洛里安·罗伊特（Florian Reuter）说，除了休闲玩家外，应急服务也许也会使用到无人机。例如无人机可直接飞往事故发生地点，而无需依赖直升机和专业飞行员。四座版VC400也在计划中，同时还会有混合动力版本——它将配备汽油驱动的增程器。罗伊特补充道，他

们的终极目标是能让Volocopter为城市等拥堵地区提供穿梭航班的服务。积累了更多此类航行的操作经验后，监管部门便可以考虑载人服务是否可以享受完全的自主。

英国的马洛伊航空学（Malloy Aeronautics）公司则没有走寻常路。这家公司正在开发一种可以像摩托车那样供人骑乘的无人机。低空飞行摩托Hoverbike已发展到了第三代；起初它只有一前一后两个旋翼，但现已发展为四旋翼。然而，它的外观并不像一个典型的四轴飞行器。它的一对旋翼位于前端，另一对位于后部，每一对旋翼都是位置上下略微错开，并部分重叠。目前，这家公司已为该飞行器进行了飞行测试，但并没安排真人乘坐，因为它想在安装座椅及把手、生产出载人版本之前先全面完善软件和系统。但马洛伊公司已试飞了实物三分之一大小的遥控样机，上面安放了一个飞行员假人（见下图）。

Malloy的一位负责人格兰特·斯泰普尔顿（Grant Stapleton）说，研发Hoverbike的初衷是生产出结实耐用且操作简单的飞行器。该款无人机为长方形而非正方形，因此更易于用车辆或其他飞行器运输，并且可在复杂的环境中（如山脊）操作和着陆。这家公司同时也在和美国陆军研究实验室（ARL）合作开发Hoverbike。这个版本的飞行器会采用和摩托车一样的基本控制方式，如右手位置的节流阀手柄，并用把手进行其他操作。

载人无人机形式多样，可能会有广阔的市场。除军事和商业应用外，它们或许还可广泛用于休闲活动。此外它们还为载人飞行和不载人飞行的结合创造了新的可能。斯泰普尔顿已经知道他想怎么用自己的无人机了：飞到一座山上，降落，踩着滑雪板滑下山；Hoverbike已按要求在山下等候，马上就可载他上山再来一趟。■



The economics of Broadway

No business like show business

Our analysis of the art and science of creating a hit show

“HAMILTON”, a hip-hop musical about one of America’s founding fathers and the architect of its financial system, is an unlikely smash. Lin-Manuel Miranda’s creation has been the hottest ticket on Broadway since the show started in July last year. On June 12th it won 11 Tony awards, theatre’s equivalent of Oscars. Michelle Obama called it “the best piece of art in any form that I have ever seen in my life”. Its success is widely credited with convincing the Treasury to keep Alexander Hamilton on the \$10 bill. But if its cultural heft is clear, its commercial achievements may be just as remarkable.

“Hamilton” serves as a reminder that although Broadway is rarely regarded as a big business in the same way as Hollywood is, the most successful musicals can outperform the silver screen. No film has ever banked \$1 billion at the box office in North America, but three musicals—“The Phantom of the Opera”, “The Lion King” and “Wicked”—have exceeded this benchmark on Broadway, admittedly over long runs. The gap widens further when counting performances worldwide. Andrew Lloyd Webber’s “Phantom”, began life on the London stage in 1986 before transferring to Broadway and beyond. It has earned \$6 billion globally, more than twice the worldwide take of “Avatar”, the film industry’s record-holder.

“Hamilton” may cement Broadway’s lead. Revenues of \$80m since opening last summer, averaging \$1.7m a week, put it on track to break the billion-dollar barrier in just over a decade. Once productions open in Chicago, Los Angeles and London, returns could triple for the show’s creators and backers.

At first glance, it is hard to fathom how theatre can compete with film's economies of scale. Many more people can see a movie; the biggest venues on Broadway seat fewer than 2,000 people a night. But scarcity also means prices are high: \$100 a ticket for two hours of entertainment is common, about five times what it costs to go to the cinema. And popular shows run and run. "Phantom" still takes over \$1m in a good week.

Theatre is a risky business, however. Just one in five shows make a profit and musicals, though usually far more lucrative than straight theatre, are lucky if they run for six months. Actors and landlords must be paid regardless of how many seats are filled. Even popular shows can shut down early if cash is tight after a few bad weeks. That makes investing a gamble.

So what can would-be backers trying to replicate the success of "Hamilton" learn from Broadway's biggest hits and misses? The data are detailed enough to make some suggestions. The Broadway League, a trade group, has published weekly revenue and attendance figures for every show going back to 1984. *The Economist* has analysed data from past shows alongside various attributes, including genre, cast size, reception by critics and star-quality of actors involved, to estimate the probability of a show selling out in a given week and potential revenues in that week. We limited our data mostly to those available to investors at the start of a show's run.

Given what people knew about "Hamilton" when it first launched, there was little hope of foreseeing the scale of its success. Two approaches appear relatively reliable paths to triumph on Broadway. One is to put successful films on the stage. Disney's "The Lion King" has delivered steady profits since 1997. Musicals based on films have grossed \$145,000 more on average during their opening weeks than those that were not. "Hamilton", by contrast, is based on a stodgy 832-page biography.

A second tried-and-tested approach is to bring in a Hollywood star: "Lucky

Guy”, with Tom Hanks, rapidly sold out its entire three-month spell in 2013. James Ulmer, an entertainment analyst, has compiled an index which rates Hollywood actors on their “bankability”. Using those data, we were able to calculate the total star power of the casts for each of the Broadway shows in our database. The presence of a well-known actor can be expected to elevate a musical’s probability of selling out in its opening week from 21% to 59%, while an A-list actor can bring the odds up to 92%. Yet “Hamilton” has no big stars.

One thing that “Hamilton” does have is a proven hitmaker in Mr Miranda. His previous musical, “In the Heights”, won four Tony awards and its total revenues exceeded \$100m. But the past success of a show’s writers and composers matters little. Even Broadway’s biggest winners have trouble repeating past glories. Lord Lloyd Webber’s “School of Rock”, has played to houses that are just over 70% full since it opened in December. For a typical musical, a celebrated impresario increases the probability of selling out in its opening week by just four percentage points.

Good reviews do not contribute as much to success as the critics would like. Data from Jeffrey Simonoff of New York University and DidHeLikeIt.com, a review aggregator, show that, all else being equal, a musical with a rave review in the *New York Times* is less than six percentage points more likely to sell out in a given week than one with a neutral review.

Our model would have projected a reasonable performance for Hamilton at best, taking perhaps \$1.3m a week while paying rent, wages, marketing and the like of around \$600,000. Despite not conforming to the template for commercial triumph, it has achieved the highest average weekly revenues of any Broadway show ever and is one of the biggest outliers of the past 30 years (see chart).

The reason it has not done even better is Broadway's squeamishness over charging high prices. Demand for "Hamilton" far exceeds supply but the additional revenues either go to scalpers or are not realised at all, as lucky theatregoers enjoy a bargain.

In order to "take the air out of" brokers, on June 9th Hamilton's producer, Jeffrey Seller, raised the price of "premium" tickets to \$849, and cranked up most seats closer to \$200. Coincidentally, the next week "Hamilton" broke the \$2m-a-week barrier for the first time. One producer estimates the show could quintuple its revenue if it charged what the market would bear. Such pricing would bolster the industry's economics just as Hamilton solidified America's financial system. And by paving the way for bigger profits, more shows would get funded in the hope of achieving Hamiltonian riches. ■



百老汇经济学

“轻歌曼舞好营生”

创作一部热门戏剧的艺术与技巧分析

一部关于美国开国元勋之一、同时也是美国财政体系奠基人的hip-hop音乐剧《汉密尔顿》，出人意料地大获成功。自去年六月上演以来，这部由林-曼努尔·米兰达（Lin-Manuel Miranda）创作的作品已在百老汇已变得一票难求。6月12日，该剧获得了11项“戏剧界的奥斯卡”——托尼奖。美国第一夫人米歇尔·奥巴马称其为“我此生观赏过的所有形式的艺术作品中最棒的一部”。很多人认为，正是由于这部剧的成功，财政部才决定在10美元纸币上保留亚历山大·汉密尔顿的头像。如果说该剧在文化上的影响力显而易见，它的商业成就或许也同样不同凡响。

《汉密尔顿》提醒人们，虽然他们很少像看待好莱坞一样将百老汇视作一个庞大的产业，但最为成功的音乐剧的表现完全可以胜过大荧幕作品。迄今为止还没有一部电影在北美取得了10亿美元的票房收入，但三部音乐剧——《歌剧魅影》（The Phantom of the Opera）、《狮子王》（The Lion King）和《魔法坏女巫》（Wicked）——在百老汇的收入就已超过了这个数字，当然这是经年连续上演的结果。将全球的演出收入都计算进来的话，戏剧和电影的差距还要更大。安德鲁·劳埃德·韦伯（Andrew Lloyd Webber）的《歌剧魅影》1986年首先在伦敦上演，之后登上百老汇，后又走向世界。它在全球范围内创造了60亿美元的票房，超过电影票房记录保持者《阿凡达》全球收入的两倍还多。

《汉密尔顿》可能让百老汇的领先地位无可动摇了。去年夏天首演以来，这部剧总收入达8000万美元，平均每周就能进账170万美元。照此趋势，也许仅用十余年就能突破10亿美元大关。一旦在芝加哥、洛杉矶和伦敦开演，该剧创作者和赞助人的收益也许会增加三倍。

乍一看，人们很难理解戏剧怎么能与电影的规模经济抗衡。百老汇最大的演出场地一晚也只能容纳不到2000人，而能看到一部电影的人要多得

多。但稀缺同时也意味着高价：花100美元看两个小时的演出很平常，但这几乎是电影票价的五倍。此外，受欢迎的演出会不断上演。行情好的时候，《歌剧魅影》仍旧能每周收入超100万美元。

然而，戏剧仍是一个有风险的行业。五部剧中只有一部能赚钱，音乐剧虽然通常远比正统的戏剧更有利可图，但能够上演六个月就已算幸运。不管上座率如何，演员薪水和租用场地的费用是一定要付的。如果有几个星期业绩不佳以致财务吃紧，即使广受欢迎的剧目也会提前停演。这让投资戏剧成了一种赌博。

对那些有意赞助戏剧表演、试图复制《汉密尔顿》成功模式的人而言，能从百老汇最大的成功和失败中学到什么？现有数据足够详尽，我们从中可得到一些建议。行业组织百老汇联盟（The Broadway League）发布了自1984年以来每部戏剧的每周收入和观众人数。《经济学人》也分析了过往的演出数据及其若干特征，如类型、演员规模、评论界的反响和演员大牌与否，以评估一场演出的门票有多大可能在一周内售罄，并估算这一周内大概会有多少收入。我们将分析的数据大致限定在投资者在一部剧的演出期开始时所能获知的那些。

《汉密尔顿》首次推出时，鉴于人们对它的了解程度，很难想见它会取得如此程度的成功。在百老汇，有两种方法似乎可算得上是相对可靠的成功之路。一种是将成功的电影搬上舞台。迪斯尼的音乐剧《狮子王》自从1997年以来一直都能带来稳定的收益。和非改编自电影的音乐剧相比，改编自电影的音乐剧开演头几周的平均税前收入要多出14.5万美元。相较之下，《汉密尔顿》改编的基础却是一部832页的枯燥传记。

第二个屡试不爽的方法是邀请好莱坞明星参演。2013年，汤姆·汉克斯出演的《幸运儿》（Lucky Guy）整整三个月演出期的门票迅速销售一空。娱乐业分析人士詹姆斯·邬莫（James Ulmer）制定了一个评价好莱坞演员“吸金能力”的指数。借由这些数据，我们便可计算数据库内每部百老汇戏剧演员阵容的总体明星影响力。有了知名演员加盟，一部音乐剧开演首周门票售罄的概率有可能会从21%提高到59%；若有一位一线演员参演更

是能将这种可能性提高到92%。但《汉密尔顿》并未有大明星出演。

《汉密尔顿》确实具备一个要素，那就是一位屡获成功的大热剧目创作者米兰达。他的上一部音乐剧《身在高地》（In the Heights）获得了4项托尼奖，总收入超过1亿美元。但剧作家和作曲人过去的成功对一部剧的表现并没有多大作用。即使对于百老汇最为成功的创作者而言，重现过往的辉煌也非易事。劳埃德·韦伯勋爵的《摇滚校园》（School of Rock）自12月开演以来，每场演出的上座率仅七成有余。对于一部典型的音乐剧来说，知名舞台总监仅会使演出首周戏票就售完的概率提高四个百分点。

好评对戏剧成功的贡献并不像评论家们所希望的那么大。来自纽约大学的杰弗里·西蒙诺夫（Jeffrey Simonoff）和点评网站DidHeLikeIt.com的数据显示，一部在《纽约时报》上得到盛赞的音乐剧和一部仅获得中性评价的音乐剧相比，前者在某一周内戏票售罄的可能性比后者只高出不到六个百分点。

按我们模型的预计，《汉密尔顿》最多只是一部表现尚可的剧目——大概一周能进账130万美元，同时还需支出约60万美元，用以支付诸如场租、演员酬劳和市场营销等费用。尽管不符合商业成功的范本，但它在取得了有史以来所有百老汇剧目中最高的周平均收入，同时也是过去30年中最大的异数之一（见图表）。

百老汇对抬高票价这件事过分紧张，不然《汉密尔顿》的成绩还能更好。这部剧的演出门票严重供不应求，但加价可能带来的额外收入或被黄牛赚去，或者根本没赚到，买到票的幸运客倒是捡了便宜。

为了“打压票贩子们的气焰”，6月9日，《汉密尔顿》的制作人杰弗里·塞勒（Jeffrey Seller）将“特等票”的售价提高到849美元，还将多数座位的票价提高到近200美元。巧合的是，下一周《汉密尔顿》就首次突破了两百万美元周票房的大关。一位制作人估计，如果当初将票价定在市场能够承受的水平，这部剧的收入可能会是现在的五倍。这种定价将会巩固戏剧业的经济，就像汉密尔顿稳固了美国的金融体系一样。如果为获得更多利润

铺平道路，更多戏剧就可能会得到资助，因为更多投资者会期望获得和《汉密尔顿》一样的超额收益。■



Buttonwood

Working hard for the money

There are more explanations than solutions for the productivity slowdown

ECONOMIC growth stems from two main sources: putting more people to work or enabling workers to operate more efficiently (ie, better productivity). With the workforce in many developed economies likely to stagnate or decline in the next two decades as the baby-boomer generation retires, a lot is riding on improvements in productivity.

So the recent progress of productivity in developed economies is cause for severe disappointment. As the chart shows, growth is well below its level in the late 20th century; the brief surge that was seen in places like America and Canada at the time of the dotcom boom has also dissipated. A combination of productivity growth of 1% or so and a stagnant workforce implies very sluggish GDP growth.

A new paper* from the OECD tries to understand this puzzling slowdown in productivity. It cites a number of possible explanations. There is the “progress is over” thesis, for example: that modern advances in information technology are nothing like as revolutionary as the spread of electricity or the car. Another possibility is the shift from a manufacturing to a services economy, where many workers may be less productive (and their jobs hard to automate). And then there is the question of mismeasurement: some activities, such as free internet-search engines, may not show up in GDP statistics; productivity in service industries is hard to measure.

The role of technology lies at the heart of the puzzle. There were clearly gains in the late 1990s and early 2000s, as the internet reduced transaction costs and allowed companies to track their sales and inventories in real

time. There may of course be further gains to come, as companies adopt such technologies as 3D printing or driverless vehicles.

However, most countries have seen a slowdown in technology investment (as a proportion of GDP) since the dotcom boom. Even with interest rates at record lows, it would seem there are fewer attractive high-tech projects around.

It may not just have been technology that caused America's productivity surge in 1996-2004. Another possible factor is the spread of "global value chains"—business networks linking suppliers in many countries. Companies that want to be part of a global value chain must be as efficient as possible; otherwise competitors will overtake them. Global trade expanded rapidly in the late 1990s and early 2000s as value chains were formed. But since the financial crisis trade growth has been even more sluggish than GDP growth. This may be slowing the development of value chains, and thus productivity.

A further factor may be a slower rate of new business formation. In the medium term, you would expect new businesses to be more efficient than the old ones they replace. But according to the latest data (2012-13), new firms account for a much smaller share of companies in most countries than before the crisis.

Another factor is the mismatch between the skills of the workforce and the needs of industry. In the wake of the recession of 2008-09, many workers were forced to take lower-paying jobs. A survey conducted in 2013 found that more than 20% of workers in rich countries thought they were overqualified for their job (in England and Japan it was over 30%). The ready availability of workers may also have persuaded firms to hire more staff, rather than making capital investments.

At the same time, however, employers also complain of skill shortages. Perhaps Western education systems are not turning out the sort of graduates modern businesses are looking for. Perhaps governments need to encourage more training in the workplace.

The OECD thinks these fundamental factors are more plausible explanations of the slowdown than mismeasurement, especially as the decline is both long-lasting and has affected emerging, as well as developed, economies.

Slowing productivity is one of the biggest problems facing rich countries. But it is remarkable how little it features in public debate. Rather than figure out how to make domestic production more efficient, politicians like Donald Trump focus on keeping out goods and people from abroad. When governments do try to improve productivity (such as the reforms to the labour market the French government is pursuing) they face huge resistance. That suggests the problem is not going to go away.

* OECD Compendium of Productivity Indicators 2016 ■



梧桐

努力挣钱

对生产率增长放缓，提出的解释比解决方法更多

经济增长主要有两大源泉：让更多人去工作，或者让工人的工作更为高效（即生产率更高）。随着婴儿潮一代的退休，许多发达经济体的劳动人口在未来20年里可能会停滞或减少，经济增长很大程度上都要依靠生产率的提高。

因此，发达经济体最近在生产率方面的进展让很多人大失所望。如图所示，如今的增长远低于20世纪末的水平，互联网繁荣时期美国和加拿大等地的短暂飙升也已烟消云散。生产率年增长在1%左右，再加上劳动人口停滞不前，这意味着GDP增长会非常缓慢。

经合组织的一篇新论文试图解释这种令人费解的生产率增长放缓，其中引用了一些可能的解释。比如，有一种论点认为“进步已经结束”：现代信息技术进步并不像电力或汽车的普及那么有革命性。另一种可能是制造业经济正在转型为服务型经济，而很多服务业工作者的生产率可能较低（而且他们的工作很难自动化）。然后就是测量不当的问题：诸如免费互联网搜索引擎等一些活动可能不会体现在GDP统计中，而服务业的生产率则难以衡量。

技术的作用是这一令人费解现象的核心。在上世纪90年代末和本世纪初，互联网降低了交易成本，让企业能够实时跟踪它们的销售和库存，让生产率明显提升。当然，随着公司采用3D打印或无人驾驶汽车等技术，生产率还可能进一步提升。

然而在互联网繁荣之后，大多数国家都发现技术投资（占GDP比例）增长放缓。即使利率处于历史最低水平，有吸引力的高科技项目似乎也不多见。

让美国生产率在1996年至2004年间迅速提高的可能不仅是技术。另一个可能的因素是“全球价值链”（即连接许多国家供应商的商业网络）的拓展。想成为全球价值链一部分，公司就必须尽可能地高效，否则会被竞争对手超越。上世纪90年代末和本世纪初，由于形成了价值链，全球贸易迅速扩大。但金融危机以来，贸易增长甚至比GDP增长更为缓慢。这可能会减缓价值链的发展，从而拖累生产率。

还有一个因素可能是新企业成立的速度较慢。从中期来看，人们会期待新企业比它们取代的旧企业更为高效。但最新数据（2012年至2013年）显示，大多数国家新企业占企业总量的比例比危机前要小得多。

另一个因素是劳动力技能和产业需求之间的不匹配。在2008年至2009年的经济衰退之后，许多工人被迫接受低薪工作。2013年的一项调查发现，富裕国家里超过20%的工人认为自己资历高于工作要求（在英国和日本，这一比例在30%以上）。充裕的劳工可能也促使公司雇佣更多员工，而不是进行资本投资。

然而与此同时，雇主也在抱怨技能短缺。也许西方教育体系没有培养出现代企业需要的那种毕业生，也许政府需要鼓励更多在职培训。

经合组织认为，与测量不当相比，这些基本因素貌似更合理地解释了生产率增长放缓的原因，尤其这种放缓是长期现象，而且对新兴经济体和发达经济体均有影响。

生产率增长放缓是富裕国家面临的重大问题之一。但是，值得注意的是很少有人公开讨论这个问题。像特朗普这样的政客不是去想如何让国内生产更加高效，而是关注怎样抵制外国产品和外国人。当政府真的试图提高生产率时（比如法国政府正在进行的劳动力市场改革）却面临着巨大的阻力。这意味着问题不会消失。

*2016年OECD生产率指标纲要 ■



Automation

I'm afraid I can't do that

Reasons to be less afraid about the march of the machines

ARE robots coming to steal our jobs? For those manning the tills at pizza restaurants, the answer seems to be yes. In late May Pizza Hut announced that by the end of the year a robot called Pepper would start taking orders and payment at some of its Asian restaurants, providing a “fun, frictionless user experience”.

There is plenty of research to suggest that restaurant workers are not the only ones at risk. One widely cited paper by Carl Frey and Michael Osborne at Oxford University found that as many as 47% of Americans work in jobs that will be highly susceptible to automation over the next two decades. But a new working paper by Melanie Arntz, Terry Gregory and Ulrich Zierahn of the Centre for European Economic Research paints a slightly brighter picture. The earlier study quizzed experts on the chance that a particular occupation could be automated, and then totted up the proportion of American workers in such jobs. But the newer study suggests that this method was too blunt.

Digging into more detailed data, the researchers find that many jobs involve bundles of tasks, only some of which machines can easily handle. Take clerks in book-keeping, accounting and auditing: the earlier study said the odds of computers supplanting them over the next 20 years were 98%. But the newer study finds that three-quarters of those jobs involve some group work or face-to-face interaction—tasks robot struggle with. Applying a similar analysis to all jobs, they find that only 9%, not 47%, are at high risk of automation.

Some caveats are in order: employers could restructure jobs to disentangle

tasks that are more or less easy to automate. If that proves difficult, another possibility is that they simply forgo the human interaction now built into many occupations. A smile and some chit-chat once seemed an integral part of paying for groceries, until automated tills became commonplace. And finally, even if the 9% figure is closer to the truth, that still threatens the livelihood of millions. For the poorest quarter of the population, the proportion of jobs at risk rises to 26%, since more of them work in the sort of routine jobs most susceptible to automation.

Even so, the authors offer a few more reasons not to panic about robot-induced unemployment. Both studies look only at what is technically possible. If labour is cheap, businesses will have little reason to invest in fancy machines. Nissan, a car manufacturer, uses robots more intensively in Japan than in lower-wage India. For a robot army to be worrisome, it has to be worth someone's while to build it.

Even if a wave of automation sweeps over the workforce, total employment may not fall. Innovation could lower prices and thus stimulate incomes indirectly, boosting demand for new jobs elsewhere. That is what happened in the past, at any rate: when automatic teller machines (ATMs) were introduced, the number of cashiers in America actually rose, since the device helped to cut costs, enabling banks to open new branches. From the Luddites to Keynes, many have worried needlessly about mass technological unemployment.

Even if things are different this time, then at least the transition is likely to be slow. The Boston Consulting Group forecasts that only 25% of cars sold in 2035 will have any self-driving features, for example. If the robots do steal our jobs, we should at least be able to see them coming. ■



自动化

恐难从命

有理由对机器的进步少一分担心

机器人要来抢我们的饭碗了吗？对于那些在披萨店负责收银的人来说，恐怕是这样。五月底必胜客宣布，今年年底一款叫Pepper的机器人将在其亚洲的一些餐厅开始负责点餐和结账，提供“好玩、流畅的用户体验”。

有大量研究显示，工作受机器人威胁的不仅仅是餐厅员工。牛津大学的卡尔·弗雷（Carl Frey）和迈克尔·奥斯本（Michael Osborne）共同撰写了一篇广受引用的研究论文，发现多达47%的美国人所在的岗位都很可能在今后的20年里被自动化技术所取代。但是，欧洲经济研究中心（Centre for European Economic Research）的梅勒妮·阿恩茨（Melanie Arntz）、特里·格里高利（Terry Gregory）和乌里奇·泽尔瑞（Ulrich Zierahn）共同撰写的工作报告则认为前景更乐观一些。先前的研究会询问专家某一个职业有多大概率被自动化取代，然后统计有多大比例的美国工人在这些岗位上工作，但新近的研究则指出这种方法过于武断。

研究人员在挖掘更详尽的数据后发现，很多工作涉及多项任务，而机器能轻松胜任的只是其中一部分。以簿记、会计和审计人员为例：先前的研究认为未来二十年里这些工作被计算机替代的机率是98%。但较近的研究则认为这些工作有四分之三的内容涉及团队合作或面对面互动——这些都是机器人难以胜任的。以同样的方法分析所有的工作，他们发现只有9%的工作很有可能被自动化技术所取代，而不是47%。

但要注意的是：雇主有可能会重新调整工作内容，将难以自动化和容易自动化的任务分开。如果发现这样有难度的话，另外一种可能就是雇主干脆放弃现在很多工作中与人互动的部分。在超市付账时，微笑并聊上几句似乎是一个必要内容，然而现在自动化收银已经很普遍了。最后，就算9%的工作会被取代的数据更接近事实，这仍然会影响几百万人的生计。对于最贫困的四分之一人口来说，由于有更多人从事的是最容易被自动化取代

的重复性工作，受影响的岗位比例会升至26%。

尽管如此，报告的几位作者提供了另外几个理由，让人们无需恐慌会因机器人而失业。这两份研究都只讨论了技术上的可能性。如果劳动力价格低廉，企业就没有理由购置昂贵的机器。比起工资较低的印度，汽车制造商日产在日本就会更多地使用机器人。机器人大军若要引人担忧，前提是有人觉得值得打造它们。

即使出现了自动化技术替代人力的大潮，总体就业机会也未必会减少。创新有可能降低价格，由此间接刺激收入增加，提振其他地方对新工作岗位的需求。至少过去的情况就是如此：ATM推出时，美国出纳的人数实际上增加了，原因是ATM有助降低成本，让银行可以开设新网点。从卢德派分子（译注：19世纪英国对抗纺织工业化的熟练工人，后泛指反对技术进步和产业调整者。）到凯恩斯，很多人都曾经对技术进步引发大规模失业杞人忧天。

即使这一次情况有所不同，至少这个过程可能会比较缓慢。波士顿咨询公司预测称，2035年所销售的汽车中，只有25%会有自动驾驶功能。如果机器人真要抢我们的饭碗，至少我们还有时间。 ■



Free exchange

X marks the knot

It is surprisingly hard to draw clear conclusions about voters' intentions from electoral results

THE voters have spoken, runs an old gag, but what on earth did they mean? In the wake of Britain's vote to leave the European Union, bereft Remain campaigners have sought to explain away the result. Some argue that Britons would never have voted for Brexit if they had known what it involves. Others claim voters were not really expressing an opinion about the EU, but simply protesting about the state of the country. The outcome, the revanchists insist, was not an accurate reflection of voters' desires, but an electoral malfunction.

To most, that sounds like sour grapes. But there is a body of academic work that supports the idea that elections often misfire. For one thing, voters can be capricious. In a recent book, "Democracy for Realists", Christopher Achen and Larry Bartels recount how people in New Jersey were significantly less likely to vote to re-elect President Woodrow Wilson in 1916 if they lived near the sites of recent shark attacks. By the same token, voters seem to punish politicians for floods and droughts, but instead of seeking candidates who plan to spend more time or money preparing for such calamities, they simply unseat the incumbent. They are also myopic, judging politicians' economic management on the basis of only the very recent past. Their opinions can fluctuate wildly, depending on how questions are asked. Before the Gulf war of 1991, almost two-thirds of Americans said they were willing to "use military force", but less than 30% wanted to "go to war".

Messrs Achen and Bartels also show that many people neither follow politics closely nor scrutinise policy carefully. Voters do not always

understand the politics of different parties: in Germany, only half of them can place “Die Linke” (“the Left”) on the left-right scale. Many do not even know who represents them: in 1985 only 59% of American voters could say whether the governor of their state was a Democrat or a Republican. The authors present compelling evidence that voters tend to pick a candidate first, then bring their policy views into line with their choice. That is true, they argue, of both educated and uneducated voters.

And then there is the question of how well voting systems distil voters’ intentions. There are mathematical difficulties in aggregating their desires. Most of the time, individuals’ preferences are at least vaguely consistent: if you prefer apples to oranges, say, and oranges to bananas, then you probably also prefer apples to bananas. But this is not true of groups. Even if each individual has consistent preferences, they can vary among voters in such a way that, in two-way races, candidate A would beat candidate B, candidate B would beat candidate C, and yet candidate C would beat candidate A. What, then, is the “will of the people”?

Another problem is that adding extra options may change a group’s choice. Al Gore might have won a straight vote against George W. Bush in America’s knife-edge presidential election in 2000. But the candidacy of Ralph Nader, a left-wing challenger, may have split the left-wing vote, allowing Mr Bush to win.

Devising electoral systems to get around such problems is far from straightforward. Take three fairly simple-seeming principles. First, if voters prefer A to B in a straight run-off, that preference should not change when you introduce C to the list. Second, if voters unanimously prefer pizza to pasta, then pizza must always outrank pasta. Finally, assume voters can at most rank the available options: they can say that they prefer lower taxes to higher taxes, but not how much they care. Yet in 1951 Kenneth Arrow, an economist, proved that it is impossible to devise a voting system that

satisfies all these assumptions.

For example, French presidential elections aim to minimise vote-splitting by whittling the field down to two candidates, who then face each other in a run-off. Yet in the first round, vote-splitting remains a problem. This can lead to tactical voting. A communist, say, who supports a radical candidate might nonetheless vote for the mainstream Socialist Party to ensure that a left-winger of some description makes it into the run-off. Building on Arrow's work, Allan Gibbard and Mark Satterthwaite proved in the 1970s that every common electoral system, even those in which voters can rank their preferences, is distorted by tactical voting.

In principle, referendums are simpler. British voters were given a straight choice between leaving the EU and remaining; there was no complicated menu of options. However, it was not clear what a vote to leave meant. One option is the "Norwegian model", under which Britain retains access to the single market but must continue to allow unfettered immigration from the EU. Yet many Brits voted out because they wanted to reduce immigration. In effect, "half-in" and "out" votes were lumped together. The result may well have been different had they been separated.

| *Don't ask, don't tell*

There is a long intellectual tradition which argues that voters should never be presented with such questions. Indeed, representative democracy is predicated on the idea that many have neither the time nor the inclination to wrestle with the details of policymaking. James Madison, one of America's Founding Fathers, and Edmund Burke, his philosophising contemporary, argued for a "trustee" model, whereby voters elect politicians to make difficult decisions for them. In the 20th century Joseph Schumpeter argued, more bluntly, that policy should be left to those with the time and skill to get it right. The role of voters is to throw the rascals out if they sense things are going wrong.

What, then, would Schumpeter have said about the EU referendum? On the one hand, he would probably have argued that it should never have been held. On the other, he might well have interpreted the outcome as an angry public, sensing that something had gone wrong, giving the elites a good kicking—just what voting is for. ■



自由交流

选举症结

根据选举结果清晰判定选民意图难于上青天

借用一句老套的话说，选民已经发话了。可选民到底是什么意思呢？英国脱欧公投之后，落败的留欧派人士一直在设法为这一结果开脱。有些人辩称，如果当时英国人真的知道脱欧牵涉的种种，他们是绝不会投脱欧票的。其他人则宣称选民并非就欧盟问题发表意见，而仅仅是在对国家的现状表示抗议。复仇主义（译注：在战争或社会运动之后，失败方通过政治运动收复失地的行为）人士坚持认为，此次公投的结果没有准确反映选民的意愿，而是选举制度失灵了。

对大多数人来说，这听起来有点酸葡萄的感觉。但有很多学术研究的结果支持选举经常失准的观点。一个原因是选民反复无常。在最近一本名为《现实主义者的民主》（Democracy for Realists）的书中，作者克里斯多夫·阿尚（Christopher Achen）和赖瑞·巴特尔斯（Larry Bartels）讲到，在1916年，如果新泽西州居民的居住地附近刚发生过鲨鱼袭击事件，他们投票再次选举伍德罗·威尔逊（Woodrow Wilson）为总统的可能就会大大下降。同样，选民似乎会因水灾和旱灾而责罚政客，但他们所做的并不是去找那些计划付出更多时间和财力应对此类灾害的候选人，而只是把现任政客赶下台。选民还很短视，仅仅依据政客近期的政绩来判断其经济管理能力。他们的观点可能还会因提问方式的不同而剧烈波动。1991年海湾战争之前，几乎三分之二的美国人说他们愿意“使用武力”，但只有不到30%的人愿意“开战”。

阿尚和巴特尔斯还指出，很多人既没有密切关注时政，也不会仔细研究政策。选民并不见得都很明白各党的政治主张：在德国，只有半数选民能正确判定德国左翼党（Die Linke）是左还是右。很多选民甚至不知道代表他们的政客属于哪个党派：在1985年，只有59%的美国选民能够说出他们的州长是民主党还是共和党。两位作者给出了有力的论据，说明选民倾向于先选出一个候选人，然后再把自己的政策观点向其所选的对象靠拢。该书

作者认为，选民不论所受教育水平高低都是如此。

还有一个问题就是选举制度能否充分提炼出选民的意图。汇总选民意愿在数学上有困难。大多数情况下，个人偏好至少还能算基本一致：如果你喜欢苹果多于橙子、喜欢橙子多于香蕉，那你就很有可能喜欢苹果多于香蕉。但群体偏好就不是这样了。即使每个个体的偏好始终如一，但在不同选民中却可能会发生变化，以至于在两方竞选中，有可能会出现候选人A击败B，B击败C，而C击败A的情况。这样说来，到底什么才是“人民的意志”？

另外一个问题是增加额外的选项可能会改变一个群体的选择。在2000年形势胶着的美国大选中，阿尔·戈尔（Al Gore）本来或许可以在直接对抗乔治·W·布什时赢得更多选票，但左翼竞选人拉尔夫·纳德（Ralph Nader）可能分流了一些左翼票数，导致小布什获胜。

设计选举制度以绕过此类问题绝非易事。来看看三个貌似很简单的原则。首先，如果选民在两人的竞选对决中倾向于竞选人A而非B，那么这种偏好不应在增加竞选人C后发生变化。其次，如果选民一致选择披萨而非意面，那么披萨这个选择必须总是排在意面之前。最后，假设选民至多可以对现有选项排序：他们可以说自己倾向于更低税率而非更高税率，但无法表达对这个问题有多关心。然而在1951年，经济学家肯尼斯·阿罗（Kenneth Arrow）证明，要设计一个能满足所有这些假设的选举制度是不可能的。

比如，法国总统选举希望最终只有两名候选人一决胜负，由此将选票分流的影响降至最低。然而在第一轮选举中，选票分流仍然是一个问题，这可能导致战术性投票。假设一个共产主义人士本来支持的是激进派候选人，他有可能将票投给主流的社会党，以确保一位一定程度上符合要求的左翼人士能进入最终决选。在阿罗所做研究的基础上，阿兰·吉伯德（Allan Gibbard）和马克·萨特思韦特（Mark Satterthwaite）在上世纪七十年代证明，任何一种常见的选举制度、即便是那些选民可以将偏好排序的制度，都被战术性投票扭曲了。

原则上来说，公投要简单一些。英国选民面临两个直接的选择，脱欧和留欧，并没有复杂的选项。然而，投票脱欧意味着什么却并不明确。有一种选择是“挪威模式”，在此模式下英国仍可接入欧盟单一市场，但必须继续允许无限制欧盟移民。然而很多英国人投脱欧票正是因为他们想减少移民。实际上，“半留”和“脱欧”票被混为一谈了，如果明确加以区分，结果可能会大不相同。

| 不问，不说

长久以来，一直有一种思想传统认为不应将此类问题抛给选民。的确，代议制民主的基础概念就是很多选民既没有时间、也没有兴趣去仔细琢磨政策制定的具体问题。美国开国元勋之一詹姆斯·麦迪逊（James Madison）和同时代的哲学家埃德蒙·伯克（Edmund Burke）都支持一种“受托人”模式，由选民选出政客来为他们做出困难的决定。在20世纪，约瑟夫·熊彼特（Joseph Schumpeter）则更直白地指出：应该让那些有时间有能力的人去制定政策。选民的作用则是如果觉得不对劲，就把其中的无赖给揪出去。

那么熊彼特对脱欧公投又会作何评论呢？一方面，他或许会认为公投本就不应该举行。另一方面，他可能会将公投的结果解释为愤怒的民众发觉情况不对，好好地教训了下精英阶层——而这正是投票的目的所在。 ■



Schumpeter

The two faces of USA Inc

American bosses are divided when it comes to Donald Trump

THE leaders of America's multinational firms are usually a picture of self-control, with sincere handshakes, grown-up hair and scripted sound bites. But ask them about the election and emotion takes over. At a drinks party in Manhattan, a mega-bank's boss froths that Donald Trump is a madman. Thumping an office table, the head of one of the country's biggest technology firms, and a rare Republican in Silicon Valley, solemnly vows to vote for Hillary Clinton. The chief of a huge transport firm giggles uneasily that a Trump presidency will destroy free trade—and his firm's booming business with Mexico.

The feeling of contempt is mutual. On June 29th Mr Trump laid into the Chamber of Commerce, big business's favourite lobbying organisation. "It's totally controlled by the special-interest groups," he said, to wild cheers from a crowd in Maine.

Big international firms do not share Mr Trump's diagnosis of America as a country that has stopped winning. For them, it has been a golden decade. Share prices are near an all-time high; the operating earnings of S&P 500 firms have risen by 137% since the crisis year of 2009. Many of the trends that have hurt Middle America have made USA Inc stronger. Big firms have cut jobs to increase productivity and now make 40% of their sales abroad. They are more dominant at home because of a wave of mergers and their mastery of lobbying. They grumble about tax, but have become superb at avoiding it. The top 50 firms paid a cash tax rate of 24% on their global profits in 2015, compared with an official rate of 39%. Even the big banks have learned to live with more regulation: they are thrashing their European rivals across the globe.

At the very point that swathes of the public say the economy isn't working, USA Inc is on top of the world, occupying all of the ten top spots in the global corporate rankings, measured by market value. Bosses of multinational firms think their country has everything to play for. The worst of the job losses attributable to cheap Chinese labour have already happened; with luck, Chinese consumers will start buying more from the rest of the world. America's lead in technology has never been bigger. New trade deals, such as the proposed Trans-Pacific Partnership, are remarkably skewed towards American interests in areas such as intellectual-property rights. "The American model that got us through the last 30 to 40 years is stronger than ever," declared Eric Schmidt, the executive chairman of Alphabet, the parent company of Google, to the Economic Club of New York last month.

The hostility of big firms towards Mr Trump goes beyond free trade. They know that America's demographics are changing. The fastest-growing cohort of consumers are Hispanic, with their share of overall spending forecast to rise by about two percentage points by 2020, even as the share of white Americans drops by the same amount, according to Morgan Stanley, a bank. Bosses see a much more socially liberal America, too. None of this sits well with Mr Trump's nativist agenda, which is perhaps why Wells Fargo, JPMorgan Chase, Ford, Coca-Cola and Apple have either cut their support for the Republican convention this month or will not support it at all.

Yet a thousand miles south of Manhattan, in suburban Florida, the mood is different. The boss of a construction firm says he is fed up. His firm does all its business within America's borders and profits have not yet recovered to 2006 levels. The Obama administration, in his view, has crippled the economy. More generous welfare benefits means labourers have got lazy. Permits and local taxes have proliferated, raising costs. The crackdown on banks has hobbled lending. Vote for Hillary? Not a chance, he says. Trump it

has to be—and if he is psychologically erratic and vulgar, better that than an endless stagnation.

The construction boss is not alone. Opinion polls suggest that Mr Trump is also popular with small-business owners. His campaign-finance disclosures show hundreds of contributions from the owners of small firms that no one on Wall Street or in Washington, DC, has ever heard of: Biagi Plumbing, James River Air Conditioning, Rosenberger Construction, Allen Unique Autos, Texan Drywall Inc and Podell Fuel Injection.

| *A demagogue and a hypocrite, with a point*

The complacent response is that these entrepreneurs are fools who have been deceived. After all, Mr Trump's business career has been built in the heart of the globalised part of the economy, not slogging it out in the trenches of Middle America. About 66% of the value of his business operations sits in New York, mainly in buildings in glittering Manhattan, according to *Economist* estimates. Global too-big-too-fail banks are tenants in two of Mr Trump's most valuable properties. He has courted foreign investors, from Hong Kong to the Middle East, since the 1990s.

But Mr Trump speaks the language of business owners when he says he will abolish Obamacare, the health-care scheme that companies say has created piles of red tape. When he promises that no firm will pay a tax rate of more than 15%, small and domestically-focused business see not a fiscal absurdity, but a chance that they might enjoy the same treatment that multinationals already enjoy (Apple, America's biggest firm, paid a cash tax rate of 18% in 2015). And when Mr Trump complains about special interests dominating the economy, and corrupting politics, he is right. Lobbying budgets have reached \$3 billion a year. Two-thirds of industries have become more concentrated since the 1990s. With big companies ascendant, the number of new entrant firms being created is at its lowest level since the 1970s.

A sensible economic agenda for America would please—and annoy—both sides of the divide. It would pursue free trade but also attack oligopolies, lobbying and bureaucracy and reform the corporate tax system. In other words, it would listen to the polished sophisticates who run America's biggest companies, but also to those business leaders who support Mr Trump. ■



熊彼特

双面美国公司

说到唐纳德·特朗普，美国老板各持己见

美国跨国公司的领导人通常都是一副克己持重的模样，握手真诚，发型考究，讲起话来滴水不漏。但只要别人问起选举的话题，他们便会立刻激动起来。在曼哈顿的一个酒会上，一家银行巨头的老板口沫飞溅，称唐纳德·特朗普就是个疯子。美国最大的科技公司之一的老板，同时也是硅谷少有的共和党人，猛捶办公室的桌子，郑重其事地宣称要投票给希拉里。一家超大型运输公司的老板不自然地傻笑着说，特朗普当总统会毁了自由贸易，还有他的公司与墨西哥欣欣向荣的业务往来。

然而特朗普也看不上他们。6月29日特朗普痛斥了大公司最为青睐的游说组织美国商会。“它完全被特殊利益集团控制了。”特朗普在缅因州一群人的欢呼声中说道。

特朗普认为美国这个国家已停止创造胜利，但大型跨国公司并不认同他的判断。对于这些公司来说，过去十年是黄金十年——股票价格接近历史高点，标准普尔500公司的运营收益自2009年金融危机以来增长了137%。许多伤害到中部美国的趋势反而让美国企业变得更加强大。大公司通过削减工作岗位提高了生产率，如今更是有40%的销售收入来自海外。得益于合并热潮和高超的游说技巧，它们进一步巩固了在国内的霸主地位。它们虽然抱怨税收，但在避税上已经登峰造极。前50强公司在2015年所付的现金税率是其全球利润的24%，而官方税率为39%。即便是大型银行也学会了应对更多监管：它们在全世界都完胜欧洲的对手。

就在大批民众认为经济不景气时，美国企业正站在世界巅峰——按市值计算，它们占据着全球企业排名前十位。跨国公司老板认为他们的国家仍大有可为。就中国廉价劳动力而引起的失业而言，最坏的情况已经过去了；如果一切顺利，中国消费者会开始从世界其他地方购买更多商品。美国在科技上从未如此遥遥领先。新的贸易协定（例如已提出的跨太平洋伙伴关

系协定)在知识产权等领域明显对美国有利。上月谷歌母公司Alphabet的执行主席埃里克·施密特(Eric Schmidt)在纽约经济俱乐部上宣称:“带领我们走过之前三四十年的美国模式比以往更为强大。”

大公司对特朗普的敌意并非只源于自由贸易,它们知道美国的人口结构正在变化。摩根士丹利称,增长最快的消费者群体是西班牙裔,到2020年他们在总体消费中的占比预计将增长约2个百分点,同时美国白人的消费占比则会有相同比例的下降。老板们也认为美国社会将变得比现在要开放自由得多。然而这些与特朗普的本土主义方略格格不入,或许正是这一原因导致富国银行(Wells Fargo)、摩根大通(JPMorgan Chase)、福特、可口可乐和苹果公司要么削减对本月召开的共和党全国大会的支持,要么完全不予支持。

不过在曼哈顿以南一千英里之外的佛罗里达州郊区,气氛却迥然不同。一家建筑公司的老板说他已经受够了。他公司的全部业务都在美国国内,利润还没恢复到2006年的水平。在他看来,奥巴马政府整垮了经济。更优厚的福利救济已让劳工们变得懒惰。证照要求越来越多,地方税激增,这些都提高了成本。打击银行业让贷款举步维艰。选希拉里?那可没门,他说。要选就选特朗普,就算他古怪粗俗,也比无穷无尽的经济停滞要好。

这么想的人不止这位建筑公司老板一个。民意调查显示特朗普在小企业主之中也颇受欢迎。从特朗普披露的竞选经费来看,成百上千笔捐款都来自小公司的经营者。无论在华尔街还是华盛顿特区都没人听说过这些小公司:Biagi管道、James River空调、Rosenberger建筑、Allen Unique汽车、Texan石膏墙股份有限公司和Podell燃油喷射。

| 有道理的煽动家和伪君子

有人洋洋自得地指出,这些企业家都是傻瓜,他们被骗了。毕竟特朗普的商业生涯都是在经济的全球化部分的核心地带建立的,而并非从中部美国的壕沟里杀出一条血路。据本刊估算,在他的商业运作中,约有66%的价值位于纽约,主要是在曼哈顿五光十色的高楼大厦里。多家大到不能倒的全球银行租用了特朗普两栋最值钱的地产。从上世纪90年代起,他就对从

香港到中东的外国投资者大献殷勤。

但是当特朗普提起要废除奥巴马医改计划时，他道出了企业主的心声。一些公司认为这个医改计划催生了大量的繁文缛节。当特朗普承诺所有公司需支付的税费都将不会超过15%时，主营国内市场的小公司并不认为这在财政上是无稽之谈，而是一个可能让其享受到跨国公司同等待遇的机会（美国最大的公司苹果2015年支付的现金税率为18%）。特朗普抱怨特殊利益集团主导了经济并且使政治变得腐败，他没有说错。游说预算已达到每年30亿美元。自上世纪90年代起，三分之二的行业都变得更加集中。大公司占尽了优势，而新创立的公司数量却跌落至20世纪70年代以来的最低水平。

对美国来说明智合理的经济方针会取悦也会惹恼分歧的两派。这样的方针不仅要追求自由贸易，也要打击寡头垄断、游说和官僚主义，还要改革企业税收系统。换言之，它既会考虑美国最大的公司那些圆滑通达、老于世故的经营者的意见，也会听取那些支持特朗普的企业领袖的声音。■



The industrial internet of things

The great convergence

China aims to lead the world in connecting the factory

THE “internet of things” (IoT) is much hyped. For a decade, a world in which household appliances, packaged goods, clothes, medical devices and much more besides would be connected to the internet via smart chips and capable of sensing and sharing information has been just around the corner. Progress remains slow in the consumer market, despite a few hit products, such as the Fitbit, an activity tracker that connects to smartphones. An industrial form of the IoT, however, may come to fruition much faster.

As the world’s biggest manufacturing power, China is well placed to lead this transition. Which is why last week GE, the world’s biggest industrial company, opened what it calls a “digital foundry” in Shanghai. The centre will help Chinese companies develop and commercialise products for the industrial internet of things, which involves factory machines and industrial goods communicating with each other and their surroundings. It will probably be a much bigger market than the one for consumers. China has millions of factories with billions of machines and it also makes most of the world’s electronics, including many of the sensors and other electronic devices that would form the backbone of such a network. Moreover, the government is keen to upgrade the country’s manufacturing base.

There are already more things connected to each other in China than in any country, with the numbers set to skyrocket further (see chart). IDC, a research firm, forecasts that the overall market for IoT kit of various forms in China will rise from \$193 billion last year to \$361 billion in 2020. Accenture, a consultancy, reckons embracing IoT in manufacturing could

add up to \$736 billion to China's GDP by 2030.

GE's new centre (it will soon open a similar one in Paris to tap into the European market) is part of its efforts to get firms to use Predix, its proprietary software for the industrial IoT. The American company had already signed up China Eastern Airlines and China Telecom, two big state-owned enterprises, and last week Huawei, a Chinese telecoms-equipment giant, also came on board as a partner. GE is not alone in seeing China as a potential hotbed of the industrial IOT. Siemens, a German rival, held an event in Beijing earlier last month to trumpet its own technology. HP, Honeywell and Cisco, all big American technology firms, are also rushing in.

| *Sany side up*

Chinese firms, however, have their own plans. China Mobile, the largest mobile-phone firm, has established its version of a digital foundry: a "cellular IoT open lab". Li Yue, the company's chief executive, dreams that he could earn 100 billion yuan (\$15 billion) from the IoT with as many as five billion devices connected by 2020.

Chinese firms also have local knowledge. Sany, which makes construction equipment, started connecting machines on its factory floor in 2008. It then put sensors on its diggers and cranes to monitor them in real-time to improve operating efficiency. The company has invested in data analytics and artificial intelligence. He Dongdong, who leads those efforts, brags that unlike foreign multinationals his firm knows how to make affordable kit that works in "Chinese conditions". By that he means places where workers are low-skilled, conditions are dirty and operators often push equipment to its limits.

That points to another sort of local advantage. Foreign firms might have fancier kit, but locals know how to make things cheap and cheerful.

Huawei's push into the IoT got a boost in June when a new protocol it helped to develop, known as "narrow band IoT", was approved as a global standard. The new protocol works with devices that require inexpensive sensors that use little energy.

Still, there are three potential snags to China's IoT ambitions. Firms, squeezed by both a weak local and global economy, may not be able to afford to connect their machines to the cloud. Sany's Mr He, however, reckons the downturn will be good for stronger firms as their low-end competitors will be forced out.

Secondly, Chinese factories are less technologically advanced than those in America or Europe, so moving to advanced computer-controlled production and automation could be daunting for some.

Finally there are standards. Despite the new narrow band IoT protocol, there is a lack of overall global standardisation, such as the common GSM protocol that allowed Europe to leapfrog others in mobile telephony. Jagdish Rebello of IHS, a consultancy, argues that a push from Chinese regulators, combined with the country's massive home market, could lead to domestic standards dominating the global market. Firms elsewhere, and in a variety of different industries from cars to robotics and cloud computing, will have other ideas. Consumers, meanwhile, will continue to wait for the refrigerator that can contact the supermarket to restock itself. ■



工业物联网

大融合

中国的目标是在连接工厂方面引领世界

“物联网”被炒得很火。十年来，一个时代一直呼之欲出——到那时，家用电器、包装商品、衣服、医疗设备以及更多其他物品都可以通过智能芯片与互联网相连，并能感知和共享信息。消费品市场中尽管出现过若干热门产品，例如与智能手机相连的运动追踪器Fitbit，但仍旧发展缓慢。然而，物联网的工业应用可能会更快实现。

作为世界制造业第一大国，中国具备引领这一变革的优势。正因为如此，全球最大的工业公司GE上周在上海开设了一个所谓的“数字创新坊”（digital foundry）。该中心将帮助中国企业为工业物联网开发产品并使之商业化。工业互联网涉及工厂机器及工业产品，使它们能够与彼此及周边环境沟通。这个市场可能比消费品市场要大得多。中国拥有数以百万计的工厂连同数十亿台机器，还制造了世界上绝大多数的电子产品，包括将构成工业物联网骨干的众多传感器以及其他电子设备。此外，中国政府还热衷于升级该国的制造业基地。

中国已经比其他国家拥有更多互相连接的物品，而且这些物品的数量肯定还会进一步飙升（见图表）。研究公司国际数据公司（IDC）预测，中国各种形式物联网套件的总体市场将会从去年的1930亿美元跃升至2020年的3610亿美元。咨询公司埃森哲预计，到2030年，制造业使用物联网对中国GDP的贡献可能会高达7360亿美元。

GE的新中心（它很快会在巴黎开设一个类似的中心以进军欧洲市场）是它努力让各企业使用其工业物联网专有软件Predix行动的一部分。这家美国公司已经与中国东方航空和中国电信这两家大型国企签署了协议，中国电信设备巨头华为也在上周成为其合作伙伴。认为中国是工业物联网潜在热土的公司不只GE一家。上月早些时候，来自德国的竞争对手西门子在北京举行了活动，宣传自己的技术。惠普、霍尼韦尔和思科等美国大型科技公

司也在纷纷涌入。

| 三一冒头

然而，中国企业有自己的计划。最大的移动通讯公司中国移动已经建立起自己的数字创新坊——“蜂窝物联网开放实验室”。该公司总裁李跃希望到2020年能从连接多达50亿台设备的物联网中赚取1000亿元（150亿美元）。

中国企业还拥有本土知识。生产建筑设备的三一集团从2008年开始在工厂车间里将机器联网。接着，它在挖掘机和起重机上安装传感器以便实时监控，从而提高操作效率。该集团还投资于数据分析和人工智能。领导了上述努力的贺东东自豪地介绍说，与国外跨国企业不同，他的公司知道如何生产符合“中国国情”、价格合理的套件。他所谓的“中国国情”指的是工人技能低、工作环境脏、以及操作者经常把设备用到极限。

这指向了另一项地方优势。外国公司可能拥有更高档的套件，但本地企业知道如何使产品物美价廉。六月，华为协助开发的被称为“窄带物联网”的新协议获批成为一项全球性标准，进一步推动了其进军物联网的努力。这份新协议适用于使用廉价传感器的设备，而这些传感器能耗很低。

不过，中国若要实现物联网梦想还需应对三个潜在的小障碍。各家企业受到疲软的本地及全球经济的挤压，可能无法负担将它们的机器与云连接起来的费用。然而，三一集团的贺东东认为，经济低迷将有利于较强的企业，因为低端竞争对手会被迫出局。

其次，中国工厂在技术上没有美国或欧洲的工厂那么先进，因此，要转型为先进的计算机控制生产与自动化可能会令一些工厂望而生畏。

最后还有标准的问题。尽管有了新的窄带物联网协议，但仍然欠缺全球总体的标准化，就像让欧洲在移动通信领域超越其他国家的通用GSM协议那样。咨询公司IHS的贾迪什·里贝罗（Jagdish Rebello）认为，中国监管机构的推动再加上庞大的国内市场可能会使中国的国内标准主导全球市场。其他地方从汽车到机器人和云计算等各行各业的公司也会有别的想法。与

此同时，消费者也将继续等待能自动联系超市补充食品的冰箱的出现。 ■



The grey market

Golden oldies

Ageing societies are forcing big shifts in the provision of health care

THE forecasts are clear: by 2050 the number of people aged over 80 will have doubled in OECD countries, and their share of the population will rise from 3.9% to 9.1%. Around half will probably need help with daily tasks—particularly those with enduring chronic illnesses such as Alzheimer's, heart disease and osteoporosis. Health systems designed only to offer hospital care for acute cases will struggle to provide such support.

To maintain the well-being of wrinkly populations, hospital stays can be replaced by residencies in purpose-built facilities at less cost. A forthcoming report covering 20 countries from KPMG, a consultancy, suggests the number of care-home residents could grow by 68% over the next 15 years. How care is managed in any one country reflects a tussle between cultural attitudes, national budgets and gritty demographic realities. The increasing availability of technology that would allow the elderly to stay in their homes for longer will also affect demand for such options.

Residential care in America and Japan is flourishing. But in an era of tight public finances, some governments are trimming the payments they offer to cover, or subsidise, care-home places. Some operators now struggle to make money; in western Europe, for example, governments are encouraging the elderly to stay in their own houses for longer. This is why the length of stays in care homes has declined from an average of three to four years a decade ago to 12 to 18 months today, says Max Hotopf, the boss of Healthcare Business International, a publishing company. Thousands of residential beds in the Netherlands and Sweden have disappeared as a result. About 5,000 debt-laden British care homes—a quarter of the

total—may close within three years.

This makes emerging markets a more attractive prospect, at least for European care firms. Senior Assist, a Belgian company which manages residential facilities and home help, is now expanding in Chile and Uruguay. But China is the big prize. The Chinese will rely heavily on residential care, thanks to the country's one-child policy and increasing urbanisation: two parents and four grandparents often depend on one child far away.

Families in other developing countries are more hesitant about handing Granny over to strangers, however. In Brazil, India and richer countries of the Middle East, such as Saudi Arabia, elderly care remains centred around hospitals. In Brazil taking the old from their neighbourhoods is frowned upon. In India and the Middle East, families are expected to look after their elderly when they are not in hospital. Helmut Schuehsler, from TVM Capital Healthcare, a private-equity firm in this sector, says to prevent hospital beds being blocked by oldies, "rehabilitation services" tied to hospitals should be on offer, or at least home care that avoids the need for a hospital in the first place.

Overall, home care is an increasingly attractive market, expected to reach \$355 billion by 2020 globally, and growing by 7.8% on average a year, according to Grand View Research. For one thing, it is cheaper to provide help for the elderly in their own homes (as long as it doesn't involve overnight care); for another, a growing desire exists to "age in place".

In India, says Mr Hotopf, many agree that equipping ordinary homes with medical equipment will be the solution for those who can afford it. But simpler and cheaper additions can help keep oldies healthier at home, too. The company Sen.se, based in Paris, has a device called Mother that runs a family of "motion cookies"—small sensors. One will fit comfortably on the

side of a pill bottle, for example. If placed appropriately around a house, they can monitor room temperature, the time that a person has spent in bed, the opening of the fridge door and whether tablets have been taken. An elderly relative's data can then be monitored remotely on apps.

Keeping an aged parent in view is also becoming easier. The robotics company Revolve has a telepresence robot called Kubi that allows spectators far away to pan and turn an iPad—a tool that makes it easier for anyone concerned to see how elderly relatives are coping.

For those in need of human oversight, meanwhile, a range of startup companies hope to make finding and employing a carer far easier. Apps, including TenderTree and HomeHero, will replace the advertisements once crafted for fusty magazines.

Care firms and other professional outfits can save money themselves through advances in remote monitoring. In Britain, for example, the Airedale Hospital in the north of England put telemedicine services (a two-way secure video link) into nursing and residential homes for a period, and hospital admissions dropped by more than a third. This was because nurses were on hand to work out whether incidents in care homes were serious or not. In February the hospital started a new digital hub to provide these services on a wider basis.

Yet health-care systems have generally been slow to adopt technology this way. It may now be possible to consult with a doctor via a tablet, but governments have many rules about how medical advice is provided and how related data are handled. The extent to which new technologies grant the elderly independence will be limited by how willing governments are to integrate them into larger systems. ■



银发市场

黄金老人

老龄化社会迫使医疗服务大变革

预测十分清楚：到2050年，经合组织国家内80岁以上人口将翻倍，其占总人口的比例也将从3.9%升至9.1%。其中约半数人的日常生活可能需要他人协助，尤其是那些患有阿尔茨海默症、心脏病、骨质疏松症等慢性疾病的老人。原本只是着眼于为急症患者提供住院治疗的医疗系统将难以提供这类协助。

为保障老年人的福祉，他们可以入住专门修建的养老机构来代替住院，这样花费更低。咨询公司毕马威即将发表的一份报告对20个国家进行了调查，显示在未来15年内，养老院的入住人数可能将增长68%。每个国家对于养老服务的处理方式都折射出文化态度、政府预算和人口老龄化的残酷现实之间的角力。科技日益普及，使得老人可在家中安居更久，这也影响到对上述老年人护理服务的需求。

在美国和日本，养老院服务正蓬勃发展。但在这个公共财政紧张的时代，一些国家政府正削减对养老院的支出或补贴。部分运营商如今难以盈利。比如在西欧，政府鼓励老年人多住家里。正是这个缘故，养老院的住宿时长已从十年前的平均三到四年下降到现在的12至18个月，出版公司“国际医疗保健商情”（Healthcare Business International）的老板马克斯·贺托夫（Max Hotopf）说。在荷兰和瑞典，数以千计的养老院床位因此消失。在英国，约有5000家（占总数的四分之一）债务缠身的养老院可能在三年内关闭。

这使得新兴市场显得更具发展前景，至少对于欧洲的老年人护理公司来说是这样。管理养老院和居家服务的比利时公司Senior Assist目前正在智利及乌拉圭扩展业务。但中国市场才是“大奖”所在。由于独生子女政策及不断发展的城市化，两名父母和四位祖父母往往靠远方的一个孩子照顾，所以中国人未来将在很大程度上依赖养老院。

然而，在把老人交由陌生人照顾这件事上，其他发展中国家的家庭则较为迟疑。在巴西、印度及中东一些较富裕国家，如沙特阿拉伯，提供老年人护理的主体仍然是医院。在巴西，把家中老人送走会招人非议。在印度和中东，人们认为老人除了住院时外都应该由家人照顾。业内私募基金公司TVM Capital Healthcare的赫尔穆特·舒斯勒（Helmut Schuehsler）认为，为防医院病床被老年人占用，应提供与医院衔接的“康复服务”，或至少提供居家护理，从一开始就避免住院需求。

国际咨询机构“大观研究”（Grand View Research）的数据显示，总体而言，居家护理市场吸引力日增，预计到2020年全球规模将达3550亿美元，平均年增长7.8%。一方面，在老年人自己家中提供护理的成本较低（只要不涉及夜间护理）；另一方面，越来越多人希望“在自家养老”。

贺托夫表示，在印度许多人认同，对于有经济能力的家庭来说，在普通家居中安装医疗设备可以解决问题。而添置相对简单便宜的装置也可让家中老年人生活得更健康。总部设在巴黎的公司Sen.se有一套名为“母亲”（Mother）的设备，可以管理一组被称为“动作追踪器”（motion cookies）的小型传感器。举例来说，传感器小至可以轻易贴在药瓶的瓶身上。只要在家中各处恰当地放置这些传感器，它们便可监控房间温度、老年人的卧床时间、冰箱门的开关状态及是否已服药。亲人可通过应用远程监控老年人的各项数据。

看护年迈父母也变得更容易了。机器人公司Revolve有一款名为库比（Kubi）的远程监控机器人，它可以远程摇摆和旋转iPad来变换视角，让关心长辈的亲人们更容易地看到老年人过得如何。

同时，对于那些确需人照顾的老年人，一系列创业公司正努力使寻找及雇用护工变更简单。TenderTree和HomeHero等应用将取代老式杂志里的广告。

养老护理公司及其他专业机构可利用远程监控技术的进步来节省成本。例如在英国，英格兰北部的艾尔代尔医院（Airedale Hospital）有一段时间

为养老院提供远程医疗服务（双向安全视频连接），使当时的住院率下降了三分之一以上。这是因为护士可以随时在旁判断养老院中的老人病症是否严重。今年二月，该医院启用了—个新建的数字中心，以便更广泛地提供这些服务。

但医疗系统—般难以如此快速地采纳新科技。人们现在也许可以通过平板电脑向医生求诊，但政府对于提供医疗建议的方式及相关信息的处理尚有诸多规定。新科技能为老年人带来多大程度的独立，就要看政府有多大的意愿将这些新科技纳入更大的体系中了。■



Schumpeter

Crazy diamonds

Billionaires are funding lots of grandiose plans. Welcome their ambition

YURI MILNER, a Russian internet billionaire, wants to answer the great existential question: “Are we alone in the universe?” He has already launched a project to listen for signals from outer space, using two of the world’s biggest radio telescopes. In April he also unveiled plans to send an armada of tiny spaceships, powered by laser beams and equipped with all sorts of sensors, to Alpha Centauri, 40 trillion kilometres away.

Sir Richard Branson, the boss of the Virgin Group, and Elon Musk, the entrepreneur running Tesla, a car company, have both founded space ventures, Virgin Galactic and SpaceX. Sir Richard wants to turn space tourism into an industry; Mr Musk lists his ultimate goal as “enabling people to live on other planets”. Once upon a time the space race was driven by the competition between capitalism and communism. Now it is driven by the competition between individual capitalists.

Space is not the only frontier that billionaires want to conquer. Sergey Brin, the co-founder of Google, hopes to give meat a makeover by growing it from stem cells. Mr Musk desires to “reinvent” railways by shooting passengers down hermetically sealed tubes. Tycoons are particularly keen on schemes to cheat the grim reaper. Peter Thiel, a co-founder of PayPal, proclaims that “The great unfinished task of the modern world is to turn death from a fact of life to a problem to be solved.” Larry Ellison, the chairman of Oracle, has said: “Death never made any sense to me. How can a person be there and then just vanish?” Both men have invested money in various ventures designed to come up with ways of reversing ageing. Dmitry Itskov, one of the pioneers of the Russian internet, says that his goal is to live to 10,000.

History is full of examples of rich men with big ideas. The merchant princes who founded enterprises such as the London Company in the 17th century wanted to build bustling empires across the seas. Howard Hughes spent the 1930s testing innovative aircraft and setting aeronautical records, almost killing himself in the process, and founded a medical clinic whose goals included discovering “the genesis of life itself”. But the closest parallel with what is happening today is the gilded age in America.

The late-19th and early-20th centuries saw gigantic concentrations of wealth in the hands of people who created their own companies. Andrew Carnegie and John Rockefeller held the majority of shares in their companies just as the founders of Facebook and Google hold controlling shares in theirs. The political system was incapable of dealing with the pace of change: in America it was paralysed by gridlock and complacency, and in Europe it was overwhelmed by animal passions. Entrepreneurs, flush with money from new technologies, felt duty-bound to step in, either to deal with problems that politicians were unable to confront or to clean up after their failures. Today’s state may be much bigger, but its shortcomings are no less glaring.

Back then, numerous industrialists, including William Lever in Britain, J.N. Tata in India and Milton Hershey in America, founded company towns that were intended, at a minimum, to combat the evils of industrial civilisation and, on occasion, to create a new kind of human being. Carnegie, a steel baron, and Alfred Nobel, a dynamite tycoon, both became obsessed by the idea of abolishing war for ever. Henry Ford launched a succession of ambitious schemes for improving the world, including eliminating cows, which he couldn’t abide. In 1915 he took a ship of leading business people and peace activists to Europe to try to end the first world war and “get those boys out of the trenches”. “Great War to end Christmas day,” read a *New York Times* headline; “Ford to stop it.” In 1928 he tried to recreate an American factory town in the middle of the Amazon rainforest.

Fashions change. None of today's billionaires spends serious money on universal peace. But the psychology of the very rich seems the same. Reforming billionaires down the ages display the same bizarre mix of good and bad qualities—of grandiosity and problem-solving genius, naivety and fresh thinking, self-importance and altruism.

There is a lot of ego involved—the minted are competing with each other to produce the most eye-catching schemes, much as they vie to run the most successful businesses. That helps to explain why the billionaire space race has escalated from sending rockets into orbit to sending spaceships to Alpha Centauri. There is also a lot of misdirected effort. The gift of \$100m by Mark Zuckerberg, Facebook's founder, has not dramatically improved Newark's schools. Ford's Amazonian experiment crumbled into ruins as employees balked at some of his rules, which included serving only American food and compulsory square-dancing. His voyage to end the first world war descended into farce: the press re-christened his vessel "the ship of fools" and the Norwegians diagnosed him as suffering from *Stormannsgalskap*, or the "madness of great men".

| *Big cheques, bigger dreams*

Yet the madness does far more good than harm. Deep-pocketed entrepreneurs not only add to the number of moonshot projects, literal or metaphorical, they also introduce fresh thinking. Mr Milner's ideas for contacting aliens challenge some of the unexamined assumptions of America's space bureaucracy by using tiny spaceships and laser beams rather than larger craft and rocket fuel. The most talented billionaires have a genius for combining grand ideas with intense pragmatism; the Gates Foundation is pursuing its aim of abolishing polio and malaria with a business-like attention to detail. And sometimes grandiose ideas can do good even without achieving their ultimate goals: the Carnegie Endowment for International Peace and the Nobel peace prize have improved the world

even if they haven't abolished war. You cannot shake up the world without treating what most people regard as facts of life as "problems to be solved". ■



熊彼特

疯狂的钻石

亿万富翁资助了许多宏伟的计划，欢迎他们的野心吧

俄罗斯互联网亿万富翁尤里·米尔纳（Yuri Milner）想回答那个有关存在性的伟大问题：“宇宙中只有我们吗？”他已启动了一个项目，用两台世界上最大的射电望远镜接收来自外太空的信号。四月他还公开了其他计划，要向40万亿公里以外的半人马座阿尔法星派遣一支用激光束驱动、配备各种传感器的微型宇宙飞船舰队。

维珍集团的老板理查德·布兰森爵士（Sir Richard Branson）和特斯拉汽车公司的埃隆·马斯克（Elon Musk）都创办了航天企业，分别是维珍银河公司（Virgin Galactic）和SpaceX。理查德爵士想把太空旅游变成一个产业，而马斯克则将其终极目标定为“使人类能在其他星球上生活”。从前，空间竞赛由资本主义和共产主义间的竞争所驱动。现在，其驱动力是单个资本家之间的竞争。

太空不是亿万富豪们想要征服的唯一前沿领域。谷歌的联合创始人谢尔盖·布林（Sergey Brin）希望从干细胞里种出肉来，彻底变革肉类生产。马斯克希望通过沿密封管道“发射”乘客来“重新发明”铁路。大亨们特别热衷于逃避死神的计划。PayPal的联合创始人彼得·蒂尔（Peter Thiel）宣称：“现代世界的一大未竟任务是把死亡从无可争辩的事实变成一个有待解决的问题。”甲骨文的董事长拉里·埃里森（Larry Ellison）说：“死亡对我毫无意义。一个人怎么会好好地在那里，然后就消失了？”两人都投资于各种商业冒险，试图找到扭转衰老的办法。俄罗斯互联网先驱之一德米特里·伊茨科夫（Dmitry Itskov）表示，他的目标是活到一万岁。

富人拥有宏大的想法，历史上满是这样的例子。创办17世纪的伦敦公司（London Company）等企业的富商大贾想要建立横跨海洋的繁华帝国。整个20世纪30年代，霍华德·休斯（Howard Hughes）都在测试新型飞机并创下航空记录，几乎为此丧命。他还建立了一家目标包括发现“生命本

身的起源”的医学研究所。但是，与当前情况最相似的是美国的镀金时代。

从19世纪末到20世纪初，巨大的财富集中在那些自己创建公司的人们手中。正如Facebook和谷歌的创始人在其企业拥有控股权，安得鲁·卡内基和约翰·洛克菲勒在各自的公司里也持有多数股份。政治体系无法应对变化的步伐：在美国，僵局与自满使其陷入瘫痪，在欧洲则被野蛮的激情所淹没。企业家通过新技术获得大笔财富，他们感到有义务插手干预，处理那些政客们无法面对的问题，或者是在他们失败后清理烂摊子。今天的政府可能大得多，但它的缺点一样显眼。

当时，英国的威廉·利弗（William Lever）、印度的塔塔（J.N. Tata）、美国的密尔顿·赫尔希（Milton Hershey）等众多实业家建立了企业城镇，其目的至少是跟工业文明的弊病做斗争，而有时候还想要创造新新人类。钢铁大王卡内基和炸药大亨阿尔弗雷德·诺贝尔（Alfred Nobel）都醉心于永远消除战争的想法。亨利·福特推出了一系列雄心勃勃的计划来改善世界，包括消灭他无法忍受的奶牛。1915年，他把一船商界领袖与和平主义领头人带到欧洲，试图结束第一次世界大战，“把那些男孩从战壕里带出去”。《纽约时报》的头条这样报道：“世界大战要终结圣诞节，福特则要把大战叫停。”1928年，他试图在亚马逊雨林中重建一个美国工厂区。

潮流在变化。当今的亿万富翁里没有一个人花费巨资去追求世界和平。但是，巨富们的心理似乎别无二致。自古以来，志在变革的亿万富翁都展现出了优点与缺点的奇异组合：计划宏伟夸大，但的确有解决问题的天赋；思想幼稚天真，但同时又有鲜活的想法；当然还有自大与无私并存。

这里还有很多自负的成分——富翁们正在竞相提出最引人注目的方案，一如他们争相努力经营最成功的企业。这有助于解释为什么亿万富翁的太空竞赛已经升级，从发射火箭进入轨道发展到发射飞船去半人马座阿尔法星。也有许多努力用错了地方。Facebook创始人马克·扎克伯格一亿美元的捐赠并没有让美国纽瓦克市（Newark）的学校教育得到明显改善。由

于员工抗拒只供应美国食品以及强制跳方块舞等规定，福特的亚马逊实验土崩瓦解。福特要结束第一次世界大战的航行沦为了一场闹剧：新闻界把他的船重新命名为“愚人船”，挪威人则断定他得了“伟人疯狂症”（挪威语为 Stormannsgalskap）。

| 大额的支票，更大的梦想

然而，这种疯狂的利远大于弊。财力雄厚的企业家不仅直接增加了登月计划或者类似宏伟计划的数量，他们还引入了新思维。利用微型宇宙飞船和激光束而非更大的飞船和火箭燃料，米尔纳接触外星人的想法挑战了美国航空官僚机构一些未经检验的假设。最有才华的亿万富翁具备把宏伟的想法与强烈的实用主义相结合的天赋。通过商业管理般对细节的务实关注，盖茨基金会正在追求其消灭小儿麻痹和疟疾的目标。有时，宏伟的想法即便没有实现其终极目标，也能产生好处：纵然没有消灭战争，卡内基国际和平基金会（the Carnegie Endowment for International Peace）和诺贝尔和平奖仍然让世界变得更好。不把大多数人视为无可争辩的事实当成“有待解决的问题”，你就无法撼动世界。 ■



Schumpeter

Tycoonomics

The rising number of emerging-market billionaires is a good thing

IN 1998 Peter Mandelson, a leading member of Britain's then Labour government, said he was "intensely relaxed about people getting filthy rich as long as they pay their taxes." Today Lord Mandelson is more uptight; he worries about the rising inequality and stagnating middle-class incomes brought about by globalisation. His volte-face is typical of the global elite. The head of the IMF, Christine Lagarde, says that rising inequality casts a "dark shadow" over the global economy. A recent OECD report warns that rising inequality will be a "major policy challenge" for all countries.

In a new study, "Rich People, Poor Countries: The Rise of Emerging-Market Tycoons and their Mega Firms", Caroline Freund of the Peterson Institute in Washington, DC, makes an important contribution to understanding this challenge. She draws a distinction between rich-world billionaires and those of the emerging economies, whose numbers have been rising at a faster rate. In 2004 the emerging world accounted for 20% of the 587 billionaires in *Forbes* magazine's annual survey. By 2014 it accounted for 43% of the 1,645 billionaires on the list. In the rich world the share who were self-made, rather than heirs to a fortune, was fairly stable between 2001 and 2014, at about 60%. In the emerging world the self-made proportion rose from 56% to 79%.

Being self-made is not automatically a virtue. Some self-made tycoons acquire their fortunes through cronyish connections. But Ms Freund argues that the fastest-growing group of emerging-world billionaires consists of what might be called "Schumpeterian" entrepreneurs—people building or managing big companies that have to fight for their lives in global markets. The rise of this type of tycoon, she says, can be a healthy consequence of

structural transformation and rapid development. When economies expand quickly—as they did in America in the late 19th century, say—they develop big firms that produce concentrations of wealth but that also contribute to broad growth by pioneering productive techniques and creating jobs. Such economies lift up those at the bottom of the income scale as well as enriching those at the top.

Ms Freund scrutinises the lists of billionaires, excludes those whose wealth was inherited and then classifies the self-made billionaires into four categories: those whose wealth came from government concessions and other forms of rent; those in finance or property; the founders of businesses that genuinely compete in the market; and highly paid executives at such Schumpeterian businesses. She treats only the last two categories as real entrepreneurs. In 2001 just 17% of all emerging-market billionaires made it into this classification; in 2014 roughly 35% did.

Among the leading examples is Terry Gou of Taiwan, who founded Hon Hai, an electronics giant (also known as Foxconn), in 1974 with just \$7,500. Its massive expansion on the mainland has made it China's biggest exporter, with a workforce of nearly 1m. Dilip Shanghvi founded Sun Pharmaceutical Industries in 1983 with a \$1,000 loan from his father. It is now India's largest drugmaker, with 16,000 workers and a market value of \$29 billion. Zhou Qunfei started out working on the family farm in Hunan and was then a factory worker in Guangdong before starting a firm that makes touchscreens. Ms Zhou is now the world's richest self-made woman. Her company, Lens Technology, employs 60,000 and is worth close to \$12 billion. The American dream of going from rags to riches appears more achievable in developing Asia than in America itself, which seems ever more in thrall to vested interests.

The emergence of these goliaths is similar to the emergence of big companies in the United States and Europe in the late 19th and early 20th

centuries, Japan in the 1950s and 1960s, and South Korea in the 1960s and 1970s. The comparison to America during the gilded age is particularly striking. Chinese tycoons such as Jack Ma of Alibaba and Robin Li of Baidu, two internet giants, are becoming fabulously wealthy by learning how to serve a huge new market in much the same way that Andrew Carnegie and John D. Rockefeller did with steel and oil. Tee Yih Jia Foods of Singapore has become a colossus of spring rolls by mechanising their production and improving marketing, much as H.J. Heinz did with sauces and pickles in 1890s Pittsburgh.

| *Where's the anti-billionaire backlash?*

There are significant regional variations in this happy picture. East Asia has the lion's share of Schumpeterian billionaires, whereas Latin America still has a disproportionate share of inheritors, and South Asia and eastern Europe a continuing problem with cronyism. However, the anti-billionaire backlash that is such a marked feature of Western politics is, thus far, much less pronounced in the emerging world. This may be because emerging-market billionaires seem more dynamic: more than half of them are under 60 compared with less than a third in the rich world. But it is partly because ordinary people in the emerging world have been getting richer alongside the billionaires; in the rich world the masses have seen their incomes stagnate.

You can pick holes in Ms Freund's arguments. The line between Schumpeterian and crony firms can be hard to draw in China, where the government exercises huge influence behind the scenes. And if a recent slowdown in emerging economies worsens, it may show that some entrepreneurial stars built their empires on sand. But if anything, she errs on the side of caution. She excludes financiers, even though they can also be wealth-creators; and heirs, even though some—such as Ratan Tata of India, who increased the value of the Tata group enormously—are

Schumpeterians. Although cronyism is far from extinct, the emerging world has witnessed a big increase in the number of true entrepreneurs. They are a symptom of economic dynamism, not a cause of rising inequality. ■



熊彼特

大亨经济学

新兴市场国家亿万富翁人数不断增加是件好事

在1998年，英国工党政府的主要成员彼得·门德尔森（Peter Mandelson）曾说，他“根本不在乎人们巧取豪夺来发家，只要纳税就行。”如今，门德尔森勋爵要保守得多。他对全球化所带来的不平等日益加剧和中产阶级收入裹足不前表示了担心。他态度上的一百八十度大转弯在全球精英中可谓典型。国际货币基金组织（IMF）总裁克里斯蒂娜·拉加德（Christine Lagarde）说，日益加剧的不平等为全球经济蒙上了“阴影”。经合组织（OECD）最近的一份报告警告说，日益加剧的不平等将成为所有国家的一个“主要政策挑战”。

美国华盛顿特区的彼得森研究所（the Peterson Institute）发布了一份最新研究报告，题为《富人穷国：新兴市场国家的大亨及其巨头公司之崛起》（Rich People, Poor Countries: The Rise of Emerging-Market Tycoons and their Mega Firms），该所的克里斯蒂娜·弗罗因德（Caroline Freund）在报告中对理解这一挑战做出了重要贡献。新兴市场国家的亿万富翁数量增加的速度快于发达国家，弗罗因德对两者进行了对比。根据《福布斯》杂志的年度调查，2004年新兴市场国家在全球587个亿万富翁中占20%，而在2014年则在全球1645名亿万富翁中占43%。2001至2014年期间，发达国家白手起家而非通过继承获得财富的亿万富翁人数占比稳定，约为60%。而新兴市场国家的这一人群比例则由56%上升至79%。

白手起家并非就值得赞美，有些白手起家的大亨通过裙带关系获得财富。但是弗罗因德认为，在人数快速增加的新兴市场国家，亿万富翁中有一些可以称作是“熊彼特式的”企业家，他们所打造或者管理的大公司必须在全球市场上求得生存。弗罗因德以为，这类大亨的成长可以看作是结构转型和快速发展的健康结果。各经济体快速扩张时（如19世纪末美国的情况）会催生一批大企业，它们不但集中了大量的财富，同时也通过创新生产技术和创造就业岗位促进了整体增长。在这些经济体里，不仅社会顶端的人

积累了财富，收入等级底层的人也得到了好处。

佛罗因德仔细研究了各国亿万富翁的名单，排除掉继承财富者之后，将白手起家的富翁分成了四类：通过获得政府特许经营和其他形式寻租而获利的；从事金融或地产行业的；创建企业实打实地在市场上比拼的；以及熊彼特式企业中收入丰厚的高管。佛罗因德只将最后两类富翁视为真正的企业家。2001年新兴市场国家的富翁中只有17%堪称此类人，2014年这类人则大约占比35%。

来自台湾的郭台铭就是一个典型的例子。他在1974年以7500美元创建了电子工业巨头鸿海集团（又名富士康）。该公司在中国大陆的大规模扩张令其成为中国最大的出口企业，工人总数接近一百万。迪利普·桑哈维（Dilip Shanghvi）在1983年向父亲借了1000美元创办了太阳制药（Sun Pharmaceutical Industries）。这家公司如今已是印度最大的制药企业，工人总数达16000人，市值290亿美元。周群飞在建立自己的触摸屏公司之前，先是在湖南老家务农，后来南下广东工厂打工。如今她已是全球排名第一的白手起家的女富翁。她的公司蓝思科技有六万名工人，市值接近120亿美元。从乞丐变身大亨的美国梦似乎在发展之中的亚洲更易实现，而在美国，既得利益者的束缚越来越难以摆脱。

这些巨头的出现与19世纪末20世纪初的欧美、上世纪五六十年代的日本和六七十年代的韩国的大企业的诞生十分相近。与美国镀金时代的相似性则尤为明显。中国的巨头们，如网络巨头阿里巴巴的马云和百度的李彦宏，通过学习如何服务于巨大的新市场而赚得盆满钵满，与安德鲁·卡耐基和约翰·洛克菲勒用钢铁和石油敲开致富大门的过程相差无几。新加坡的“第一家食品公司”（Tee Yih Jia Foods）通过机械化生产及改善市场营销成为春卷一哥，这与十九世纪九十年代时H·J·亨氏在美国匹兹堡销售调味汁和腌制食品的历程如出一辙。

| 哪里存在反巨富情绪？

在这幅美好的图景里，各地区差异很大。东亚地区熊彼特式亿万富翁人数占比最大，而拉丁美洲继承致富的比例仍然远超其它区域，南亚和东欧富

翁依然依赖裙带关系。然而，到目前为止，在西方政治中凸显的反巨富情绪在新兴市场国家远没有那么明显。这有可能是因为这些国家的富翁看似更有活力：超过一半都在60岁以下，而在发达国家连三分之一都不到。但还有一个原因是新兴市场国家的普通人也随着亿万富翁的崛起而更加富裕，而发达国家的普罗大众收入一直停滞不前。

你当然可以在弗罗因德的观点中挑出漏洞。在中国，熊彼得式的企业和依赖裙带关系的公司很难区分，因为在这背后政府影响巨大。如果新兴市场国家近年来的经济衰退进一步恶化，就有可能暴露出一些企业家之星不过是沙上建塔。不过如果弗罗因德真的错了，也是因其谨慎而造成的。她排除了金融家，尽管他们也可能是财富创造者，同时排除的还有财富继承人，但他们当中有些人也是熊彼特式的企业家，如印度的拉坦·塔塔（Ratan Tata）就极大地提升了塔塔集团的价值。尽管裙带主义远未消除，新兴市场国家仍见证了真正的企业家人数的巨大增长。这些企业家不是不平等加剧的原因，而是经济活力的象征。■



Schumpeter

The grey market

Older consumers will reshape the business landscape

IN 1965 Diana Vreeland, the editor-in-chief of *Vogue*, coined a phrase “youth-quake” to describe how baby-boomers were shaking up popular culture. Today the developed world is in the early stages of a “grey-quake”. Those over 60 constitute the fastest-growing group in the populations of rich countries, with their number set to increase by more than a third by 2030, from 164m to 222m. Older consumers are also the richest thanks to house-price inflation and generous pensions. The over-60s currently spend some \$4 trillion a year and that number will only grow.

Yet companies have been relatively slow to focus on this expanding market—certainly slower than they were to attend to the youth-quake. The Boston Consulting Group (BCG) calculates that less than 15% of firms have developed a business strategy focused on the elderly. The Economist Intelligence Unit, a sister organisation to *The Economist*, found that only 31% of firms it polled did take into account increased longevity when making plans for sales and marketing.

One reason for this tardiness is that young people dominate marketing departments and think that the best place for the old is out of sight and mind. Germaine Greer, a feminist, speaks for her generation, as usual, when she says that “just because I’m over 60 nobody wants to sell to me.” A study by fast.Map, a marketer, and Involve Millennium, a consultant, found 68% of British 65-74-year-olds “don’t relate” to advertising that they see on television.

But the biggest reason is that oldies are such slippery customers. The definition of what it means to be “old” is complicated and dynamic. Sixty-

five-year-olds are not the same as 85-year-olds. Age affects people in different ways: some fade early while others march on. Class divisions are more marked now than for previous generations of retirees: the winners, sitting on suburban mansions and defined-benefit pensions, cannot spend their money fast enough, while losers go cap in hand to charities (31% of working-age Americans don't have a pension or savings, according to the Federal Reserve). Most greying baby-boomers in the rich world are in denial about ageing: 61% say that they feel at least nine years younger than their chronological age.

The surest way of alienating older consumers is to treat them as old. When Procter & Gamble, a consumer-goods company, repackaged some of its dental products as "selected for aged fifty-plus consumers", it saw sales plunge. Bridgestone blundered by promoting a new line of golf clubs as one for pensioners, producing poor sales.

Yet change is in the air. Some industries such as health care and automobiles have been thinking about the grey market for a while. Others such as retailing and consumer goods started paying attention more recently. Now comes the silver rush. A report by the McKinsey Global Institute points out that older consumers are one of the few engines of growth in an otherwise sluggish global economy. The emerging-market boom is slowing in some countries, notably China, and turning into a bust in others, notably Brazil. Millennials suffer from the twin burdens of student debt (especially in America) and the lingering effects of the 2008 financial crisis. They are starting families and buying houses later than their parents, if at all. MGI calculates that pensioners in the rich world spend an average of \$39,000 on consumption compared with \$29,500 for the 30-44 age group. The old are becoming the new new thing.

Some firms are trying to understand older people better. Kimberley-Clark, a maker of consumer products, has built a mock-up of what a senior-friendly

shop might look like in the future. Ford has created a “third-age suit” for car designers to wear to help them understand the needs of older people: the suit thickens the waist, stiffens the joints and makes movement more cumbersome. Thick gloves reduce the sense of touch and yellow-tinted goggles simulate eye cataracts. BCG research on older people suggests they are less eager to acquire material possessions than preceding generations and much keener to acquire experience, particularly through travel and study.

Understanding is giving birth to new products and business models. NTT DoCoMo not only produced a phone with large keys and a big display screen. It also redesigned its marketing, promoting the new phones during bus tours for pensioners and providing classes in shops to explain the ins-and-outs of apps. Electronics makers are producing devices that are designed specifically for old people: for example, Independa manufactures a monitor that sends an alert if something untoward happens, making it easier for the frail elderly to stay in their own homes (“age in place”) rather than move to nursing homes.

Companies are also mastering the art of discretion—addressing older people, but not too explicitly. Retailers are surreptitiously lowering shelves and putting in carpets to make it harder to slip. Package-goods firms are printing larger typefaces and using more white space. Kimberley-Clark has overhauled its Depend brand of adult nappies to make them more like regular underwear. Sabi, a design company, now sells walking canes in bright colours. Car firms don’t make a song and dance about the fact that old people with stiff necks and fading vision will benefit disproportionately from self-parking cars.

| *One foot in the gravy*

Yet this is only the early stages of a revolution. Baby-boomers have spent their lives making noise and demanding attention. They are not going to

stop now. They will be the biggest and richest group of pensioners in history. They will also be the longest lived: many will spend more time in retirement than they did working. The baby-boomers have changed everything they have touched since their teenage years, leaving behind them a trail of inventions, from pop culture to two-career families. Retirement is next on the list. ■



熊彼特

银发市场

老年消费者将会重塑商业生态

1965年，《Vogue》杂志主编戴安娜·弗里兰（Diana Vreeland）创造了一个新词“青年大骚动”（youth-quake），来形容婴儿潮一代对流行文化带来的震荡。如今，发达世界已经迈入“银色冲击”（grey-quake）的初期。富裕国家中60岁以上人口是人数增长最快的群体，到2030年将从1.64亿增至2.22亿，增幅超过三分之一。得益于房价上涨和丰厚的退休金，老年消费者同时也是人口中最富裕的人群。60岁以上的消费者目前年消费额约为4万亿美元，而且这一数字在未来会只升不降。

然而企业在面对这个不断扩大的市场时，反应速度却相对较慢，至少要慢于它们对“青年大骚动”的反应。根据波士顿咨询公司（BCG）的计算，只有不到15%的公司针对老年消费群体制定了经营策略。《经济学人》杂志的姊妹机构经济学人智库发现，在其调查的公司中，只有31%在制定销售和营销策略的时候会考虑到人均寿命的延长。

这种反应迟缓的原因之一是年轻人在企业营销部门占主导，认为老年人最好位置的就是“眼不见，心不烦”。女权主义先驱杰梅茵·格里尔

（Germaine Greer）一如既往地为她这一代人发声：“就因为我超过了60岁，没有人想卖东西给我了。”由市场营销公司fast.Map和咨询公司Involve Millennium共同完成的研究显示，英国65至74岁的人群中有68%认为他们在电视上看到的广告与他们“没有关系”。

但最主要还是因为老年消费者太难把握了。“老年人”的定义复杂而又多变，65岁的老人和85岁的老人就不是一回事。年龄影响人的方式各不相同：有些人一老即衰，有些人则老当益壮。相比上一代的退休者，如今阶层分化愈加明显：赢家们坐拥郊区宅邸，享受规定受益制养老金，大把的钱花不完；而输家们则要低声下气地向慈善机构求助（根据美联储的数据，劳动年龄美国工人中有31%没有退休金或储蓄）。富裕世界中，大部

分两鬓斑白的婴儿潮一代都否认自己已步入老年：61%的人说他们感觉自己实际年龄至少年轻九岁。

有一种方式一定会赶走年长消费者，那就是把他们当做老人来对待。消费品公司宝洁曾把旗下一些护齿产品重新包装成“专为50岁以上消费者打造”，其后销量大跌。普利司通也犯过错，它曾专为退休人士推出一款高尔夫球杆，同样销路不佳。

但是变化已经来临。有些行业，比如医疗保健和汽车，早已开始考虑银发市场的需求，其他如零售和消费品行业最近也已经开始更多地关注这一市场。银发潮已经到来。麦肯锡全球研究院（McKinsey Global Institute）的一项报告指出在全球经济低迷之时，老年消费者是少有的增长动力之一。新兴市场的繁荣发展在一些国家已经开始降温（尤其在中国），在另一些国家则转向破灭（特别是在巴西）。千禧世代面临两座大山：学生贷款（尤其在美国）和2008年金融危机的后遗症。千禧世代生儿育女和购置房屋（如果他们会这样做的话）都要晚于他们的父母。麦肯锡全球研究院的计算显示，富裕世界的退休人士人均年消费额达3.9万美元，而30至44岁年龄段人群的平均水平只有2.95万美元。老年人正将世界甩在身后。

有些公司正在试图加深对老年人的了解。消费品制造商金佰利公司（Kimberley-Clark）已经建造了一个模拟商店，展示未来可以怎样更好地为老年人服务。福特公司为汽车设计师专门打造了一款“老年服”，穿上可以帮助他们更好地了解老年人的需求：这款服装会在腰围处加厚，将关节处变硬，让行动不便。厚厚的手套会降低触觉敏感度，黄色护目镜可以模拟白内障的视觉效果。波士顿咨询公司对年长者的研究显示，比起他们的先辈，他们对追逐物质财产的热情不是那么高，而更热衷于获得体验，尤其是通过旅游和学习。

通过了解老年人，催生了很多新产品和商业模式。NTT DoCoMo（日本最大的移动通信运营商）不仅设计了一款按键和显示屏都很大的手机，还重新设计了营销模式，改为在退休者乘大巴旅行的时候做推广，并在店内开设课程，教授如何在手机上安装及卸载应用。电子产品制造商们也在生产

专门为老年人设计的设备：比如，Independa（美国远程医疗服务平台开发商）打造了一个监视器，一旦发生任何事故都会发出警报，更方便体弱的老年人留在家中（“居家养老”），而不必搬去养老院。

各公司也正在掌握周到的艺术——解决老年人的问题，但要行事低调。零售商们悄悄地就将货架高度降低，铺设地毯防止滑倒。包装商品公司将包装袋印刷字体放大，加入了更多空白。金佰利彻底改变了旗下得伴

（Depend）成人纸尿裤的设计，看起来更像一般的内裤。设计公司Sabi现在销售的手杖全都是五颜六色的。老年人颈部僵硬，视力退化，自动泊车功能可以给他们带来极大的方便，但汽车公司却不会大张旗鼓地进行宣传。

| 涉市未深

然而这一切都只是革命的初期阶段。婴儿潮一代一生都不甘沉默，不断寻求关注，现在也不会改变。他们将会成为历史上人数最多、最富有的退休人群，也会是最长寿的：很多人退休生活的年头将会超过他们工作的时间。婴儿潮一代从青少年时期开始就改变了他们所接触的一切，从流行文化到双职工家庭，他们一路走来，开创了各种新事物，接着就轮到退休这件事了。■



Globalisation and inequality

The new wave

Surprisingly little is known about the causes of inequality. A Serbian-American economist proposes an interesting theory

IT'S a golden age for studying inequality. Thomas Piketty, a French economist, set the benchmark in 2014 when his book, "Capital in the Twenty-First Century", was published in English and became a bestseller. The book mapped the contours of the crisis with a sweeping theory of economic history. Inequality, which had been on the wane from the 1930s until the 1970s, had risen sharply back toward the high levels of the Industrial Revolution, he argued. Now Branko Milanovic, an economist at the Luxembourg Income Study Centre and the City University of New York, has written a comprehensive follow-up. It reinforces how little is really known about economic forces of long duration.

In some ways "Global Inequality" is a less ambitious book than "Capital". It is shorter, and written more like an academic working paper than a work of substantial scholarship for a wider readership.

Like Mr Piketty, he begins with piles of data assembled over years of research. He sets the trends of different individual countries in a global context. Over the past 30 years the incomes of workers in the middle of the global income distribution—factory workers in China, say—have soared, as has pay for the richest 1% (see chart). At the same time, incomes of the working class in advanced economies have stagnated. This dynamic helped create a global middle class. It also caused global economic inequality to plateau, and perhaps even decline, for the first time since industrialisation began.

To help interpret these facts, Mr Milanovic provides the readers with a

series of neat mental models. He muses, for instance, that at the dawn of industrialisation, inequality within countries (or class-based inequality) was responsible for the largest gaps between rich people and poor. After industrialisation, inequality across countries (or location-based inequality) became more important. But as gaps between countries become ever more narrow, class-based inequality will become more important as most of the differences in incomes between rich people and poor people will once again be due to gaps within countries. He seasons the discussion with interesting comments, such as how incomes and inequality fell over the course of the Roman Empire.

Mr Milanovic's boldest contribution is about "Kuznets waves", which he offers as an alternative to two other prevailing theories of inequality. Simon Kuznets, a 20th-century economist, argued that inequality is low at low levels of development, rises during industrialisation and falls as countries reach economic maturity; high inequality is the temporary side-effect of the developmental process. Mr Piketty offered an alternative explanation: that high levels of inequality are the natural state of modern economies. Only unusual events, like the two world wars and the Depression of the 1930s, disrupt that normal equilibrium.

Mr Milanovic suggests that both are mistaken. Across history, he reckons, inequality has tended to flow in cycles: Kuznets waves. In the pre-industrial period, these waves were governed by Malthusian dynamics: inequality would rise as countries enjoyed a spell of good fortune and high incomes, then fall as war or famine dragged average income back to subsistence level. With industrialisation, the forces creating Kuznets waves changed: to technology, openness and policy (TOP, as he shortens it). In the 19th century technological advance, globalisation and policy shifts all worked together in mutually reinforcing ways to produce dramatic economic change. Workers were reallocated from farms to factories, average incomes and inequality soared and the world became unprecedentedly

interconnected. Then a combination of forces, some malign (war and political upheaval) and some benign (increased education) squeezed inequality to the lows of the 1970s.

Since then, the rich world has been riding a new Kuznets wave, propelled by another era of economic change. Technological progress and trade work together to squeeze workers, he says; cheap technology made in foreign economies undermines the bargaining power of rich-world workers directly, and makes it easier for firms to replace people with machines. Workers' declining economic power is compounded by lost political power as the very rich use their fortunes to influence candidates and elections.

This diagnosis carries with it a predictive element. Mr Milanovic expects rich-world inequality to keep rising, in America especially, before eventually declining. Importantly, he argues that the downswing in inequality that occurs on the backside of a Kuznets wave is an inevitable result of the preceding rise. Where Mr Piketty sees the inequality-compressing historical events of the early 20th century as an accident, Mr Milanovic believes them to be the direct result of soaring inequality. The search for foreign investment opportunities engendered imperialism and set the stage for war. There are parallels, if imperfect ones, to the modern economy; rich economies seem to be stagnating as the very rich struggle to find places to earn good returns on their piles of wealth.

Mr Milanovic's analysis leads him to consider some dark possibilities as he looks ahead. America looks to be falling into the grips of an undemocratic plutocracy, he says, which is dependent on an expanding security state. In Europe right-wing nativism is on the rise. The good news is that emerging economies will probably continue on their path toward rich-world incomes—though that, he allows, is not guaranteed, and could be threatened by political crisis in China or in other markets.

The book's conclusion is a little unsatisfying. A theory in which rising inequality eventually triggers countervailing social dislocations feels intuitively right, but it also leaves many important questions unanswered. When is war, rather than revolution, the probable outcome of inequality? Are governments at the mercy of the cycle, or can they act pre-emptively to flatten out the waves and avoid crises of high inequality? Mr Milanovic's contributions are ultimately similar to those made by Mr Piketty. The data he provides offer a clearer picture of great economic puzzles, and his bold theorising chips away at tired economic orthodoxies. But the grand theory does as much to reveal the scale of contemporary ignorance as to illuminate the mechanics of the global economy. ■



全球化和不平等

新风潮

人们对造成不平等状况的原因知之甚少，令人惊讶。一位塞尔维亚裔的美国经济学家提出了一项有趣的理论。

这是研究不平等状况的黄金时代。2014年，法国经济学家托马斯·皮凯蒂（Thomas Piketty）设定了衡量基准，彼时他的大作《21世纪资本论》以英语出版且大卖特卖。该书以经济史的全面理论描绘出危机的概要。他认为，从20世纪30年代到70年代，不平等状况已逐渐减轻，但又急剧抬头，直奔工业革命时的严重程度。如今纽约城市大学卢森堡收入研究中心（the Luxembourg Income Study Centre）的经济学家布兰科·米兰诺维奇（Branko Milanovic）写出了一部全面的后续之作。该书强调人们对长期持续的存在经济力量的真正了解的确非常之少。

在某些方面，比起《21世纪资本论》一书，《全球不平等》不那么雄心勃勃。它篇幅更短，更像是一篇学术研究论文，而不是面向更广泛读者群的鸿篇巨著。

像皮凯蒂一样，米兰诺维奇也以多年研究积累的大量数据开篇。他将不同国家的趋势置于全球背景之下。过去三十年，在全球收入分配中处于中间阶层的工人（如中国工厂的员工）的收入已经暴涨，最富裕的1%阶层的收入也是如此（见图表）。与此同时，发达经济体工薪阶层的收入则处于停滞状态。这样的动态变化帮助创造了全球的中产阶级。它也使得全球经济不平等状况趋向稳定，甚至可能是自工业化开始以来第一次减缓。

为了解释这些事实，米兰诺维奇为读者提供了一系列简明巧妙的心智模式。例如，他思忖道，在工业化初始，各个国家内部的不平等状况（或各阶层间的不平等）是造成富人和穷人间最大差距的原因。工业化之后，各国之间的不平等（或因位置造成的不平等）变得更为重要。但是随着各国间的差距越来越小，各阶层间不平等的重要性将提高，因为富人和穷人之间的收入差别，大部分将再次归因于各国内部的差距。他的讨论还佐以有

趣的评论，例如收入和不平等状况在罗马帝国时期如何下降。

米兰诺维奇最引人注目的贡献是“库兹涅茨波形”（Kuznets waves），他提出的这一理论是关于不平等的另两种盛行理论之外的又一选择。20世纪的经济学家西蒙·库兹涅茨（Simon Kuznets）认为，不平等程度在经济发展水平较低时期较低，在工业化时期会加剧，而当各国到达经济成熟期时则会下降；不平等程度高是发展过程中暂时的副作用。皮凯蒂则提出了另一种解释：高度不平等是现代经济的自然状态，只有非常事件，如两次世界大战和20世纪30年代的大萧条，才会打破这种正常的均衡。

米兰诺维奇认为这两种说法都不对。他认为纵观历史，不平等状况倾向于周期式波动：即库兹涅茨波形。在工业化之前，这些波形受到马尔萨斯动态支配：当国家福星高照、收入高企时，不平等状况会加深；而当战争或饥荒将收入拖回到勉强糊口的水平时，不平等状况会缓解。有了工业化，产生库兹涅茨波形的力量变成了技术、开放和政策（米兰诺维奇取首字母将其缩写为TOP）。19世纪，技术进步、全球化和政策转变共同作用，相辅相成，从而产生了巨大的经济变革。工人们被重新分配，从农场来到工厂，平均收入和不平等状况飙升，整个世界互相连通的程度前所未有。种种因素的合力，有的有害（战争和政治动乱），有的有益（不断提升的教育水平），将不平等状况压至20世纪70年代的低点。

自那时起，在又一个经济变革时代的推动下，富裕世界乘上了新一波的库兹涅茨浪潮。他认为，技术进步和贸易的共同作用压制了工人，而外国经济体产生的低成本技术则直接削弱了富裕国家工人的议价能力，公司更容易以机器取代人力。政治力量的缺失使得工人们不断下降的经济力量雪上加霜，因为富商大贾运用他们的财富影响候选人和选举。

这一分析带有预测的成分。米兰诺维奇预计富裕世界，尤其是美国的不平等程度会不断提高，直至最终下降。重要的是，他认为在一个库兹涅茨波形的下行区间出现的不平等程度降低，是之前不平等程度提高的必然结果。皮凯蒂认为20世纪早期不平等状况引发的历史事件是偶然事故，但米兰诺维奇相信那些是之前不平等程度剧增的直接后果。寻找外国投资机会

产生了帝国主义，酝酿了战争。这与现代经济发展相似，但不完全一样；富裕经济体似乎处于停滞状态，因为富人很难找到地方为其大量财富赚得高额收益。

米兰诺维奇的剖析让他在展望未来时考虑到一些黯淡前景。他称，依赖于一种不断扩展的安全状态，美国似乎正落入不民主的富豪统治集团之手。在欧洲，右翼本土主义正在崛起。好消息是新兴经济体可能会继续在接近富裕世界收入的道路上前行，尽管他认为这一趋势无法保证，也可能受到中国或其他市场政治危机的威胁。

这本书的结论部分有点不尽如人意。不断加深的的不平等最终会触发对抗性的社会混乱，这在直观上看似正确，但仍然遗留了很多重要问题没有解答。什么时候会有战争而不是革命，作为不平等可能导致的结果是什么？政府是受制于周期，还是可以先发制人，平息波动，避免严重不平等产生的危机？米兰诺维奇的贡献究其根底与皮凯蒂相似。他提供的数据让我们对宏大的经济谜题有了更清晰的了解，他的大胆立论层层削弱了陈腐的经济正统观点。但是宏伟的理论不只阐明了全球经济的机制，也揭示了当代人的无知程度。 ■



The internet of things

Where the smart is

Connected homes will take longer to materialise than expected

THE fanfare has gone on for years. Analysts have repeatedly predicted that the “internet of things”, which adds sensors and internet capability to everyday physical objects, could transform the lives of individuals as dramatically as the spread of the mobile internet. Providers have focused on the home, touting products such as coffee pots that turn on when the alarm clock rings, lighting and blinds that adjust to the time of day, and fridges that send an alert when the milk runs out. But so far consumers have been largely resistant to making their homes “smart”.

That’s not for want of trying by tech firms, which have poured cash into their efforts to connect everyday objects to the internet. In 2014 Google made the biggest statement of intent so far, spending \$3.2 billion to acquire Nest, a smart thermostat-maker, and \$550m to buy Dropcam, which makes home-security cameras. Nest absorbed Dropcam; it is now one of the best-known smart-home brands. But it is also a warning about how long it will take for such gadgets to enter the mainstream.

Nest has undoubtedly disappointed Google. It sold just 1.3m smart thermostats in 2015, and only 2.5m in total over the past few years, according to Strategy Analytics, a research firm. For a couple of years the firm has mainly tweaked existing products rather than introducing new ones. That may explain why Tony Fadell, Nest’s founder and boss, stepped down on June 3rd to take an advisory role at Google’s parent company, Alphabet (see next article). Mr Fadell, a former executive at Apple and designer of the iPod, failed to bring his magic touch to the smart home.

Nest’s problems are symptomatic. Only 6% of American households have a

smart-home device, including internet-connected appliances, home-monitoring systems, speakers or lighting, according to Frank Gillett of Forrester, a research firm. Breakneck growth is not expected; by 2021 the number will be just over 15% (see chart). Too few consumers are convinced that the internet has a role to play in every corner of their lives. A survey conducted in Britain by PricewaterhouseCoopers, a consulting firm, found that 72% of people have no plans to adopt smart-home technology in the next two to five years and that they are unwilling to pay for it. Last year consumers globally spent around \$60 billion on hardware and services for the smart home, a fraction of the total outlay on domestic gadgets.

There are several reasons for muted enthusiasm. Businesses have an incentive to embrace the internet of things: there are cost savings to be had from embedding sensors in equipment and factories, analysing the data thus produced and improving efficiency. A lot of smart devices for the home, in contrast, remain “fun but not essential”, says Adam Segar of Canary, a startup that makes cameras that lets people monitor what is happening in their house.

Many smart gadgets are still too expensive. One of Samsung’s smart fridges, with cameras within that check for rotting food and enable consumers to see what they are short of while shopping (through an app on their phone), sells for a cool \$5,000. People who can afford that probably don’t do their own shopping. Appliances such as fridges are also ones that households replace infrequently: that slows the take-up of new devices.

The technology is not perfect yet, either. The smartphone, the link between the customer and smart-home device, has raised consumers’ expectations, explains Jamie Siminoff, the boss of Ring, a startup that makes a doorbell that can be answered remotely. Smartphones have trained users to expect a level of quality and seamless ease of use that smart-home devices struggle to replicate. And a lack of standardisation means that gadgets from

different firms cannot communicate with each other.

There are exceptions. Devices that are easy to install and offer obvious benefits are gaining in popularity, such as motion sensors that send alerts when windows and doors are opened and cameras to monitor activity. Some devices, such as smart smoke detectors, are in homes because insurance companies offer financial incentives for using them. The smart-home sector is vibrant with startups and big firms betting that the hesitancy is temporary. But consumer apathy has forced firms to rethink how they might woo customers.

Perhaps the biggest surprise is that Amazon, which failed miserably in its ambition to develop a smartphone, is showing the way. Amazon Echo is a smart speaker that can recognise and respond to voice commands. It shares information about the weather and sports scores, plays music and turns lights on and off. The device, which costs around \$180, is not yet a big seller. Amazon does not release sales figures, but Strategy Analytics estimates that fewer than 1m Echos have been sold since it was released in November 2014. Yet the Echo is the talk of Silicon Valley.

| *Talk to your appliance*

An interface that relies on voice commands could overcome one of the drawbacks of the piecemeal approach to the smart home, by becoming the standard integrator of all the other bits of smart kit. Echo is open to outside developers, who can come up with all manner of devices and services that hook up with it. Echo's success may have come as a surprise, but competitors have cottoned on that it may be a crucial piece of equipment. Google has announced plans to build a stand-alone hub like Echo, called Google Home, which will also rely on voice commands.

Apple is also expected to announce new smart-home capabilities: there are rumours it could launch a stand-alone hub in the Echo vein at its annual

developers' conference on June 13th. Its smart-home platform, called HomeKit, has been a failure so far. That Apple, despite its large base of affluent acolytes, has not yet cracked the smart home is a sign of its difficulty, points out Geoff Blaber at CCS Insight, which tracks mobile-industry trends.

Each tech giant has a different reason for trying to overcome the indifference of consumers, and to embed itself more deeply in the home. The Echo can help Amazon learn how people spend their time, and make it easier for them to spend money too by suggesting things they might buy. Google, whose main business is advertising, also wants to draw from a fresh well of data; by learning as much about users as possible, it can target them with appropriate ads. Apple, with a track record of simplifying and creating ecosystems where others before it could not, wants its devices to be the gateway through which people go to organise their lives.

If the tech giants retain their ambition to sit at the centre of the smart home, uncertainty prevails over where the profits lie. "It remains unclear what the economic model for the smart home will be," says Andy Hobsbawm of Evrythng, an internet-of-things platform. Some firms will try to make enough profit just from hardware. Others will try to sell services, such as archiving security videos, as well as devices, and charge a fee. The products that fill houses are diverse, personal and durable. That should give plenty of companies a shot at lodging themselves in the home—but only when consumers decide to put out the welcome mat. ■



物联网

智能所在

实现互联家居所需时间将比预期要长

这场喧嚣已经持续了多年。分析师曾多次预测，给日常物品加上传感器和互联网功能的“物联网”将像手机上网的普及一样彻底改变人们的生活。供应商们把目光投向顾客家中，兜售的产品包括闹钟响起时自动开启的咖啡壶，按照一天中的时间自动调节的灯光和百叶窗，还有牛奶喝完时发送提醒的冰箱。不过到目前为止，消费者对于把自己的家变得“智能”大体上表现得很抗拒。

这并非由于高科技公司没有努力。它们倾注了大量的现金，努力把日常物品连接到互联网。2014年，谷歌给出了迄今最大金额的意向声明，出价32亿美元收购智能温控器厂商Nest，同时出价5.5亿美元收购家庭安保摄像头厂商Dropcam。Nest吸收了Dropcam，如今已成为最知名的智能家居品牌之一。然而，这也警示我们，这种小电器要进入主流需要花多长的时间。

Nest无疑让谷歌失望了。根据研究公司Strategy Analytics的报告，Nest在2015年仅售出130万个智能温控器，在过去几年中的累计销售量也只有250万个。几年来，公司主要在对现有产品做调整，而没有推出新产品。这也许可以解释为什么Nest的创始人和老板托尼·法戴（Tony Fadell）在6月3日下台，改在谷歌的母公司Alphabet担任顾问。法戴尔曾在苹果公司任职并设计了iPod，但却没能把他的魔力带给智能家居。

Nest的问题只是表象。研究公司Forrester的弗兰克·吉列特（Frank Gillett）称，仅有6%的美国家庭拥有智能家居设备，包括连接互联网的电器、家庭监控系统、扬声器或照明设备。这一比例的增长预计不会太快，到2021年也就将刚刚超过15%（见图表）。相信互联网应该在生活中无处不在的消费者太少了。普华永道咨询公司在英国进行的一项调查发现，72%的人并没有在未来两到五年内采用智能家居技术的打算，而且他们不愿意为之付钱。去年，全球消费者在智能家居的硬件和服务上总共花费了

600亿美元，只占到家居用品总开支的一小部分。

消费者热情不高有几个原因。企业有动力去拥抱物联网——通过在设备和工厂嵌入传感器，分析由此产生的数据并提高效率可以节约开支。相比之下，很多家用智能设备仍然只是“好玩但并非必需”，Canary公司的亚当·塞加（Adam Segar）说道。Canary是一家创业公司，生产能让人们监视家里发生了什么摄像机。

许多智能工具仍然过于昂贵。三星有一款智能冰箱内置了摄像头，可以检查腐烂的食品，并让消费者在购物时看到自己缺了什么（通过手机上的应用）。这款冰箱售价高达5,000美元，能买得起的人大概也用不着自己去购物了。而且冰箱这种家用电器也不是大家会经常更换的，这延缓了新产品被接受的步伐。

而且技术尚不完善。智能手机——消费者与智能家居设备之间的桥梁提高了消费者的期望，生产远程应答门铃的创业公司Ring的老板杰米·斯密诺夫（Jamie Siminoff）说道。智能手机已经让用户习惯于期待较好的质量且使用顺畅便捷，而智能家居设备很难达到这种水平。缺乏标准化意味着来自不同公司设备之间无法互相通信。

然而也有例外。易于安装且能带来明显好处的设备越来越受欢迎，比如在门窗被打开时发送警报的运动传感器和监控活动的摄像头。智能烟雾探测器等设备之所以能够走入家庭，是因为保险公司用金钱鼓励大家使用它们。智能家居行业充满活力，创业公司和大公司都押注消费者的犹豫是暂时的。但是，消费者的冷淡已经迫使企业重新思考该如何吸引客户。

或许最令人惊讶的是，在开发智能手机方面雄心勃勃却一败涂地的亚马逊给大家指出了一条路。亚马逊Echo是一台能够识别和响应语音命令的智能扬声器。它可以分享天气和赛事比分信息，播放音乐并控制照明开关。这个装置售价约180美元，目前卖得还不算太好。亚马逊没有公布销售数字，但Strategy Analytics估计，自2014年11月发布以来，Echo的销售量不到100万台。然而，Echo已经是硅谷的谈资了。

依靠语音命令的人机界面也许可以成为所有智能套件的标准整合器，由此克服智能家居设备各自为政的弊端。Echo对外部开发者开放，他们可以拿出各种与之连接的设备和服务。Echo的成功也许是个惊喜，但竞争对手已经意识到这可能是一个关键的设备。谷歌已经宣布计划设计一个类似于Echo的独立枢纽，称为Google Home，而它也将依赖于语音命令。

此外，苹果还有望宣布新的智能家居功能——有传闻它会在6月13日的年度开发者会议上发布一个与Echo相仿的独立枢纽。苹果智能家居平台叫作HomeKit，迄今为止一直很惨淡。跟踪移动行业趋势的CCS Insight公司的Geoff Blaber指出，苹果虽有大批富裕的追随者却仍未能搞定智能家居，这本身就说明了此事有多么困难。

每一个试图打破消费者的冷淡，并让自身更深入家居每个角落的科技巨头都有各自不同的原因。Echo可以帮助亚马逊了解人们如何支配自己的时间，从而推荐一些他们可能会买的东西，让其更容易花钱。谷歌的主要业务是广告，它也想获得最新鲜的数据——通过尽可能地了解用户，即可为其投放更有针对性的广告。对于历来善于简化，并创造前人所无法创造的生态系统的苹果而言，则希望其产品能够成为人们安排自身生活的途径。

如果科技巨头们依然有占据智能家居核心地位的雄心，利润从哪里来就会是一个问题。“智能家居的经济模式现在还不清楚，”物联网平台Evrythng的安迪·霍布斯鲍姆（Andy Hobsbawm）说道。一些公司将努力单从硬件上获取足够的利润，其他公司则会尝试出售服务（如归档监控视频）以及设备并收取一定的费用。多元化、有个性且经久耐用的设备能够走入家庭。这应该能让很多公司都有机会把自己的产品摆到人们的家里——但必须要赢得消费者的欢迎才行。■



Buttonwood

Vanishing workers

Can the debt-fuelled model of growth cope with ageing populations?

THE world is about to experience something not seen since the Black Death in the 14th century—lots of countries with shrinking populations. Already, there are around 25 countries with falling headcounts; by the last quarter of this century, projections by the United Nations suggests there may be more than 100.

Such a shift seems certain to have a big economic impact, but there is plenty of debate about what that impact might be. After the Black Death a shortage of labour eventually led to a sustained rise in real wages. If that trend were repeated, it would come as a big shift after a prolonged period of sluggish wage growth, something that has fuelled political discontent across the rich world.

A new report on the demographic outlook by Berenberg, a German bank, focuses on one important measure: the dependency ratio. This compares the number of children and the elderly with people of working age (those aged 15-64). The higher the dependency ratio, the greater the burden on the workforce. In the world's biggest economies, America apart, the workforce is set to shrink significantly (see chart).

In many developed countries, the dependency ratio rose after the second world war (thanks to the baby boom), fell in the late 1960s and 1970s as the boomers entered the workforce, and has recently started rising again. That history makes it possible to analyse how economies performed during periods of both falling and rising ratios. Berenberg based its analysis on ten rich countries: America, Australia, Britain, France, Germany, Italy, Japan, Spain, Sweden and Switzerland.

The housing market seems an obvious place to start. You would expect a growing workforce to push house prices higher, as wage-earners seek more space for their families. Sure enough, the authors find that, since 1960, the median increase in real house prices when the dependency ratio was decreasing (ie, when there were relatively more workers) was 2.7% a year. However, when the dependency ratio was increasing (ie, relatively fewer workers), real house prices fell by 0.2% a year.

Similarly, as you might expect, real GDP per person tends to grow faster (2.6%) in years when the dependency ratio is falling than in years when it is rising (1.9%). Having more workers makes it easier for the economy to grow. Inflation also tends to be higher (4.1%) in years when the dependency ratio is falling and lower (2.7%) when the ratio is increasing.

That points to a problem. In recent decades, the developed world has seen a big surge in total debt-to-GDP ratios in both the private and public sectors. People tend to take on debt for two reasons: to maintain their consumption or to buy an asset (for individuals, often a home). This requires a belief on the part of the debtor (and the lender) that, at a minimum, their future incomes and asset prices will not both fall by a lot, so the money can be paid back.

In a world of sluggish growth, low inflation and stagnant house prices, debts become much harder to pay off. Indeed, that has pretty much been the picture since the financial crisis in 2008: debt has been shuffled around a bit (from the private sector to the government) but total debt-to-GDP ratios have not fallen.

The show has been kept on the road by big reductions in interest rates, which have enabled most borrowers to keep servicing their debts. And demography suggests that the era of low interest rates is set to continue. Berenberg finds that, since 1960, real interest rates have tended to rise

when the dependency ratio is decreasing and fall when the ratio is rising (as it is now forecast to do).

Low rates are in part a deliberate policy by central banks to stimulate the economy by encouraging people and companies to borrow. But as workers age, they are less likely to want to take on debt. And if an ageing workforce means slower growth, companies won't want to borrow to invest. So the policy may not work. Indeed, the Berenberg study found that since 1960, private-sector debt rose almost three times as fast, relative to GDP, in years when the dependency ratio was decreasing than when it was increasing.

The big question is whether economic growth and rising debt levels go hand-in-hand, or whether the former can continue without the latter. If it can't, the future could be very challenging indeed. To generate growth in our ageing world may require a big improvement in productivity, or a sharp jump in labour-force participation among older workers. To date, the signs on productivity are not encouraging and elderly employment ratios have a lot further to go. ■



梧桐

消失的工人

以债务推动的增长模式能否应对人口老龄化？

这个世界即将要经历自14世纪黑死病以来未曾一见的境况：很多国家的人口都在萎缩。已有约25个国家的人口总数正在减少，据联合国预测，到本世纪最后25年，这类国家也许将超过一百个。

如此转变看来必然会对经济产生巨大影响，但至于究竟会是何种影响，争议颇多。黑死病之后的劳动力短缺最终促使实际工资持续增长。如果这一趋势得以重复，那么将是对很长一段时间薪资增长迟滞的一次巨大转变，这种停滞已在富裕世界引发了人们对政治的不满情绪。

德国贝伦贝格银行（Berenberg）就人口展望发布的新报告着重关注了一个重要的指标：抚养比，即儿童和老人的人数与劳动年龄人口（15岁至64岁）数量之比。抚养比越高，劳动力的负担就越重。全球最大的经济体中，除了美国，其他国家的劳动力都将明显减少（见图表）。

在很多发达国家，抚养比在二战后上升（由于婴儿潮的缘故）。随着婴儿潮一代开始就业，这一比率在20世纪60年代末及70年代下降，近来又开始上升。这段历史让我们得以分析抚养比下降和上升时期各个经济体的表现。贝伦贝格银行的分析基于十个富裕国家：美国、澳大利亚、英国、法国、德国、意大利、日本、西班牙、瑞典和瑞士。

房地产市场似乎是个明显的切入点。工薪族会寻求更大的空间供家人居住，因此你可能会以为劳动力增长会推高房价。报告的作者们确实发现自1960年起，抚养比下降时（即相对来说工作人口更多时）实际房价每年增长的中位数为2.7%。而抚养比上升时（即相对来说工作人口更少时），实际房价每年下跌了0.2%。

同样，如你所料，在抚养比下降的年份，人均实际GDP往往会增长得更快

（2.6%），而抚养比上升时，人均实际GDP增长较慢（1.9%）。工作人口越多，经济就越容易增长。当抚养比下降时通胀往往也较高（4.1%），而抚养比上升时通胀则较低（2.7%）。

这凸显了一个问题。近几十年来在发达国家，无论是私营部门还是公共部门，总体债务占GDP的比重都大幅攀升。人们倾向于借债，原因有二：维持消费或购买资产（对个人来说，通常是房子）。这要求借方（和贷方）相信，至少，他们未来的收入和资产价格不会都下降很多，这样才能够偿还贷款。

在增长疲软、通胀偏低、房价停滞的世界，债务会变得更难偿还。事实上，自2008年金融危机以来，实际情况差不多一直就是这样：债务只稍微挪了下地方（从私营部门到政府），但总体债务占GDP的比重从未下降。

这一趋势因利率大幅削减得以始终保持，低利率让大部分借款人能支付利息。而人口结构显示低利率时代必将继续。贝伦贝格银行发现自1960年起，当抚养比下降时实际利率往往会增长，抚养比上升时实际利率则通常将下跌（正如目前所预测的那样）。

在某种程度上，低利率是中央银行深思熟虑之举，鼓励个人和公司借款，从而刺激经济增长。但是随着工薪阶层年龄渐长，他们愿意背负贷款的可能性也降低了。如果劳动力老龄化意味着增长趋缓，那么公司也将不愿贷款进行投资。这样一来这项政策或许就不会再起作用。的确，贝伦贝格银行的研究发现自1960年起，当抚养比下降时，私营部门的债务占GDP比重的增长速度比抚养比上升时快了近三倍。

一个重大的问题是经济增长和债务水平上涨是否会同时发生，亦或经济能否在债务不增长的情况下保持增长。如果经济无法在债务不增长的情况下保持增长，那么未来将颇具挑战。在我们这个逐渐老龄化的世界，要实现经济增长需要生产率的巨大进步，或者老龄工人劳动力参与度的大幅提升。直至目前，生产率改进的迹象并不令人欢欣鼓舞，而老龄人口就业率若要增长，还有很长的路要走。■



Shareholder value

Analyse this

The enduring power of the biggest idea in business

WHAT is the most influential contemporary book about the world economy? An obvious choice is “Capital in the Twenty-First Century”, a 696-page analysis of inequality by Thomas Piketty, a French economist. There is another candidate: “Valuation”, a 825-page manual on corporate finance and shareholder value. Some 700,000 copies of it encumber the bookshelves of MBA students, investors and chief executives around the globe.

Inequality and shareholder value are linked in the minds of many folk, who blame investors and managers for stagnant wages and financial crises. Ruthless corporations are a big theme in America’s election campaign. The near-collapse of Valeant, a drugs firm, seems to illustrate a toxic business culture. Its shares have fallen by 73% this year. It is restating its accounts and is in negotiations with its lenders and under investigation by regulators. Valeant describes itself as “bringing value to our shareholders”. While there is no indication of fraudulent or illegal practice, the company could end up joining a pantheon of corporate fiascos that includes Enron (which pledged to “create significant value for our shareholders”), Lehman Brothers, (“maximising shareholder value”) and MCI WorldCom (“a proven record of shareholder value creation”).

Yet the sixth edition of “Valuation”*, published last year, a quarter of a century after the first, is a reminder of why shareholder value is still the most powerful idea in business and why many criticisms thrown at it are unfair. The origins of the doctrine lie in the 1950s and 1960s, when Franco Modigliani and Merton Miller, two scholars, showed that a firm’s value is independent of its capital structure and dividend policy. That inspired a

new framework for analysis, popularised in the 1980s by Joel Stern, a consultant, Alfred Rappaport, another scholar, and McKinsey & Co, a consultancy, among others.

Company analysis was antediluvian until then. Models were scribbled on paper covered in correction fluid. Profits were cheered, without much regard to the book-cooking done, risks taken and capital used to achieve them. The worth of a firm was estimated by placing its profits or book value on a multiple, whose value was best decided after a three-Martini lunch.

“Valuation” and a few books like it, offered new tools. Cashflow, not easy-to-manipulate accounting profit, mattered. An activity only made sense if capital employed by it made a decent return, judged by its cashflow relative to a hurdle rate (the risk-adjusted return its providers of capital expected). Two newish spreadsheet programs, Lotus 123 and Microsoft Excel, let analysts forecast firms’ long-term cashflows and gauge their present value today.

This breathed fresh life into an old idea—that shareholders had the whip hand. Technically, shareholders do not own a company: the firm is a legal person and a share represents a bundle of entitlements to dividends and voting powers. But a doctrine of “shareholder primacy” had been outlined in 1919, when a Michigan court observed that “a business corporation is organised and carried on primarily for the profit of stockholders”. The new science of corporate finance revolutionised the pursuit of that goal. Managers realised that by working out where firms employed capital and using it more efficiently they could increase their value. Outsiders had a methodology with which to second-guess incompetent managers.

These ideas lit up corporate America first. In the late 1980s and 1990s, profits relative to GDP were at historic lows and global competition intensified. Managers used the methodology of shareholder value to break

up conglomerates and ditch weak business lines. The financial industry was deregulated, creating an army of number-crunchers to scrutinise firms.

By the turn of the century, big European firms were on board. Germany's system of cross-shareholdings between financial and industrial firms was unwound: investors could buy the same exposure and did not need companies tying up capital. The jewels of French industry were privatised and their bosses obliged to think of profitability as well as impressing politicians.

Today shareholder value rules business. Abenomics, the plan to revive Japan's economy, involves prodding firms to use capital better. Fosun, a private Chinese firm, devotes a page of its annual report to calculating the value it claims to have created. The only boardrooms that shareholder value has not reached are those of China's state-run firms, whose party-appointed bosses look baffled if asked about return on capital and buzz for more tea.

| *Value cremation*

Yet at this moment of ascendancy in the business world, shareholder value is under fierce attack beyond it, fuelled by a sense that Western economies are not delivering rising prosperity to most people. The criticism falls into two categories. The first is that shareholder value is a licence for bad conduct, including skimping on investment, exorbitant pay, high leverage, silly takeovers, accounting shenanigans and a craze for share buy-backs, which are running at \$600 billion a year in America.

These things happen, but none has much to do with shareholder value. A premise of "Valuation" is that there is no free lunch. A firm's worth is based on its long-term operating performance, not financial engineering. It cannot boost its value much by manipulating its capital structure. Optical changes to accounting profits don't matter; cashflow does (a lesson

WorldCom and Enron ignored). Leverage boosts headline rates of return but, reciprocally, raises risks (as Lehman found). Buy-backs do not create value, just transfer it between shareholders. Takeovers make sense only if the value of synergies exceeds the premium paid (as Valeant discovered). Pay packages that reward boosts to earnings-per-share and short-term share-price pops are silly.

Outbreaks of madness in markets tend to happen because people are breaking the rules of shareholder value, not enacting them. This is true of the internet bubble of 1999-2000, the leveraged buy-out boom of 2004-08 and the banking crash. That such fiascos occur is a failure of governance and human nature, not of an idea.

The second criticism is weightier: that firms should be run for all stakeholders, not just shareholders. In a trite sense the goals of equity-holders and others are aligned. A firm that sufficiently annoys customers, counterparties and staff cannot stay in business. Some bosses, such as Paul Polman of Unilever, and Joe Kaeser at Siemens, say that pursuing social and financial objectives is consistent. But it is disingenuous to pretend conflicts do not arise. A firm with a loss-making factory cannot shut it without destroying jobs.

The trouble is identifying a goal that could replace the pursuit of shareholder value. If firms had to promote employment they would be less productive and riskier borrowers, as China is discovering. The objective of maximising wealth is deeply embedded in the global savings system, with asset managers obliged to protect clients' money. Asking firms to adopt objectives to solve inequality loads a giant problem on their shoulders.

For these reasons shareholder value—properly defined—will remain the governing principle of firms. It is still drawing recruits. In August Larry Page, the co-founder and boss of Alphabet (Google's parent), reorganised

the firm, partly to “rigorously handle capital allocation” and make a “return above the benchmark”. But shareholder value is not the governing principle of societies. Firms operate within rules set by others. Consequences of stagnation could include higher taxes, tougher antitrust policing, more regulation and more rules to protect jobs. How firms respond is an issue for the next bestseller to tackle.

* “Valuation: Measuring and Managing the Value of Companies”, by McKinsey & Company, Tim Koller, Marc Goedhart, David Wessels ■



股东价值

分析一下

商业中最重要理念的永恒力量

当代有关世界经济的书，最有影响力的是哪一本呢？法国经济学家托马斯·皮凯蒂（Thomas Piketty）以696页的篇幅分析不平等的《21世纪资本论》（“Capital in the Twenty-First Century”）无疑是一个选择。另一部候选作品是《价值评估》（“Valuation”）。这是一本825页的公司金融和股东价值手册，差不多有70万册充塞了世界各地的MBA学生、投资者和首席高管的书架。

在很多人看来，不平等和股东价值是联系在一起的。他们把停滞不前的工资和金融危机归咎于投资者和经理人。无情的公司是美国竞选中的一大主题。瓦伦特（Valeant）医药公司的几近崩溃似乎体现了有毒的公司文化，其股价今年跌去了73%。公司正在重整账目，与贷款方谈判并接受监管机构调查。瓦伦特公司称自己是“为股东带来价值”。虽然尚未有欺诈或非法行为的征象，公司可能最终会和安然公司（发誓“为股东创造显著价值”）、雷曼兄弟（“最大化股东价值”）、MCI世通公司（“创造股东价值的光辉履历”）等一起，坠入崩塌企业的万人坑。

然而，在一刷25年后，《价值评估》第六版于去年面世。它提醒我们为什么股东价值仍然是商业中最强有力的概念，以及为什么对它的很多批评并不公正。这一学说起源于20世纪50年代和60年代间，两位学者——弗朗科·莫迪利亚尼（Franco Modigliani）和默顿·米勒（Merton Miller）证明了企业的价值与其资本结构和分红政策无关。这启发了一个新的分析框架，顾问乔尔·斯特恩（Joel Stern）、学者阿尔弗雷德·拉帕波特（Alfred Rappaport）和麦肯锡咨询公司等在20世纪80年代把它发扬光大。

在那之前，公司分析都处于史前时代。模型写在涂满修正液的纸上。众星捧月的是利润，却没有怎么考虑账目上做了多少文章，承担了多少风险以

及它是用什么资本来实现的。企业的价值就是把利润或账面价值乘上一个倍数，而这个倍数最好是在喝了三杯马提尼的午餐之后确定的。

《价值评估》以及类似的几本书提供了新的工具。现金流才是重要的，而不是容易操纵的会计利润。一项投资要有意义，其使用的资本就必须获得可观的回报，判定标准就是在最低预期回报率（经风险调整后资本提供方的预期回报率）下的现金流。Lotus 123和Microsoft Excel这两个当时比较新电子表格程序让分析员可以预测公司的长期现金流并评估它们的现值。

这为“股东大权在握”的旧观念带来了新生。理论上来说，股东并不拥有公司：公司是一个法人，一股就代表了一份股息和投票权。但是，“股东本位”的原则在1919年密歇根州法院认定“商业企业的组织和运营主要是为了创造股东利润”时就定下来了。企业财务的新科学颠覆了追求这一目标的方式。管理者意识到，通过找出公司资本用在了哪里并更有效地利用它，就可以提升公司价值。外界也有了一套方法可以质疑庸碌无能的管理者。

这些想法首先启发了美国企业。20世纪80年代末和90年代，利润相对于GDP的比例处于历史低位，全球竞争愈发激烈。管理者利用股东价值方法来分拆企业集团并剥离孱弱的业务。金融业放松了管制，创造出一大批鼓捣数字的分析师，对各家公司审查抽丝剥茧。

到了世纪之交，欧洲的大公司也开始实践这一理念。德国式金融和工业企业交叉持股的体系被解构：投资者仍然可以按同样的风险偏好购买资产，而无需让无关的公司占用资本。法国工业的明珠被私有化了，它们的老板不得不同时考虑如何盈利和以及如何取悦政客。

如今，股东价值主宰着商业。计划重振日本经济的安倍经济学，就包含要刺激企业更好地利用资本的内容。中国私营企业复星公司，在年报中用了一页纸的篇幅来计算自己声称创造的价值。只有在中国的国营企业，股东价值才没能影响董事会。要是被问起资本回报是多少，那些由党指派的领导会满脸疑惑地再要上一杯茶。

| 价值灰飞烟灭

然而，虽然如今在商业世界占有统治地位，股东价值却遭受了猛烈的攻击，其源头在于西方经济似乎没有给大多数人带来日益繁荣的生活。这些批评可分为两类。一类是说股东价值为不好的行为大开绿灯，包括克扣投资、过高的薪酬、高杠杆、愚蠢的收购、会计欺诈以及股票回购的热潮——每年在美国达6000亿美元。

这些事情确有发生，但没有哪个和股东价值有多少关系。“价值评估”的前提是天下没有免费的午餐。企业的价值在于其长期的经营业绩而不是金融工程。价值并不能通过操控资本结构来提升多少。会计利润的表观变化无关紧要，而现金流则不然（这是世通和安然无视的一个教训）。杠杆可以提高整体收益率，反过来也提高了风险（就像雷曼兄弟发现的那样）。回购并不创造价值，只是把价值在股东之间转移而已。并购只有在协同效应的价值超过支付溢价时才有意义（如瓦伦特公司发现的）。鼓励提高每股盈利和短期股价上扬的薪酬组合是愚蠢的。

市场疯狂的爆发往往是由于人们打破了股东价值的规则，而非制定了它。1999-2000年的互联网泡沫、2004-2008的杠杆收购热潮和银行危机都是如此。这样的毁灭是治理和人性的失败，而与这一理念无关。

第二个批评更有分量一些：公司应当考虑所有的利益相关方，而不是仅仅为股东而运营。照老一套的说法，股权持有人和其他人的目标是一致的。把客户、交易对手和工作人员都惹毛的公司是活不下去的。一些老板，比如联合利华的保罗·波尔曼（Paul Polman）和西门子的乔·凯撒（Joe Kaeser）说，追求社会目标和财务目标是一致的。但要是说这两者从来不会冲突，那就太虚伪了。如果一个工厂亏损，公司没办法做到把它关了还不会让人失业。

麻烦在于，如何确定一个可以代替股东价值的目标。如果企业必须促进就业，那它的生产力就偏低，作为借款人的风险也会较高，就像中国现在看到的那样。财富最大化的目标深深植根于全球储蓄体系，资产管理公司有义务保护客户的资金。要求企业把解决不平等问题作为目标，那是把一个

巨大的问题压在了它们肩上。

由于这些原因，股东价值——如果正确定义的话——仍将是公司的主导原则，还有人不断地在加入它。八月份，Alphabet公司（谷歌的母公司）的共同创始人拉里·佩奇（Larry Page）对公司进行了重组，部分原因是为了“严格分配资本”，并获得“高于基准的回报”。但股东价值并不是社会的主导原则。公司要按照别人设置的规则运行。发展停滞的后果可能包括更高的税收、更严厉的反垄断政策、更多监管和更多保护就业的规则。至于企业要如何应对，就留给下一本畅销书来解决吧。

* 《价值评估：公司价值的衡量与管理》，麦肯锡公司，蒂姆·科勒等著（“Valuation: Measuring and Managing the Value of Companies”, by McKinsey & Company, Tim Koller, Marc Goedhart, David Wessels） ■



Etsy's growing pains

Knitty gritty

A do-good company tests investors' need for speed

ETSY, an online marketplace for all things artisan, from dog soap to Bernie Sanders dolls, seems to be on a roll. In February the firm was recertified as a “B Corporation”, which meets certain social and environmental standards, and reported good results, with sales last year reaching \$2.4 billion, up by 24%. On April 5th the firm’s executives, flanked by succulents and a yarn bouquet at their headquarters in Brooklyn, announced a new service to help sellers build their own websites. On April 16th Etsy celebrates the one-year anniversary of its initial public offering.

All this appears to add up to what Etsy aims for: “sustainable growth”. The company wants to make everybody involved richer: not just shareholders, but buyers, sellers and manufacturers. It does not give quarterly guidance. It works for the long term. “We are really focused on building a business that can grow consistently year after year,” says Chad Dickerson, Etsy’s chief executive.

Yet this sunny vision confronts a glum fact. In its year as a listed company, Etsy’s share price has plunged by nearly three-quarters. Investors are happy for the firm’s goods to be produced slowly. Sales are another matter.

The firm has a big market to tap. Americans spend about \$35 billion each year on handmade and vintage jewellery and other crafts, reckons Rohit Kulkarni of RBC Capital Markets, a bank. Globally, that figure rises to \$70 billion. Etsy fits consumer trends like a crocheted glove. Shoppers trust about one-fifth of brands in North America and one-third in Europe, according to Havas, a marketing agency. They crave “authenticity”—none more so than Brooklyn’s prairie-booted yuppies.

Etsy offers authenticity by the gigabyte. Consumers can buy all sorts of unusual products, whether handmade or vintage. For sellers, Etsy is an alternative to craft fairs and trunk shows. The firm owns no inventory. It charges 20 cents to list a product and a 3.5% commission for each sale, as well as optional services such as shipping labels. By the end of last year Etsy had 24m buyers and 1.6m sellers on its site.

Etsy's share price has plummeted mainly because the firm is not growing quickly enough to satisfy investors. Sales may have climbed by 24% last year, but this is down from expansion of 43% in 2014. Growth of revenue, active buyers and sellers slowed last year, too. For a regular e-commerce site Etsy's numbers may still be good, but for an online marketplace they suggest a slowing of the virtuous cycle by which more sellers attract more buyers, which brings higher sales, which in turn lures more sellers.

When this flywheel is losing speed, "it limits the company's ability to reinvest," says Brian Nowak of Morgan Stanley, another bank. He expects Etsy's revenues—from commissions and fees—to grow at about the same pace as Amazon's this year, but expects sales on the online giant's website to rise twice as fast. As Etsy's share price has sunk, Amazon's has jumped by more than 50%.

Being a "B corporation", which does not bind Etsy legally, distinguishes the firm from rivals. But Etsy's do-good culture is not what is holding it back. It is facing more fundamental problems, says Mr Kulkarni of RBC: people will spend only so much on artisan goods, so it may be hard to coax more sales from existing buyers; and Etsy's sellers, most of whom work from home, may have trouble making more products.

Etsy is not sticking to its knitting to boost sales. It is spending more on marketing to lure new buyers, though this has widened losses. It is helping sellers to grow. Its new website service lets them reach more buyers. And a

programme launched last year connects sellers with vetted manufacturers. But the competition is not sitting still either: Amazon has introduced its own crafts site, called “Handmade”. Etsy’s second year as a listed company could be even more tricky than its first. ■



Etsy成长之痛

小织情结

有社会责任感的公司考验投资者对速度的需求

ETSY是一个销售手工艺品的网络平台，所售商品从狗狗香皂到伯尼·桑德斯（Bernie Sanders）人偶一应俱全，看起来人气爆棚。今年二月公司因达到一定的社会及环境要求而再次通过认证成为“B公司”（译注：B Corporation，由第三方非营利机构B Lab基于其社会和环境标准进行的认证），而且业绩优异，去年销售额高达24亿美元，上升24%。4月5日在布鲁克林的总部，身边摆放着多肉植物和手工编织花束的Etsy高管们宣布将提供一项新服务，帮助卖家打造自己的网站。4月16日Etsy迎来了公司上市一周年庆典。

所有这一切似乎都契合Etsy“可持续增长”的目标。公司想让所有参与者都更加富有：不仅仅是股东，还有买家、卖家和制造商。它不会给予季度指引，而是着眼长远。“我们是真正在专心打造一个可以年复一年持续成长的企业。”Etsy的首席执行官查德·狄克森（Chad Dickerson）说。

然而阳光的愿景却面临着阴郁的现实。公司上市第一年股价大跌近四分之三。投资者对公司产品慢工出细活没有意见，但销售额就是另外一回事了。

公司面对的市场潜力巨大。投行RBC资本市场（RBC Capital Markets）的罗希特·库尔卡尼（Rohit Kulkarni）估计，美国人每年在手工和古董珠宝及其他手工艺品上的花费约为350亿美元。全球，这一市场高达700亿美元。Etsy的业务正好契合这一消费趋势，如同一只大小合适的针织手套戴在手上一样。营销公司Havas的数据显示，消费者对五分之一的北美品牌和三分之一的欧洲品牌有信赖感。他们渴望“本真”——这与布鲁克林穿着草原靴的雅皮士们不谋而合。

Etsy通过网络带来了这种本真。消费者们在此可以买到各种各样与众不同

的产品，无论是手工制品还是古董宝贝。对卖家而言，Etsy是手工艺品展销会和衣箱秀之外的一片新天地。公司本身没有库存，平台上展示一件产品收费20美分，对每笔销售和可选收费项目（如运输标签）抽取3.5%的佣金。去年底，Etsy平台已经汇聚了2400万买家和160万卖家。

Etsy股价大跌的主要原因是公司增长速度不够快，未能满足投资者。去年销售额可能增长了24%，但较之2014年43%的升幅有所下降。营业额和活跃买卖家数增速去年也都有所下滑。较之一般的电商网站，Etsy的数据还算不错，但对于一个线上市场来说，这些数字显示出良性循环发展的放缓，即更多的卖家可以吸引更多的买家，随即带来更多的销售额，转而再吸引更多的卖家。

当公司的增速放缓，“便限制了公司再投资的能力。”另一家投行摩根士丹利的布莱恩·诺瓦克（Brian Nowak）说，他预计今年Etsy来自佣金和手续费的营业额增幅与亚马逊的增速相近，但亚马逊的销售额增速却有望是这一收入增速的两倍。Etsy股价缩水了，而亚马逊的股价却大涨超过50%。

“B公司”的认证虽对Etsy并无法律约束力，却让其与竞争对手区别开来。但RBC的库尔卡尼认为，拖Etsy后腿的并不是其社会责任感文化，而是它所面临的更为根本的问题：人们愿意花在手工艺品上的钱就那么多，所以要吸引现有的买家买更多的东西恐怕不易；而卖家们大多数在家工作，要提高产量可能也难。

Etsy提升销售额靠的不是固守本业，而是靠增加营销投入来吸引新买家，尽管这扩大了亏损。Etsy也在帮助卖家成长。新的网站服务可以让卖家接触到更多的买家。去年启动的一个项目可以为卖家与经过审查的制造商牵线。但竞争对手也没闲着：亚马逊已经引入了自己的手工艺品网站，名字就叫“手工制造”（Handmade）。Etsy上市的第二年可能会比第一年更加难过。■



The Big Mac index

Patty-purchasing parity

The size of the world economy—measured in burgers

IN THE mall below a McDonald's restaurant in Hong Kong, excitable children pose for photos next to a statue of the chain's clownish mascot, Ronald, who lounges on a bench, one yellow glove raised in welcome. He fronts a display of other promotional decor, including a soft drink the size of a man and a box of fries that looms even larger. A video chronicles the chain's 41 years in Hong Kong, which have been full of menu twists and tweaks: sausage McMuffins, shake-shake fries, chicken McNuggets, salads. At the restaurant upstairs, touchscreen menus now allow choosy customers to build their own burger, adding exotica like grilled champignon, herb aioli and sliced jalapeños or even (heresy!) subtracting the bun.

Innovation and differentiation—the creation of things new and singular—are a boon to economic progress and the bane of economic measurement. It would be much easier to compare economies across borders and time if goods remained much the same, wherever and whenever they were made. Fortunately, amid all the creativity and complexity, the Big Mac remains something of a constant. It varies rather little from country to country or year to year. Its consistency is part of its appeal to customers. It is also why it appeals to us—as a handy benchmark for judging the strength of currencies and even the size of economies.

To calculate our Big Mac index, we collect the price of the burger (with bun, of course) in 59 countries accounting for 94% of the planet's output. (In India, we substitute the Maharaja Mac, which is made with chicken rather than beef.) It turns out that some of these burgers are much cheaper than others in dollar terms. In America, a Big Mac costs \$5.04 on average. In

Hong Kong, by comparison, the same burger costs the equivalent of \$2.50 or so. There are many potential reasons why Hong Kong's Big Macs are cheaper than America's. But one is that Hong Kong's currency is undervalued.

The Big Mac index thus provides a simple gut-check for judging the competitiveness of currencies. It compares each country's exchange rate with a hypothetical alternative: the rate that would equalise the price of a Big Mac around the world. In Hong Kong, where the Big Mac costs 19.20 Hong Kong dollars, that hypothetical exchange rate would be 3.81 Hong Kong dollars to the greenback. The real, market exchange rate is much weaker: it takes 7.75 Hong Kong dollars to buy one of the American sort. According to the Big Mac index, then, the Hong Kong dollar is heavily undervalued—by more than half.

Hong Kong is not alone. Judging by the price of burgers, most currencies are undervalued against the dollar. The euro looks 17% too cheap. The yen is undervalued by about 30%. Big Macs also look strikingly cheap in many emerging economies, including South Africa (58%) and Malaysia (61%). In fact, only three currencies look overvalued by this measure: Sweden (overvalued by 4%), Norway (9%) and Switzerland (31%).

If most currencies are “too” cheap against the dollar, it follows that the dollar itself must be too expensive. The Big Mac index suggests it has climbed a whopping 56% above fair value on a trade-weighted basis. Does this mean we should expect a dollar crash? No. There are fundamental economic reasons why exchange rates tend to look cheap in developing countries—in particular, poor productivity in both tradable sectors (eg, manufacturing) and non-tradable ones (eg, services). As productivity in manufacturing improves in emerging markets, factory wages will rise, putting upward pressure on wages and prices elsewhere in the economy, even in fast-food chains. That will make their burgers dearer, narrowing the

gap with America.

In a more sophisticated version of the Big Mac index, we have taken these fundamentals into account. The adjusted index looks at whether a currency is cheap or expensive compared with what you would expect given the country's level of development. By this measure, the dollar is still overvalued, but by a much smaller margin: roughly 11% on a trade-weighted basis.

The Big Mac index also provides a fun gauge of the size of national economies, a matter of great debate and controversy. If a country spent its entire annual income on Big Macs, how many burgers could it buy? America's GDP is forecast to be over \$18.5 trillion this year, according to the IMF. That translates into almost 3.7 trillion burgers at a little over five bucks apiece. America thus accounts for a big share of the world total, which will amount to over 19.2 trillion in 2016, by our calculations, based on IMF forecasts (see chart).

Can any other economy rival the home of the hamburger? China's GDP will be a little over 73 trillion yuan this year, says the IMF, or less than \$11.4 trillion. But in China, a Big Mac costs only 18.6 yuan. So its GDP is equivalent to over 3.9 trillion burgers, over 5% more than the American total. Indeed, by this measure, China overtook America back in 2013. At market exchange rates, America's economy is still far bigger than China's. But at patty-purchasing parity, their positions have been flipped. ■



巨无霸指数

汉堡购买力平价

以汉堡衡量全球经济规模

在香港一家麦当劳餐厅楼下的商场里，兴奋的孩子们在小丑吉祥物麦当劳叔叔的塑像旁摆姿势拍照片。麦当劳叔叔悠闲地坐在长椅上，举着一只戴着黄色手套的手欢迎顾客。他身后还有其他促销装饰，包括真人大小的一杯软饮和一盒更为高大、气势逼人的薯条。显示屏上播放的视频记录了麦当劳在香港41年的发展历程，其间菜单经历了多次调整：猪肉满福堡、摇摇薯条、麦乐鸡、色拉。楼上的餐厅里，挑剔的顾客现在可以通过触屏菜单定制专属汉堡，他们可选择添加香煎蘑菇、浓郁蛋黄酱和墨西哥风味辣椒圈等新奇配料，甚至还可以（离经叛道啊！）不要面包。

以创新与差异化打造全新而独特的产品，对经济进步而言是福音，对经济计量来说却是麻烦。如果不管何时何地生产的商品都差不多，对不同地域不同时间的经济体进行比较便会容易得多。在无限创意和纷繁复杂之中，好在巨无霸仍算是一种常数，在不同国家不同年份变化不多。其一致性既是吸引顾客的原因之一，也是吸引我们的原因——它可以作为一个简便的基准，用于判断货币的竞争力，甚至是经济体的规模。

为了计算巨无霸指数，我们收集了59个国家的巨无霸价格（当然是有面包的那种），这些国家占据了全球产出的94%。（在印度，我们选的是以鸡肉替换牛肉的麦王公巨无霸。）结果发现以美元计算的话，这些巨无霸在有些国家的售价要便宜许多。在美国，巨无霸平均5.04美元一个。相比之下，同样的巨无霸在香港只相当于2.50美元左右。香港巨无霸比美国卖得便宜有很多潜在原因，但其中之一是港币估值过低。

这样巨无霸指数就提供了一个判断货币竞争力的简便方法。它用一个假设替代物比较每个国家的汇率：假定巨无霸在各国的售价相同。在香港，巨无霸售价19.20港币，美元兑换港币的假设汇率即为3.81。而实际的市场汇率要低得多：7.75港币才能兑换1美元。那么根据巨无霸指数来看，港币严

重估值过低——低了超过一半。

香港并非个例。就巨无霸的价格来看，大多数货币对美元都估值过低。欧元低了17%，日元低约30%。巨无霸在很多新兴经济体好像也便宜很多，包括南非（58%）和马来西亚（61%）。事实上，以这种计量方式计算，只有三种货币对美元估值偏高：瑞典（高出4%）、挪威（9%）和瑞士（31%）。

如果大部分货币对美元都估值“过”低，依此逻辑美元也必然估值过高。巨无霸指数显示美元在贸易加权基础上已大幅超过公允值的56%。这是否意味着我们应该会看到美元暴跌？并非如此。在发展中国家、尤其是在贸易领域（如制造业）和非贸易领域（如服务业）生产力都很低下的国家，货币汇率一般看起来较低是有根本原因的。随着新兴市场制造业生产率的提升，工厂工资水平会提高。这会对经济中其他领域中的工资和价格产生上行压力，甚至包括快餐连锁行业。这会使它们的汉堡提价，缩小与美国的差距。

在更为复杂化的巨无霸指数里，我们考虑了这些基本因素。经过调整的指数根据一国发展水平而产生的对其货币水平的期望来判断该国货币的估值高低。以此方式衡量，美元仍然估值过高，但高估的程度已大大减少：在贸易加权基础上约高出11%。

巨无霸指数还提供了一个衡量国家经济规模的有趣标准，引发了很多讨论和争议。如果一国将其全年收入用于购买巨无霸，能买多少个？IMF预计美国GDP今年将超过18.5万亿美元，以五美元多一点的单价可以买3.7万亿个巨无霸。在IMF预测的基础上（见图表），经过我们的计算，2016年全球GDP可以买19.2万亿个巨无霸。这样算来，美国占据了很大比重。

其他经济体中有没有谁能与巨无霸之乡抗衡呢？IMF预测中国GDP今年将是73万亿元多一点，或将近11.4万亿美元。但在中国，一个巨无霸仅售18.6元，所以其GDP相当于3.9万亿多个巨无霸，比美国高出5%还多。确实，若以这种方法计算，中国经济总量在2013年就超越美国了。就市场汇率而

言，美国经济仍远超中国。但若以汉堡购买力平价计算，它们的排位已经反转。■



Technology in China

China's tech trailblazers

The Western caricature of Chinese internet firms needs a reboot

GOOGLE left. Facebook is blocked. Amazon is struggling to make headway. And if further proof were needed that China's tech market is a world apart, this week seemed to provide conclusive evidence. Uber, a ride-hailing service that is the world's most valuable startup, decided to sell its local unit to Didi Chuxing, a Chinese rival. Its China dream, like those of so many before, is dead.

For many, the lessons of this latest capitulation are clear. China is a sort of technological Galapagos island, a distinct and isolated environment in which local firms flourish. Chinese firms are protected from external competition by government regulation and the Great Firewall. And that protection means that they need not innovate but can thrive by copying business models developed in the West. In short, China is closed, its firms are cosseted and their talent is for mimicry.

At first sight, Uber's retreat appears to fit this damning profile. The startup has ceded China to Didi: it will concentrate on its home market and elsewhere. Uber's surrender was caused partly by regulations, issued at the end of July by the Chinese authorities, that in effect outlawed subsidies—Uber spent \$1 billion a year in incentives to Chinese drivers and riders. Now Didi, whose forerunner firms were founded in 2012, three years after Uber introduced ride-hailing, can make hay. But look more closely and a more positive picture emerges—not just of Didi, but of China's technology firms as a whole.

| *Getting the message*

The usual story about the isolated nature of the Chinese market is that

foreign firms are either blocked altogether or hobbled by regulators. The government has indeed restricted competition in some areas—which is why China has subpar clones of Western firms, such as Baidu in search or Renren, an ailing knock-off of Facebook. But China is not as impenetrable as its critics suggest. WhatsApp, the world's most popular messaging app, which is owned by Facebook, is freely available in China; yet it is dwarfed by WeChat, China's leading app (which has also fought off Alibaba, a formidable local internet giant). China is the largest market for Apple's iPhone. And Uber made a valiant effort to establish itself in China, the world's largest ride-hailing market: a 17.7% stake in Didi is not a bad consolation prize. Nor are Chinese tech giants walling themselves off from the rest of the world. They have invested in American startups, including Snapchat and Lyft, and bought mobile-gaming firms like Supercell of Finland and Playtika of Israel.

Being present in the Chinese market is all very well, comes the retort, but not if you are stopped from winning. That gives too little credit to China's tech leaders. Ride-hailing, like many online businesses, is a cut-throat, winner-takes-all market: Didi itself is the product of a 2015 merger of two local firms. Uber was outcompeted. Globally, Uber arranged its billionth ride at the end of 2015, after five years in business; Didi arranged 1.4 billion rides in 2015 alone, just in China. Uber struggled to raise its market share in China above 10%. Didi understood the local culture, integrated better with social-media platforms and got taxi drivers onside by incorporating them into its app from the beginning. In outlawing subsidies, the regulators called time on a fight the American firm had already lost.

Similarly, whatever the settings of the Great Firewall, there is nothing outside China that offers WeChat's combination of features. It has over 700m monthly users, and combines messaging, voice calls, browsing, gaming and payments. It can be used for everything from paying parking tickets to booking a hospital appointment, ordering food or paying for a

cup of coffee. WeChat is not so much an app as an entire mobile operating system, and accounts for more than one-third of all time spent online by Chinese mobile users; HSBC, a bank, values the app at over \$80 billion. To Chinese users, Western apps look hopelessly backward.

WeChat is the best riposte to the condescending, widely held belief that Chinese internet firms are merely imitators of Western ones, and cannot innovate themselves. But it is not the only example. Alibaba kick-started Chinese e-commerce with the clever trick of holding payments in escrow, helping buyers and sellers establish trust. It now offers services that exploit its vast customer database, including credit-scoring, digital marketing, and vetting visa applicants and users of dating sites. Didi's ride-hailing app includes novel features such as on-demand bus services and the option to request a test-drive of a new car. Sina Weibo, the Chinese equivalent of Twitter, has a built-in payments system and supports premium content, both features that Twitter lacks. With revenue from payments, virtual goods and gaming, Chinese internet firms are also much less dependent on online ads than Western rivals.

As a result, the flow of ideas between China and the West is now two-way. Facebook's efforts to incorporate payments and commerce into its Messenger app are inspired by WeChat, as is Snapchat's expansion from a messaging app into a media portal, and the sudden enthusiasm of Google, Facebook and Microsoft for bots (smart software that chats with customers). Western consumers are having their experience of the mobile internet shaped by a Chinese success story. Companies that want a glimpse of the future of mobile commerce should look not just to Silicon Valley but also to the other side of the Pacific.

| *Digital dragons*

Policymakers should study China, too. No other place will reveal more about the advantages and drawbacks of winner-takes-all digital markets. As

WeChat shows, a single dominant app, particularly with a payments system included, is amazingly convenient for users. But monopolies can also spell danger. Now that Didi has a 90% market share and no serious rivals to speak of, riders can expect to pay more and drivers to be paid less. How to strike the balance between convenience and dominance is the great question for regulators in the digital age. One lesson is already clear: compared with Renren and Baidu, Didi and WeChat were strengthened by fierce rivalries. If China's tech trailblazers aim to become truly global champions, then competition is their friend. Watch closely, world. ■



科技在中国

中国的科技开拓者

西方对中国互联网公司的讽刺漫画需要改改了

谷歌走了。Facebook被封。亚马逊正艰难前行。如果还需要进一步证明中国的技术市场独立于世界之外，那么本周似乎提供了决定性证据。叫车服务公司优步（Uber）这一全球估值最高的创业公司决定将自己的中国业务卖给其中国对手滴滴出行。和之前许许多多公司一样，它的中国梦也破灭了。

对很多人而言，最近这一投降协议的教训非常清晰。中国就像是科技业的加拉帕戈斯群岛，绝世独立、非同寻常，本地公司在其中蓬勃发展。在政府法规和国家防火墙的保护下，中国公司免受外部竞争。这种保护意味着它们无需创新，只需将西方开发出来的商业模式照搬过来便可兴旺发达。简言之，中国是封闭的，中国的公司也娇生惯养，它们的聪明才智只会用来模仿。

乍看之下优步的退出似乎符合这一糟糕的形象。这家创业公司把中国业务割让给了滴滴：接下来它将专注于美国本土和其他市场。在一定程度上，优步的投降是因为中国政府在7月底颁布的一则法规。该法规在实际上认定补贴不合法，而优步每年要花费10亿美元用以奖励中国司机及乘客。现在滴滴可以抓住时机了。它的前身创立于2012年，比优步引入叫车服务晚了三年。但若观察得更仔细些就会发现，即将迎来更光明前景的不止滴滴一家，中国科技公司整体也会如此。

| 领会意图

关于中国市场的与世隔绝，最常听到的故事是外国公司要么被完全拒之门外，要么受到监管部门掣肘。政府的确在一些领域限制了竞争，这也是中国拥有多个西方公司劣质克隆体的原因，如搜索领域的百度。此外还有人人，这个Facebook的山寨版如今每况愈下。然而中国并不像批评人士所说的那样难以渗透。世界上最流行的短讯应用——Facebook旗下的

WhatsApp，就可以在中国自由地使用。但它与中国首屈一指的应用微信相比就相形见绌了（微信还打败了令人生畏的国内互联网巨头阿里巴巴）。中国还是苹果iPhone手机最大的市场。优步为了在这个全球最大的叫车市场站稳脚跟做出了顽强的努力：滴滴17.7%的股份还算是一个不坏的安慰奖。中国的科技巨头也没有将自己与世界隔绝开来。它们投资了美国的创业公司，如Snapchat和Lyft，还收购了手游公司，如芬兰的Supercell和以色列的Playtika。

不过反驳的声音又来了：能参与中国市场固然很好，可如果在争取胜利时受到掣肘就不好了。这么说太低估了中国领先科技公司的能力。像很多在线业务一样，叫车行业是一个竞争惨烈、赢家通吃的市场：滴滴本身是两家国内公司2015年合并的产物。优步早已被超越了。业务运营五年后，2015年底优步在全球累计实现了十亿次订单量；而在中国，滴滴仅2015年一年的总订单量就突破了14亿。尽管百般努力，优步在中国的市场份额也没能提高到10%以上。滴滴了解本地文化，与社交媒体平台融合得更好，并且从一开始就把出租车司机纳入应用，因而得到了他们的支持。通过将补贴定为不合法，监管部门叫停了这场美国公司已经输掉的战斗。

与此类似，不论国家防火墙如何设置，中国之外也还没有任何应用能提供微信的丰富功能。它拥有超过7亿月活跃用户，并集合了短信、语音、浏览、游戏和支付功能。从付停车费到预约门诊，从点餐到买咖啡，它可以用来做各种事情。与其说微信是一款应用，不如说它是一个完整的移动操作系统。中国移动终端用户的全部在线时间里超过三分之一用于微信。汇丰银行对微信的估值超过800亿美元。对于中国用户来说，西方的应用看起来落后得无可救药。

人们普遍认为，中国互联网公司仅仅是西方公司的模仿者，自己则无法创新。对于这种傲慢的观点，微信无疑是最好的回击。但它并不是唯一的案例。阿里巴巴通过托管付款这一聪明做法帮助买家和卖家建立信任，撬动了中国的电子商务。如今它还利用其庞大的客户数据库提供各类服务，包括信用评分、数字营销、审查签证申请人及婚恋网站用户。滴滴的叫车应用也包括很多新颖的功能，如按需提供的公交服务、新车试驾等。新浪微

博（相当于中国Twitter）则有内嵌的支付系统，并且支持优质内容服务，这两个功能都是Twitter所欠缺的。有了来自支付、虚拟商品和游戏的收入，中国的互联网公司也不像西方对手那么依赖在线广告。

因此，中国和西方之间的灵感流动现在已变成双向的了。Facebook将支付和商业功能融入信息应用，正是受到了微信的启发；Snapchat从短讯应用扩展到媒体门户，以及谷歌、Facebook和微软对聊天机器人（和客户聊天的智能软件）突然高涨的热情也始于此。西方消费者的移动互联网体验正由一个中国的成功故事来塑造。要想一窥移动商务的未来，各家公司不应只盯着硅谷，还该看看太平洋的另一边。

| 数字巨龙

政策制定者也应该研究下中国。没有哪个地方能将数字市场“赢家通吃”的优点和缺点展示得更为充分。正如微信所示，一个占统治地位的应用，尤其是内嵌支付系统的，能给用户带来惊人的便利。但是垄断也会造成危险。如今滴滴占据了90%的市场份额，但并没有值得一提的强劲对手，可以想见乘客会花费更多，而司机也将赚得更少。如何在便利性和垄断之间求得平衡，对于数字时代的监管部门来说是个大问题。有个启示已非常清晰：比起人人和百度，滴滴和微信是在激烈的竞争中壮大的。如果中国的科技开拓者目标是成为真正的全球冠军，那么竞争才是它们的朋友。看仔细了，世界。■



Ageing

Cheating death

Science is getting to grips with ways to slow ageing. Rejoice, as long as the side-effects can be managed

IMAGINE a world in which getting fitted with a new heart, liver or set of kidneys, all grown from your own body cells, was as commonplace as knee and hip replacements are now. Or one in which you celebrated your 94th birthday by running a marathon with your school friends. Imagine, in other words, a world in which ageing had been abolished.

That world is not yet on offer. But a semblance of it might be one day. Senescence, the general dwindling of prowess experienced by all as time takes its toll, is coming under scrutiny from doctors and biologists. Suspending it is not yet on the cards. But slowing it probably is. Average lifespans have risen a lot over the past century, but that was thanks to better food, housing, public health and some medicines. The new increase would be brought about by specific anti-senescence drugs, some of which may already exist.

This, optimists claim, will extend life for many people to today's ceiling of 120 or so. But it may be just the beginning. In the next phase not just average lifespans but maximum lifespans will rise. If a body part wears out, it will be repaired or replaced altogether. DNA will be optimised for long life. Add in anti-ageing drugs, and centenarians will become two a penny.

| *Man and superman*

To this end, many hopeful repairmen are now setting up shop. Some of them want to upgrade worn-out tissues using stem cells (precursors to other sorts of cell). Such bio-renovation is the basis of an unproven, almost vampiric, treatment in vogue in some circles: transfusion into the old of

the blood of the young. The business of growing organs from scratch is also proceeding. At the moment, these “organoids” are small, imperfect and used mainly for drug testing. But that will surely change. Longevity is known to run in families, which suggests that particular varieties of genes prolong life. Some are investigating this, with the thought that modern gene-editing techniques might one day be used to make crucial, life-extending tweaks to the DNA of those who need them.

From an individual’s viewpoint, this all sounds very desirable. For society as a whole, though, it will have profound effects. Most of them will be good, but not all.

One concern is that long life will exacerbate existing social and economic problems. The most immediate challenge will be access to anti-senescence treatment. If longer life is expensive, who gets it first? Already, income is one of the best predictors of lifespan. Widening the gap with treatments inaccessible to the poor might deepen divisions that are already straining democracies.

Will older workers be discriminated against, as now, or will numbers give them the whip hand over the young? Will bosses cling on, stymying the careers of their underlings, or will they grow bored, quit and do something else entirely? And would all those old people cease to consider themselves elderly, retaining youthfully vigorous mental attitudes as well as physical ones—or instead make society more conservative (because old people tend to be)?

A reason for hoping that the elderly would turn out less hidebound is that life itself would be more a series of new beginnings than one single story. Mid-life crises might be not so much about recapturing lost youth as wondering how to make the most of the next half-century.

Retirement would become a more distant option for most, since pension pots would have to be enormous to support their extended lifespans. To this end, the portfolio career would become the rule and education would have to change accordingly. People might go back to school in their 50s to learn how to do something completely different. The physical labourer would surely need a rest. The accountant might become a doctor. The lawyer, a charity worker. Perhaps some will take long breaks between careers and party wildly, in the knowledge that medicine can offer them running repairs.

Boredom, and the need for variety, would alter family life, too. How many will tie the knot in their 20s in the expectation of being with the same person 80 years later? The one-partner life, already on the decline, could become rare, replaced by a series of relationships, each as long as what many today would consider a decent marital stretch. As for reproduction, men's testes would presumably work indefinitely and, though women's ovaries are believed to be loaded with a finite number of eggs, technology would surely be able to create new ones. Those who wished to could thus continue to procreate for decades. That, and serial marriage, will make it difficult to keep track of who is related to whom. Families will start to look more like labyrinthine networks. In the world where marriages do not last, women everywhere will be freer to divorce and aged patriarchs will finally lose their hold.

Such speculation is fun, and mostly optimistic. The promise of a longer life, well lived, would round a person out. But this vision of the future depends on one thing—that a long existence is also a healthy one. Humanity must avoid the trap fallen into by Tithonus, a mythical Trojan who was granted eternal life by the gods, but forgot to ask also for eternal youth. Eventually, he withered into a cicada.

The trap of Tithonus is sprung because bodies have evolved to be throwaway vessels for the carriage of genes from one generation to the next. Biologists have a phrase for it: the disposable soma. It explains not only general senescence, but also why dementia, cancer, cardiovascular problems, arthritis and many other things are guarded against in youth, but crammed into old age once reproduction is done with. These, too, must be treated if a long and healthy life is to become routine. Moreover, even a healthy brain may age badly. An organ evolved to accommodate 70 or 80 years of memories may be unable to cope when asked to store 150 years' worth.

Yet biological understanding is advancing apace. Greater longevity is within reach—even if actual immortality may not be as close (or as interesting) as some fantasists would like to believe. Be sure to draw up a very long bucket list. ■



衰老

躲过死神

科学界正逐渐掌握延缓衰老的方法。这值得庆祝，只要副作用可控

试想有这样一个世界：在那里人们能够换上由自身细胞培育而成的新的心脏、肝脏或一对肾脏，就像现在的髌关节和膝关节置换手术一样稀松平常。或者再想象一下，你和一班同窗好友跑一场马拉松来庆祝你的94岁生日。换句话说，试想一个衰老已被消除的世界。

目前那样的世界还可望而不可及，但某天与它类似的情形有可能会发生。人体机能总会在时间流逝中衰退，衰老人人难逃，医生和生物学家正在仔细研究这种情况。停止衰老尚无可能，但延缓衰老大概还是有希望的。人类的平均寿命在过去一百年已经大幅延长，但这得益于饮食、住房、公共医疗的改善以及一些药物的作用。若要进一步延长寿命也许就要靠专门的抗衰老药物，有些可能已经研发出来了。

一些乐观的人说，这会使很多人的寿命延长到如今的寿命上限，即120岁左右。但这大概还只是个开始。到下一阶段，不止平均寿命，最长寿命也会延长。如果身体的某一部分耗损了，可以将其修复或整个置换。为了实现长寿，DNA将被优化。再加上抗衰老药物的作用，满大街都将会是百岁老人。

| 人和超人

为了实现这一目的，很多满怀希望的“修理工”现正开店设厂。有些人想用干细胞（其他各种细胞的母体）升级损坏的组织。这种生物修复构成了在某些圈子里很流行的一种疗法的基础。此疗法尚未经证实，而且听来像吸血鬼一样：将年轻人的血液输入老年人体内。除此之外，从零开始“种”出器官的生意也正在推进。目前，这些“类器官”都比较小、存在瑕疵且主要用于药物试验。但是这一情况肯定会改变。我们知道长寿是家族遗传，这意味着有某些特殊的基因能够延长寿命。有些人正在对此进行研究，希望有朝一日可以用现代基因编辑技术对DNA做出关键性微调，帮助有需要的

人延长寿命。

就个人而言，这听来十分令人神往。但对于整个社会而言，这将会产生深远的影响。大多数影响都会是好的，但也并非全部。

顾虑之一是长寿会让已有的社会和经济问题进一步恶化。最迫切的问题就是如何让所有人都享有抗衰老治疗的机会。如果要长寿得花大价钱，谁会先享受？收入已经是寿命的最佳预测指标之一。以穷人无法获得的疗法扩大寿命差距，这可能会加深已让民主国家备感压力的贫富分化。

年老的员工会不会像现在这样被歧视，亦或人数增多会让他们比年轻人更占上风？老板们会不会占着位子，妨碍下属的晋升，还是他们会开始厌烦，于是辞职，继而开始做完全不同的事情？这些老年人是否有可能不再认为自己是老人，始终保持同身体状态一样年轻而有活力的精神状态，还是会让这个社会更加保守（因为老年人通常会这样）？

我们希望老年人能变得不那么墨守成规，原因之一便是生命本身将更可能是一系列新的开始，而不再是从头到尾一个故事。中年危机可能更多是关于思索怎样好好利用下一个五十年的时间，而非设法找回逝去的青春。

退休对于大多数人而言将成为一个更加遥远的选择，因为退休金必须非常丰厚才能支撑他们已经延长的寿命。为此，多种多样的职业生涯将变得司空见惯，教育也应做相应的调整。人们可能会在五十多岁时重返校园，学习如何去做一些全然不同的事。体力劳动者肯定需要歇一歇。会计师可能成为医生，而律师可能会去做慈善义工。有些人或许会在两份工作之间休长假，聚会狂欢，因为他们知道医学可以帮他们修复身体的损耗。

无聊以及对变化的需求也会改变家庭生活。有多少人愿意在二十多岁永结同心，期盼着八十年后身边厮守的仍是同一个人？从一而终的人已经在减少，以后可能会更罕见，取而代之的将是一段段新恋情，每段关系延续的时间都和今天很多人认为的一段像样的婚姻那样长。说到繁衍，男性的睾丸可能会工作不休；虽然人们认为女性的卵巢只存有一定数目的卵子，但科技必将创造出新卵子。因此只要他们想，可以连续几十年生育子女。这

一点，再加上一段又一段的婚姻，会把血缘关系弄得很复杂，使家庭看起来更像错综复杂的迷宫。在婚姻不长久的世界，各地的女性会更自由地离婚，年迈的族长最终将失去掌控。

这样的推测很有趣，并且大部分是乐观的。更长寿、活得更好的希望让一个人更圆满。但对未来的这一憧憬取决于一个因素——长命的同时也得健康。人类要避免像提托诺斯（Tithonus）那样落入陷阱。希腊神话中，这个特洛伊人请求诸神赐予他不死之身，但忘了祈求永葆青春。最终，他日渐枯萎，化为一只蝉。

| 期待彭祖之寿

提托诺斯的陷阱已挖好，因为身体已经进化成为用完即弃的容器，用来盛放代代相传的基因。生物学家对此有个说法：可抛式躯体。这不仅解释了一般的衰老问题，也解释了为什么年轻时人们能免受痴呆、癌症、心血管疾病、关节炎和很多其他问题的困扰，而到了晚年繁殖完成之后这些问题就蜂拥而至。要使长寿而又健康的生活成为常态，这些疾病都必须加以治疗。而且，即便是健康的大脑也可能严重老化。一个进化成能存储七八十年记忆的器官一旦要储存150年的经历，可能会无法应付。

不过，生物学研究正在突飞猛进。尽管真正的长生不老可能并不像一些幻想家所认为的那么近在咫尺（或那么有趣），但长寿还是可以企及的。一定要记得写一份长长的遗愿清单。■



Corporate philanthropy in China

The emperor's gift

Chinese bosses are giving more to charity

WHEN Warren Buffett and Bill Gates held a banquet for Chinese billionaires in 2010, they hoped to win them over to philanthropy. They got the cold shoulder. Many wealthy industrialists stayed away, and none of those who attended signed their “Giving Pledge”. This meanness was not due to penury: China boasts more dollar billionaires today than does America. Asked why he and his compatriots rebuffed the evangelisers, Jack Ma, boss of Alibaba, an e-commerce giant, insists it is not because they were stingy. At a conference on private-sector philanthropy hosted by his firm this month in Hangzhou, he explained that China’s charitable sector was then still in its infancy.

The outlook has since improved. Charitable giving in China still lags that in America, but it is rising (see chart). Oscar Tang, a Chinese-American billionaire and philanthropist, tells of another banquet for fat cats in Beijing, this one hosted earlier this month by Ban Ki-moon, secretary-general of the United Nations, and the C100, a group of prominent Chinese-Americans. Unlike at the frosty meeting in 2010 with the “two white men” telling them to give away money, he recounts, the mainland bosses were enthusiastic about his exhortations to share the wealth.

One reason for this shift in attitude is a generational change. Scholars at Harvard University have looked at patterns of giving among China’s top donors. In the past, the most generous were property tycoons who gave to educational outfits, especially elite universities in their home provinces along the wealthy coast. It was a careful approach, suited to a political system where making pots of money had only recently become normal. But it meant poor schools and indigent interior provinces lost out.

As the economy modernises, a crop of youngish technology billionaires, keen to “democratise” philanthropy, has emerged. On the eve of Alibaba’s initial public flotation in New York two years ago, Mr Ma and Joseph Tsai, the firm’s co-founder, donated options worth about 2% of their firm’s equity to a new charitable trust (Alibaba’s market capitalisation today is around \$200 billion). Pony Ma (pictured), founder of Tencent, a Chinese gaming and social-media giant, said in April that he will donate shares worth over \$2 billion to his firm’s charitable foundation.

Many entrepreneurs are following their lead. The younger generation is much more likely than older ones to give money to more politically sensitive areas such as the environment and public health, as the two Mas are doing with their respective foundations. They are also applying whizzy digital tools, from the mobile internet to cloud computing, in order to help charities to modernise their operations.

Such beneficence is helping to address some of the flaws in the non-profit sector. There is a lack of proper management and not enough transparency. Governance is weak. Various prominent charities have been ensnared in corruption scandals in recent years. Numerous research institutes and academic training programmes have sprung up of late to address the problem.

The last, and most surprising, push towards philanthropy comes from the government. Chinese rulers have long viewed private philanthropy with suspicion, worrying that the public might recognise in it the manifold failings of the state. Many would-be donors also resisted giving money, or did so furtively, for fear of attracting unwanted official attention. But the government has pushed through a sensible philanthropy law, due to come into force later this year, that makes it easier to donate. It also clarifies regulations governing local charities and pushes for transparency. If the implementation is as good as the framework, China’s corporate giving will

surely surge. ■



中国的企业慈善

王者之馈

中国的企业家们在更多地进行慈善捐赠

巴菲特和盖茨曾在2010年为中国亿万富翁举办慈善晚宴，希望能说服他们投身慈善，然而反响冷淡。很多富有的企业家避之不来，而参会者中也无一人签署了“捐赠承诺”。这不是因为他们囊中羞涩：中国现今的亿万富翁人数比美国还多。当电商巨头阿里巴巴的老板马云被问及他和其他富翁为什么不接受劝捐时，他坚持认为这并不是因为他们吝啬。在阿里巴巴本月于杭州举办的一次私营领域慈善事业大会上，他解释道中国的慈善事业在当时还处在襁褓期。

自那以后，情形已有所改善。尽管中国的慈善捐赠仍然落后于美国，但呈上升趋势（见图表）。美籍华裔亿万富翁、慈善家唐骝千谈到了另外一场晚宴——这是本月初由联合国秘书长潘基文和杰出美籍华裔人士组织百人会（C100）在北京为大亨们举办的。他说与2010年那场由“两个白人”劝捐而气氛冷淡的晚宴不同，这一次大陆的各位老板对他分享财富的宣讲反响热烈。

这种态度转变的一大原因是世代交替。哈佛大学的学者研究了中国捐赠最多的富翁们的捐赠模式。过去，最为慷慨的是地产大亨，他们主要捐赠给教育机构，尤其位于他们那些富裕的沿海家乡省份的名牌大学。这是一种谨慎的做法，适用于赚大钱才刚刚成为正常现象的政治体系。但这也意味着资金不足的学校和贫困内陆省份无法受惠。

随着经济的现代化，一批热衷于将慈善“大众化”的中青年科技亿万富翁出现了。一年前阿里巴巴在纽约上市的前夕，马云和公司联合创始人蔡崇信向一个新的慈善信托基金捐赠了相当于公司2%股份的期权（阿里巴巴今天的市值约为2000亿美元）。中国游戏和社交媒体巨头腾讯的创始人马化腾（见照片）四月份表示将向其公司的公益慈善基金会捐赠价值逾20亿美元的股票。

很多企业家都在效仿他们的做法。正如两位马总通过各自的慈善基金所做的那样，年轻一代比老一代更有可能在如环境和公共卫生等更具政治敏感性的领域捐赠。他们还会利用从移动互联网到云计算等高新数字工具帮助慈善机构实现运营现代化。

这种造福之举有助于解决非盈利领域的一些不足之处。慈善机构往往缺乏良好的管理，也不够透明，治理薄弱。近年来各个知名慈善机构纷纷陷入腐败丑闻。新近涌现出很多研究机构和学术培训机构以解决此类问题。

推动慈善事业发展的最后一个、也是最意想不到的动力来自政府。中国的统治者们长久以来一直对私人慈善抱有疑心，担心它们有可能会使公众认识到政府的种种失败。很多本来有心做慈善的人因为担心会引来不必要的官方注意也拒绝捐赠，或者只是暗地里捐款。但政府已经通过了一部合理的慈善法，今年晚些时候将予实施，这会使捐赠变得更加容易。这部法律还明确了治理地方慈善机构的规定，着力提高透明度。如果有好法可依，又能执法到位，中国的企业捐赠必将风生水起。■



Free exchange

Econometrics

It is not easy to compare the size of economies—even across the Channel

FRANCE is renowned, fairly or not, for its long holidays and short working weeks, subsidised farmers and unionised workers, high culture and higher taxes. Less than two-thirds (64%) of its working-age population was employed last year, according to the OECD, compared with almost three-quarters (73%) in Britain. But is France's well-lunched workforce of 26.4m now producing more than Britain's harried 31.1m employees?

Many people seem to think so. France's GDP in 2015 was about €2.18 trillion. Britain's was a little over £1.86 trillion. On July 6th the pound fell below €1.17 on the currency markets, rattled by Britain's vote to leave the European Union (EU). Since 1.86 multiplied by the exchange rate of July 6th is less than 2.18, many commentators jumped to the conclusion that Britain's economy had slipped overnight from fifth-biggest in the world to sixth. It was one more humiliation among many.

Comparing the size of national economies can be a frustrating exercise. The measuring tape is not always consistent from place to place or period to period. In July, Ireland's statisticians added over 19% to last year's GDP after folding multinationals' aircraft and intellectual property into its economy. Both China and India, two of the biggest economies in the world, have recently revised their methods for calculating GDP, bringing them closer to international standards agreed on in 2008. India's controversial overhaul recalculated everything from manufacturing output (drawing on a new database of corporate e-filings) to the value of dung. (This latter revision added over \$180m to India's GDP, assuming an "evacuation rate" of 0.3kg a day for goats and rather more for sheep.)

China, for its part, in July added R&D spending to its measure of economic size (just as advanced countries already do). It also took the opportunity to revise its figures all the way back to 1952 (see chart). The new numbers suggest that China's GDP was over 68 trillion yuan last year, compared with only 478 billion yuan in 1952 (at 2015 prices). The difference between those two numbers, however sketchy they may be, represents the greatest economic story of the modern age. But the statisticians keep fiddling with the earlier chapters.

When laypeople reflect on the size of their national economy, they may think of a vast inventory of productive assets: humming factories, gleaming skyscrapers, fertile lands, cosy homes and teeming workers, full of brains and brawn. Similarly, when they look at a chart of GDP, like China's above, it may remind them of a pile of money accumulating steadily over time, like an unusually successful stock portfolio.

Viewed this way, it may seem natural to recalculate the value of an economy in the light of sudden currency fluctuations, like the yuan's decline since August or the pound's since June 23rd. Why not mark these economies to market? It seems unobjectionable to reprice Britain's GDP at the lower July 6th exchange rate, just as a Frenchman in London might recalculate the diminished euro value of his sterling bank account or his Battersea flat.

But such an exercise betrays a misunderstanding of GDP. This deceptively familiar gauge of economic size does not represent a stock of assets but a flow of goods and services. It is more akin to the wages and interest someone earns during a year than to the money in an account at the end of the year. It cannot therefore be valued at a point in time, like a bank balance, dwelling or stock portfolio. It must instead be evaluated over a span of time.

Most often, this span is a year (which obviates the need for seasonal adjustment) or a quarter. Other periods are possible, both longer and shorter. From 1952 to 2015 China's GDP amounted to over 809 trillion yuan (at 2015 prices), according to our calculations, based on the government's revised figures. Incredibly, of all the goods and services ever produced by the People's Republic of China, over half were produced from 2008 onwards.

Shorter timespans are also possible: Canada publishes a monthly GDP estimate. In theory, one could even calculate the output of Britain and France in the few weeks since the EU referendum. But weekly GDP figures do not exist and would be hideously volatile if they did.

Because GDP represents a flow of goodies over time, it makes sense to value it at the exchange rates that prevailed during that time. It seems odd, in contrast, to reprice what happened last year at an exchange rate that arose only last week. Many of the items that constitute GDP are perishable, disappearing shortly after their creation. Hot meals and long journeys, a stirring night at the theatre, a warm radiator on a winter's morning—Britain produced many such necessities and conveniences over the course of 2015. But these items left nothing behind that could be marked to market in July 2016.

This is not to deny that the pound was overvalued. Its strength was rooted not in the international appeal of British goods but in the widespread appeal of British assets—including gilded homes and gilt-edged securities. Foreign purchases of these assets added little directly to British output (because GDP includes only newly built homes and factories, not financial securities or pre-existing properties or companies sold to new owners). But these buyers did bid up the currency in which GDP was priced.

| *Liberty, fraternity, purchasing-power parity*

The size of Britain's GDP, when converted into euros, thus reflected an uneasy amalgam of demand for its goods and services and a somewhat separate demand for the pounds required to buy British assets. The combination made Britain an expensive place to visit: all told, its prices were about 16% higher than France's last year, according to the World Bank and the IMF. As it happens, if similar items were priced similarly in both countries (bringing their purchasing power into parity with each other), France's GDP would have been almost the same size as its neighbour's in 2015, even before Britain's recent setbacks and indignities. ■



自由交流

计量经济学

比较经济规模并不容易，即使只隔一道英吉利海峡

无论这么说是否公平，法国闻名于世的是它悠长的假期和短暂的工作周，那里农民有补贴，员工有工会，有高雅的文化，还有更高的税收。据经合组织（OECD）统计，法国去年劳动年龄人口就业比例不到三分之二（64%），而英国几乎达到四分之三（73%）。但是法国待遇优厚的2640万劳动力如今的产出，是不是比英国疲于奔命的3110万雇员更多呢？

似乎很多人都这么认为。法国2015年的GDP约为2.18万亿欧元，英国则略超过1.86万亿英镑。受英国公投脱欧的影响，7月6日英镑在货币市场上跌破1.17欧元。因为1.86乘以7月6日的汇率结果小于2.18，很多评论家便匆匆得出结论，称英国经济一夜之间就从世界第五跌至第六。这在重重羞辱之上又加了一笔。

比较国家的经济规模并不是件容易操作的事。从一处到另一处，从一个时期到另一个时期，衡量的尺度并非始终一致。七月，爱尔兰的统计人员把跨国公司的飞机和知识产权都算入本国经济，在去年的GDP之上增加了19%还多。位居世界最大经济体之列中国和印度最近修订了计算GDP的方法，使之更贴近2008年达成一致的国际标准。在此次颇具争议的全面修订中，印度重新计算了所有的数据，从制造业产出（利用公司电子申报的新数据库）到粪便的价值（假定山羊的“排泄率”为每天0.3千克，绵羊则可能更多。单单这一项就为印度GDP增加了1.8亿美元以上）。

在七月，中国将研发支出也纳入了经济规模的计算（向发达国家看齐）。它还抓住此次机会，修订了一直追溯到1952年的数据（见图表）。新数据显示，去年中国的GDP已超过68万亿元，而1952年仅为4780亿元（按2015年价格）。不管这种比较有多么粗略，这两组数据间的差距还是展现了现代最伟大的经济故事。然而统计人员仍在鼓捣着早期的数据。

当外行人思考自己国家的经济规模时，他们可能想到的是大批的生产性资产：轰鸣运转的工厂、闪闪发光的摩天大楼、肥沃的土地、舒适的房屋和大批头脑灵活、肌肉发达的工人。同样，当他们着眼GDP走势图时，就如上面关于中国的图表那样，他们可能会想到逐渐稳步积累的大笔资金，就像是一个异常成功的股票投资组合。

从这个角度看，在货币突然波动之时（例如自去年8月以来人民币的贬值或者6月23日以来英镑的下跌）重新计算经济体的价值似乎是再自然不过的事。为什么不按市价来衡量这些经济体呢？按照7月6日的较低汇率重新计算英国的GDP似乎不会招致反对，正如一个身在伦敦的法国人可能会重新估算自己银行账户里英镑的欧元价值蒸发了多少，或其在伦敦巴特西区公寓的欧元价值会缩水多少一样。

但是这样的做法透露出对GDP的一种误解。这一为人熟知的经济规模衡量指标具有迷惑性，它体现的不是资产的存量，而是货物流和服务流。它更像是一个人在一年里的工资和利息收入，而不是他年底在银行账户里有多少存款。因此我们不能像银行存款余额、住宅或股票投资组合那样，在某一个时点上确定它的价值，而是必须在一段时间区间里对其进行评估。

这一区间通常为一年（这避免了季节性调整）或一个季度，也可采用更长或更短的其他区间。我们依据中国政府修订后的数字做了计算，从1952年到2015年间，中国GDP累积总额超过809万亿元（按2015年价格）。难以置信的是，在中华人民共和国产出的所有货物和服务中，超过半数来自2008年及以后。

我们也可以采用较短的时间区间：加拿大每月都会发布GDP估算。理论上，人们甚至可以计算英国和法国在退欧公投后几周内的产出。但还没有每周GDP数据，即使有，数字波动也会非常厉害。

由于GDP表示一段时间内的产出流，使用那段时间里主流的汇率定价才比较合理。相反，用上一周的汇率来重新确定过去一年的产出就显得很奇怪了。很多构成GDP的项目都不能久存，在出产后会很快消失。热腾腾的饭

菜、长途旅行、在剧院里震撼人心的一晚、冬日清晨热乎乎的暖气——在整个2015年，英国生产了很多这样的必需品和便利服务。但是这些事物没有留下丝毫痕迹，让我们可以在2016年7月按市场价计价。

这并不是在否认英镑过去定价过高。英镑的优势并不在于英国货的国际吸引力，而是源于英国资产的广泛吸引力，包括金碧辉煌的房屋和镶着金边的证券。外国收购这些资产对英国的产出基本没有直接的贡献（因为GDP只涵盖新建房屋和工厂，而不包括金融证券、现有地产或已被转手的公司）。但这些买家的确炒高了英镑币值，并间接推高了英国的GDP。

| 自由，博爱，购买力平价

因此按欧元计算的英国GDP反映了一种不安定的结合——既有对其货物和服务的需求，还有一种在某种意义上与此分离的、对购买英国资产所需英镑的需求。这种组合让到访英国花费不菲：根据世界银行和IMF的数据，总体而言，去年英国的物价比法国高约16%。如果令类似的物品在两个国家定价相近（使其购买力达到同等水平），法国2015年的GDP就和英国基本一致了，哪怕是在英国最近遭受的挫败和羞辱发生之前就已是如此。■



The Olympic games

Fanfare

A sobering history of how the Olympic games evolved

IN 1892, Baron de Coubertin, a French educator and historian, called for the restoration of the Olympic games, hoping that they would promote peace and also help achieve his decidedly conservative political aims. De Coubertin considered the games a way to promote ideals of manliness. He argued that women's sport was "the most unaesthetic sight human eyes could contemplate" and that the games should be reserved for men.

The Olympics have always been intertwined with politics, as David Goldblatt shows in an elegant and ambitious new study. The International Olympic Committee (IOC) has never wavered from its underlying conservatism. Taiwan preserved its place in the Olympics far longer than it did in the United Nations. Ludicrously, the IOC maintained the "hypocritical and ultimately forlorn" pretence of amateurism until 1988—even as Soviet athletes were amateurs in name only. And from 1928 until 1968, there were no women's races of more than 200 metres because it made them look too tired. It took until 1984 for women to make up one-fifth of competing athletes.

If the Olympics have been a force for wider good, this has often been in spite of the IOC rather than because of it. In Mexico City in 1968, Tommie Smith and John Carlos, two African-American athletes who had just won medals in the 200 metres, gave the Black Power salute. Avery Brundage, the American president of the IOC, ordered the delegation to expel the athletes. They did. South Africa had been excluded from the Olympics in 1964 because of its apartheid policy, but in 1968 the IOC at first gave the nation the all-clear, before protests forced it to back down.

At every turn, the Olympics has allowed itself to be manipulated by governments, including appalling regimes. Ahead of the 1936 games in Berlin, the chairman of the American Olympic Committee concluded that there was no case for a boycott as there was no discrimination in German sport. Nazi Germany, which had initially been reluctant to play host, soon realised the huge potential benefits: it is estimated that more was spent on the Berlin games than all the previous Olympics combined. Adolf Hitler and the Nazi entourage attended every day. More recently, the IOC has allowed governments to hide their problems from view during the games—after Atlanta submitted its bid for the 1996 games, homeless people were even locked up—and to trample over the rights of their citizens. Construction before the Beijing games in 2008 forced more than 1m people out of their homes.

In crude financial terms, hosting is a disaster: the 2004 games in Athens cost the Greek government about \$16 billion (about 5% of the government's total debt) and the swimming complex remains unused. Mr Goldblatt reckons that, of the 17 Olympic tournaments held between the second world war and 2012, only the one in Los Angeles, in 1984, actually made a profit. Moreover, the idea that the games makes a host nation more athletic has no foundation. In Britain, fewer people do sport now than did before the Olympics in 2012. Little wonder, then, that a “Nolympics” movement has built up, made of protesters against hosting the games.

Another dark side of the sport can be seen in the way athletes, often at the behest of their national Olympic committees, have used performance-enhancing drugs. This kind of cheating began in the 1930s, if not earlier, though the IOC did not introduce drug testing until 1968. As the recent Russian doping scandal highlights, drug use remains all too prevalent. So far, this has not undermined the popularity of the games. In 1912 de Coubertin created a poetry contest and chose as the winner a poem he had written himself, which included the words, “O sport you are justice!” His

view of the Olympics was never accurate; now the games seem more imperilled than ever. ■



奥运会

鼓角连天

引人深思的奥运会进化史

1892年，法国教育家、历史学家顾拜旦男爵（Baron de Coubertin）提出复兴奥运会，希望以此推动和平并帮助自己实现无疑很保守的政治目标。顾拜旦认为展现男子气概的完美典范可以借这一赛事得以传扬。他辩称女子运动在“可观览的景象中最不具美感”，因而奥运会应是只属于男子的领地。

正如大卫·戈德布拉特（David Goldblatt）精妙而宏伟的新研究所显示的那样，奥运会向来都与政治交缠在一起。国际奥林匹克委员会（IOC）也从未偏离其骨子里的保守主义。与联合国相比，国际奥委会为台湾保留席位的时间要长得多。可笑的是，国际奥委会直到1988年还虚假地维持着“虚伪并且最终还是行不通”的“业余原则”——而同期的苏联选手仅仅名义上是业余身份而已。另外，1928年到1968年间一直没设200米以上的女子竞速项目，因为那样会使女选手们看上去太过疲惫。直到1984年，女选手才在所有参赛选手中占据了五分之一的比例。

如果说奥林匹克已然成为推动实现更广泛福祉的力量，国际奥委会并未发挥多少作用。在1968年的墨西哥城奥运会上，两位刚刚摘得200米奖牌的非裔美国选手汤米·史密斯（Tommye Smith）和约翰·卡洛斯（John Carlos）在颁奖仪式上致黑权敬礼（Black Power salute）。来自美国的国际奥委会主席艾弗里·布伦戴奇（Avery Brundage）命令美国代表团驱逐二人，他们照做了。1964年，南非因其种族隔离制度而被奥运会拒之门外。1968年国际奥委会起先曾准予南非参赛，但此举遭到抗议，只得作罢。

奥运会还处处都任由主办国政府操纵，包括那些让人胆战心惊的政权。1936年柏林奥运会举行之前，美国奥委会主席判定，德国体育中不存在歧视现象，因而并没有理由抵制这届奥运会。起初，纳粹德国对主办奥运会

并不情愿，但很快就意识到它可能带来的巨大收益：据估计，此次奥运会的花费比之前所有奥运会加起来还要多。阿道夫·希特勒及其纳粹追随者们每天都会出席。到了距今更近一些的时候，国际奥委会还准许主办国政府在奥运会举行期间掩盖自身问题（亚特兰大提交承办1996年奥运会的申请表后，甚至将无家可归者关了起来）以及践踏本国公民的权利。2008年北京奥运会开始前的建设项目迫使一百多万人搬离自己的家园。

若单从经济角度来看，主办奥运会堪称一场灾难：希腊政府为雅典奥运会耗资160亿美元（几乎占政府总债务的5%），赛后游泳场馆也一直闲置。戈德布拉特估算，从二战到2012年期间举办的17次奥运会中，只有1984年的洛杉矶奥运会获得盈利。此外，这项赛事会增强主办国国民体育素质的说法也毫无根据。现在英国进行体育运动的人比2012年奥运会举办前还要少。如此一来，反对主办奥运会的抗议者们发起的“不要奥运会”（Nolympics）运动愈演愈烈，也就不足为奇了。

这项赛事的另一处阴暗面表现在，过往已有选手（通常是在本国奥委会的授意下）使用提高表现的药物。国际奥委会直到1968年才引入药物检测，但这种形式的作弊起码可以追溯到上世纪三十年代。近期俄罗斯的药物丑闻表明，违禁药物的使用仍相当普遍。目前，这一问题尚未影响到人们对奥运会的热情。1912年，顾拜旦举办了一场诗歌比赛，并将自己创作的一首诗选为优胜。其中有这样的诗句：“啊，体育，你就是正义！”他对于奥林匹克的见解从未准确过，如今这项赛事似乎更是陷入了前所未有的危险境地。■



Europe v America

From clout to rout

Why European companies have become a fading force in global business

IT FEELS indelicate to raise it at a time like this, but European business has a bigger problem on its plate than Britain's decision to leave the European Union. After a decade of stagnation the continent's firms have suffered an alarming decline in their global clout. Europe's slide down the corporate rankings has been brutal, even before the market rout in the wake of Brexit. Of the 50 most valuable firms in the world, only seven are European, compared with 17 in 2006. No fewer than 31 are American, and eight are Chinese (few other emerging-market firms are really big yet). It's past time that Europe's bosses, investors and governments paid attention.

At the turn of the century it seemed natural that European firms would compete head to head with American ones, dividing the world between them, especially given that Japan's once-aggressive multinationals were in retreat. In the following years Europe's weight rose, relative to America's, measured by the profits and value of listed firms. It peaked before the financial crisis (see chart 1).

How things have changed. The seven European firms that do make the cut are often oddities: three are Swiss, suggesting there really is something special about mountain air and rösti; another, AB InBev, a beer firm, is run by Brazilians who happen to have picked Belgium for their main share listing. The continent's traditional heavyweight champions have become middleweight journeymen. In Britain BP, HSBC, Vodafone and GSK have all slid to the middle of the global rankings of their respective industries. So too have France's equivalents: Total, BNP Paribas, Orange and Sanofi-Aventis.

A European firm occupies the top spot in only one out of 24 global sectors (Nestlé in food). European leaders are typically much smaller than their rivals across the Atlantic. Unilever's market value is three-fifths of Procter & Gamble's, Airbus is about half as big as Boeing and Siemens is a third of the size of General Electric. Deutsche Bank's market value is a tenth of JPMorgan Chase's. Walmart is ten times bigger than Tesco or Carrefour, two of Europe's largest supermarket chains.

Europe and America have economies of a similar size, but the aggregate market value of the top 500 European firms is half that of the top 500 American firms. Aggregate profits are 50-65% smaller, depending on the measure used. Of these firms, the median American company is worth \$18 billion, with net income of \$746m in the past year. The median European firm is worth \$8 billion and earned only \$440m.

It wasn't meant to turn out like this. In the 1980s corporate Europe was held back by a patchwork of national boundaries, the heavy hand of the state and cross-shareholdings with banks and insurance companies. Starting in the late 1980s new ideas emerged to reinvigorate European business. There was a trend towards privatising industries and making them answerable to investors. There was a push to create pan-European firms that would compete across the EU's single market using, in most countries, a single currency. And there was a drive to take European firms global, exploiting the historical links of their home countries around the world.

These ideas had an electrifying effect in the 1990s and early 2000s. There were intra-European deals aimed at bulking up that created GlaxoSmithKline, Sanofi-Aventis, TotalFinaElf and Air France-KLM. Other deals aimed for global reach. In Spain, Telefónica, Santander, Repsol and BBVA made huge investments in Latin America, aiming to build a second "home" market. Some went shopping in North America. BP bought Amoco, Vivendi bought Seagram and Unilever purchased Best Foods. Europe even

put up a respectable fight against Silicon Valley. As late as 2000 the old continent was dominant in mobile technologies, many of which had been invented there. Nokia, Ericsson and Alcatel were among the most valuable firms in the world.

| *Relegated from the big league*

What went wrong? Slow growth in Europe has not helped, and a strong dollar has made American firms' domestic operations more valuable. But four other factors also explain the slide. First, Europe picked the wrong businesses. It focused on old industries such as commodities and steel, and on banking, where new rules have caused a depression in cross-border lending. Europe has gone backwards in technology—it hasn't created any firms of the scale of Facebook or Google. From the early 2000s its tech-and-telecoms incumbents proved to be poor at reinventing themselves, even as American contemporaries, including Cisco and Microsoft, learned how to evolve.

The second explanation is that Europe focused on the wrong parts of the world. The continent's firms are skewed towards emerging markets, which generate 31% of their revenues, according to Morgan Stanley, a bank. For American firms the figure is 17%. As the developing world has slowed, it has hit corporate Europe disproportionately hard, from banks to cognac distillers and makers of luxury handbags.

Third, Europe stopped doing deals even as the rest of the world continued to consolidate. The share of global deals by European acquirers fell from a third before the financial crisis to a fifth after it (see chart 2). Meanwhile, American firms have continued to bulk up at home, seeking to dominate their huge domestic market.

Last, European managers' less aggressive attitude towards shareholder value may account for the difference in market values between Europe and

America. European firms generate a lower return on equity and return less cash to shareholders through dividends and buy-backs. That may explain why for every dollar of expected profits and of capital invested, European firms are awarded a lower valuation.

One response to all of this is that raw size is not the same thing as global heft. Several of America's most valuable firms, including AT&T and Berkshire Hathaway, are largely domestic. Many others are huge as a result of their businesses at home, but weaker abroad. P&G may be far bigger than Unilever, but its emerging-market business is smaller than that of its Anglo-Dutch rival. Germany's medium-sized engineering firms dominate specialised product categories without having multi-billion-dollar market capitalisations.

Yet corporate Europe's waning scale is still a concern. Investment in research and development (R&D) tends to be disproportionately done by multinational firms. Of the world's top 50 R&D spenders only 13 are European (down from 19 in 2006) while 26 are American.

A lack of scale may also make firms vulnerable as takeover targets. GE's purchase in 2014 of most of Alstom, a symbol of French engineering prowess, is a case in point. Of the firms in Britain's FTSE 100 index, about a fifth have received bids in the past three years or are viewed as possible targets, among them AstraZeneca, a drugs firm, BP and IHG, a hotel group. Moreover, American companies have a strong incentive to buy overseas because of tax rules that encourage them to stash cash abroad.

Free-traders may be relaxed about this but foreign ownership could become a political problem. Europe will attract more controversial Chinese deals. Pirelli, an Italian tyre company, was bought by ChemChina in 2015, which is now buying Syngenta, a Swiss seeds firm. A bid for Kuka, a German robot maker, by a Chinese firm has caused a political stink. Europe's fights

with Google, over the right to be forgotten, antitrust and tax, are a sign that the continent's emerging status as an American technology colony will not be pain-free.

An obvious response is a renewed push for consolidation within Europe. But such deals are often a nightmare because nationalist emotions boil over. The attempted takeover of BAE Systems, a British defence firm, by Airbus in 2012 collapsed after political arguments; the proposed takeover of the London Stock Exchange by Deutsche Börse could be cancelled after the Brexit vote. The union last year of Lafarge and Holcim, a French cement firm and a Swiss rival, has been mired in rows.

The difficulty of pushing through recent transactions echoes the past. Many careers have been wrecked by pan-European deals. Of the 50 biggest such transactions attempted in the past 20 years, about a third have failed to materialise. The rest have often been bruising to implement.

There are some signs of a new wave of European deals. Shell, now the continent's most powerful energy company, bought BG, a rival, in 2015. A few tycoons are reinvigorating the 1990s idea of European empires. Vincent Bolloré, who controls Vivendi, a French conglomerate, is now investing in Italy and wants to create a European media giant to take on the empires of the Murdoch clan and Netflix.

But if it wants to create giants, Europe may have to restrain more than its nationalist instincts—it may have to temper its tougher approach to antitrust, too. The secret of some big American firms is that they have created oligopolies at home. For example, America has allowed broadband provision to be dominated by a few firms, and profits are high. Europe has scores of operators and its regulators have pushed prices and margins lower.

By allowing companies to merge, Europe might be entering a Faustian pact. Helping its firms re-establish global clout could be bad for consumers if competition is diminished. But there is an even worse possible outcome: that Europe's corporate weakness will eventually lead to a defensive protectionism and the continent will close itself off from the outside world. ■



欧美相争

从雄师到败将

为什么欧洲公司在全球商业版图中日渐式微

现在提出这个问题似乎有些不近人情，但欧洲商业面临的问题比英国决定脱欧更为严重。历经十年的裹足不前，欧洲企业的全球影响力急剧下降，在全球企业排名榜上的下滑惨不忍睹，早在英国决定脱欧后的市场重挫发生之前就已经如此。全球最有价值的50家企业中，只有7家欧洲企业，而2006年时还有17家。美国企业不少于31家，中国则有8家（其他新兴市场还没有几个真正的大企业）。欧洲的企业家、投资者和政府必须要注意起来了。

世纪之交之际，欧洲公司和美国企业正面竞争并瓜分世界看似理所当然，尤其是鉴于当时日本一度咄咄逼人的跨国公司陷入全线溃退。接下来几年里，按照上市公司盈利水平和市值来衡量，相比美国而言，欧洲的影响力在上升，并在金融危机前夕达到顶峰（见图表1）。

如今真是时过境迁啊。前50名中仅存的七家欧洲企业也多为异类：三家来自瑞士，说明山中的空气和煎土豆饼确有不凡之处；还有一家百威英博啤酒集团（AB InBev）是巴西公司，只不过恰好选择了在比利时上市。欧洲传统的重量级领军企业已沦落为中量级专业公司。在英国，英国石油、汇丰银行、沃达丰（Vodafone）和葛兰素史克（GSK）在各自行业的全球排名都已经滑落至中游。法国的大企业道达尔（Total）、巴黎银行（BNP Paribas）、Orange和赛诺菲-安万特（Sanofi-Aventis）也是同样的命运。

在全球24个行业中，只有一家欧洲企业占据首位（食品业的雀巢）。欧洲领军企业的规模一般都要比大西洋彼岸的竞争对手小得多。从市值来看，联合利华仅为宝洁的五分之三，空客只有波音的一半，西门子为通用电气的三分之一，德意志银行仅为摩根大通的十分之一，而沃尔玛是欧洲最大两家连锁超市乐购（Tesco）或家乐福的十倍。

欧洲和美国经济规模相近，但欧洲500强公司的总市值只有美国500强公司的一半，总利润只有其50%至65%（具体百分比取决于所使用的计算方法）。在过去一年里，在世界500强公司中处于中位的美国公司市值180亿美元，净收入7.46亿美元。同样处在中位的欧洲公司市值仅为80亿美元，收入仅有4.4亿美元。

情形原本不该如此。上世纪八十年代，欧洲公司受多重因素牵制——纵横交错的国界、政府的高压管制以及与银行和保险公司之间的交叉持股。八十年代末开始，出现了重振欧洲公司的新理念。行业私有化及公司向投资者负责的趋势兴起。当时欧洲有一种决心，要创造出泛欧企业，在大多数国家使用单一货币在欧盟的单一市场上展开竞争。还有一种动力让欧洲企业利用其母国遍及全球的历史联系走向世界。

这些想法在上世纪90年代和21世纪初有了令人振奋的效果。欧洲各国内部达成了很多并购协议，意欲壮大欧洲企业的实力，因此成立了葛兰素史克、赛诺菲-安万特、道达尔和法荷航空（Air France-KLM）。其他协议则着眼全球布局。西班牙的西班牙电信公司（Telefónica）、桑坦德银行（Santander）、雷普索尔公司（Repsol）和西班牙对外银行（BBVA）在拉丁美洲大举投资，旨在建立第二个“本土”市场。有些企业则远赴北美寻求并购目标，BP收购了阿莫科（Amoco），威望迪（Vivendi）买下施格兰（Seagram），联合利华买入Best Foods。欧洲甚至还与硅谷展开竞争，虽败犹荣。一直到2000年，当时的欧洲都还主导着移动技术，很多技术诞生于此。诺基亚、爱立信和阿尔卡特当时跻身于全球市值最高公司之列。

| 降级之殇

问题出在哪里？欧洲经济增长缓慢未能帮助到欧洲公司，强势的美元却推高了美国企业在国内的运营收入。但还有另外四个因素解释了欧洲企业的衰落。首先，欧洲选错了行业。它主要关注大宗商品和钢铁、银行业等传统行业，而银行业的新规定压缩了跨境借贷。欧洲在技术上已经落伍，没有出现过任何规模堪比Facebook或谷歌的企业。自21世纪初以来，欧洲的技术和电讯巨头在自我改造上一直表现拙劣，哪怕它们美国的对手——包

括思科和微软——都学会了如何与时俱进。

其次，欧洲选错了市场。欧洲企业纷纷趋向新兴市场，摩根士丹利的数据显示，新兴市场贡献了欧洲企业收入的31%，而在美国则仅为17%。随着发展中国家经济放缓，对欧洲商业的打击尤为巨大，从银行到干邑酒厂和奢侈手袋制造商无一幸免。

第三，尽管其他国家一直没有停下整合的脚步，但欧洲却已裹足不前。在全球收购案中，欧洲收购方所占比例从金融危机前的三分之一下降到危机后的五分之一（见图表2）。同时，美国企业在国内不断壮大，寻求在其巨大的国内市场占据主导地位。

最后，欧洲经理人在对待股东价值方面没有那么锐意进取，这可能也导致了欧洲和美国公司的市值差异。欧洲企业的股本回报率较低，通过分红及回购给予股东的现金回报也较少。可能正因为如此，对每一美元的预期利润和资本投入，欧洲企业获得的估值都要低一些。

对此的一个回应是规模大小并不等同于全球影响力的大小。美国几家市值最高的企业——包括AT&T和伯克希尔·哈撒韦（Berkshire Hathaway）——业务都主要在国内。很多其他公司由于国内业务发展的原因而规模庞大，但海外业务比较薄弱。宝洁可能规模上比联合利华大很多，但其在新兴市场的业务却比其英荷对手要小。德国中型工程公司虽然没有数十亿的市值，但却在专业产品市场占据优势。

然而，欧洲公司不断萎缩的规模仍然令人担忧。在研发投入中，来自跨国公司的比例似乎出奇地高。在全球研发支出最多的50家企业里，欧洲只占13家（2006年时为19家），而美国占了26家。

规模不够还可能使企业容易成为收购战的目标。通用电气于2014年收购了象征法国最高工程水平的阿尔斯通公司的主要业务，恰好说明了这一点。英国富时100指数企业中，有约五分之一在过去三年里曾收到过收购要约或被视为可能的收购对象，其中就包括制药公司阿斯利康

（AstraZeneca）、英国石油和洲际酒店集团（IHG）。另外，由于美国的

税务规则鼓励美国企业把现金留在国外，因此它们在海外并购方面干劲十足。

自由贸易者可能对海外并购毫不紧张，但外资收购确有可能成为政治问题。欧洲将会吸引更多有争议的中国并购案。2015年中国化工收购了意大利轮胎公司倍耐力（Pirelli），现在又在收购瑞士种子先正达（Syngenta）。一家中国企业对德国机器人制造公司库卡（Kuka）提出的收购要约已经引发了政治丑闻。欧洲与谷歌在“被遗忘的权利”（the right to be forgotten）、反垄断和税务问题上的拉锯战都象征着欧洲作为美国技术殖民地的地位日益凸显，而这一过程将不会一帆风顺。

对此一个明显的应对之举就是重新推动欧洲内部的企业整合，但由于会引发民族主义情绪的泛滥，此类并购案通常都是一场噩梦。2012年空客公司曾意图收购英国防务公司BAE Systems，最终在连番政治争论后无果而终；德意志银行提出收购伦敦证交所，也可能在英国退欧公投之后取消。法国水泥公司拉法基集团（Lafarge）及其瑞士竞争对手豪瑞（Holcim）的合并已深陷泥潭。

最近几笔并购交易难以成功也映照出过去的轨迹。很多人的职业生涯因泛欧并购而毁。过去二十年中提出的50个最大的并购案中，约三分之一无果而终，余下的也经常在实际实施时磕磕绊绊。

有迹象显示，一股新的欧洲并购浪潮正在涌现。2015年，欧洲最大的能源企业壳牌公司（Shell）收购了其竞争对手英国天然气集团（BG）。几位大亨想要重振上世纪九十年代欧洲王国的理想。掌控着法国企业集团威望迪（Vivendi）的文森特·博洛雷（Vincent Bollore）正在意大利投资，意图打造欧洲媒体巨头，与默多克家族和Netflix的传媒帝国相抗衡。

但如果欧洲想要打造自己的巨头企业，它可能不只要克制其民族主义本能，还需收敛一下其反垄断的强硬做法。美国一些大公司成功的秘诀就是它们在国内已建立了寡头垄断地位。比如说，美国已经允许宽带业务由少数几家公司主导，由此产生了丰厚的利润。欧洲则有几十家运营商，而且

监管机构已将价格和利润压低。

通过允许企业合并，欧洲也许可以达成一个浮士德契约（译注：浮士德是德国16世纪民间传说中一个神秘性人物。据说他用自己的血和魔鬼签订契约，出卖灵魂给魔鬼，以换取世间的权利、知识和享受）。帮助欧洲企业重塑其全球影响力的过程中，如果竞争减少，可能对消费者不利；但可能还会有更糟糕的结果：欧洲企业的疲软最终会导致防御性保护主义，让欧洲将自身与外部世界隔绝开来。 ■



Free exchange

Optimising romance

To find true love, it helps to understand the economic principles underpinning the search

DATING is a treacherous business. There may be plenty of fish in the sea, yet many are unhygienic, self-absorbed, disconcertingly attached to ex-fish, or fans of Donald Trump. Digital dating sites, including a growing array of matchmaking apps, are meant to help. Their design owes more to hard-nosed economics than it does to the mysteries of the heart.

In a sense, searching for a mate is not so different from hunting for a job. Jobs, like prospective partners, have their strengths and weaknesses, which makes finding the right one a matter of complicated trade-offs. Such exchanges are different from other transactions, in that both parties must be enthusiastic about the match for it to happen. A supermarket, in contrast, does not particularly care whose wallet it is draining, nor does the power company agonise about whether a customer is worthy of its watts.

Alvin Roth, who won a Nobel prize in economics for his work on market design, made a career of studying such “matching markets”, where supply and demand are not balanced by price. Instead, people transact based on information. An apple-seller can nudge down his prices until the whole cart is sold. Yet if Apple were looking to hire two workers, it would not set a salary so puny that only two people applied. The quality of new hires often matters at least as much as their salaries.

Mr Roth, who won the prize jointly with Lloyd Shapley in 2012, found that the structure of matching markets made a significant difference in determining who wound up with whom. Systems designed to elicit people’s true preferences generated better matches between hospitals and

doctors, for example. But the entire medical profession has an interest in improving matches, and so can set up a national clearing house to do just that. The lovelorn must instead rely on an array of digital matchmakers.

Good matches depend on good information. Even without digital help, people usually have some inkling of how much they have in common. Cosmopolitan strivers move to New York, say, rather than sleepier cities, in part because they will meet other ambitious types with similar interests. Within New York, the places people choose to spend their time—whether Yankee Stadium or a yoga studio—determine which sorts of people they come into contact with. Because it is expensive to live in New York, and to spend time sweating in a yoga studio or swearing in the stands, people in such settings can be reasonably confident those around them are in some sense like-minded.

But one critical bit of information is missing: whether there is mutual interest. The act of asking someone out is fraught. In the non-digital world, approaching a potential partner brings the risk of awkwardness or humiliation. Digital dating reduces this cost dramatically. Apps like Tinder and Happn, for example, reveal that a user likes another only when the feeling is mutual.

The best matching markets are those that are “thick”, with lots of participants. The more people there are seeking digital dates, the greater the chance of finding a good match. Odds improve that another person in the crowd also enjoys Wagner, Thai food, or discussions about the economics of matching markets.

The wealth of information many dating sites request may help to home in on the perfect match, but if the effort involved is enough to deter potential mates from joining in the first place, then it does more harm than good. When Tinder first launched, largely to facilitate casual sex, users assessed

one another based only on looks, age and gender. Simplicity worked wonders; there are 26m matches made between Tinder users each day.

The advantages of thick markets are lost, however, if they become too “congested”, with users overwhelmed by the number of participants and unable to locate a good match among them. One response is to specialise. JSwipe, for instance, caters to Jewish singles while Bumble, an app where women must initiate contact, is meant to attract feminists.

But the most popular apps seek to help their users filter possible mates using clever technology. Tinder, for example, only provides users with profiles of fellow Tinderites who are nearby, to make it that much easier to meet in person. It has also introduced a “super like” feature, which can be deployed only once a day, to allow smitten users to signal heightened interest in someone. In addition, last year it started allowing people to list their jobs and education, to help users to sort through the crowds. Users get the benefits both of a big pool of potential partners and various tools to winnow them.

| *Sext and the city*

The emergence of matching apps, for those seeking love or theatre tickets or a lift, has certainly made once-onerous tasks more convenient. They may also contribute to more profound economic change. Dating apps could strengthen the trend toward “assortative mating”, whereby people choose to couple with those of similar income and skills. By one estimate, the trend accounts for about 18% of the rise in income inequality in America between 1960 and 2005. A recent study of online dating in South Korea found that it boosted sorting among couples by education.

Better matching may also mean bigger cities. Metropolitan goliaths have long been melting-pots, within which those early on in their adult lives link up with jobs, friends and mates. Matching apps, romantic or not, make

it easier to navigate the urban sprawl and sample all it has to offer. That, in turn, should make the biggest cities relatively more attractive to young people.

Apps cannot yet make break-ups less painful. And love remains mysterious enough that even the most refined algorithms cannot predict mutual attraction with confidence. But they clearly help, judging by their legions of users. After all, it is better to have super-liked and lost than never to have super-liked at all. ■



自由交流

优化浪漫

若要找到真爱，懂得这种探寻背后的经济学原理将能帮助你

约会是件变幻莫测的事。海里的鱼多的是，但很多鱼要么不卫生，要么太过自我，要么对“前鱼”一往情深得令人心悸，要么是唐纳德·特朗普（Donald Trump）的粉丝。数字交友网站，包括越来越多的婚介应用，目的就是为此提供帮助。比起神秘莫测的人心，它们的设计更多是凭借精明实际的经济学。

在某种意义上，寻找伴侣和求职并没有太大的区别。工作就像未来的伴侣，既有优势也有缺点，因此找到合适的那个就成了复杂的利弊权衡。这样的交换不同于其他交易，因为要成功双方必须都对匹配充满热情。相反，一家超市并不怎么关心它在掏空谁的钱包，电力公司也不大会为用户值不值得用电而烦恼。

阿尔文·罗斯（Alvin Roth）因其在市场设计方面的成就获得诺贝尔经济学奖，他在研究此种“匹配市场”方面颇有建树。这类市场的供求并非以价格来平衡，相反，人们基于信息交易。卖苹果的可以逐步调低价格，直到卖完整车苹果。但是如果苹果公司要雇两名员工，它定的工资不会低到只有两人来申请。新雇员的素质通常至少与他们的工资一样重要。

2012年罗斯与罗伊德·沙普利（Lloyd S. Shapley）一同获得诺贝尔奖，罗斯发现匹配市场的结构对于决定谁和谁相匹配十分重要。例如，能够推导出人们真正偏好的系统在医院和医生间产生了更好的配对。但是整个医疗行业有兴趣改善匹配状况，因而可以成立一个全国信息交换中心，专攻此类。而失恋的人则只能靠形形色色的数字交友网站了。

好的匹配靠的是好的信息。即便没有数字化的帮助，人们通常对彼此之间的共同点也略知一二。向往在大都市打拼的人去纽约而不是较为安静的城市，原因之一是他们会遇到其他志趣相投、野心勃勃的人。在纽约，人们

选择消磨时光的地方，是洋基体育场还是瑜伽馆，决定了他们会跟什么类型的人接触。因为在纽约生活、在瑜伽馆里挥汗如雨或是在体育场看台上呐喊助威都花费不菲，这种环境下的人们可能相当肯定他们周围的人在某种程度上跟自己志同道合。

但是这里少了一个关键的信息点：是否互相有兴趣。邀人去约会的举动令人担忧。在非数字化世界里，接近可能的伴侣面临着尴尬或被羞辱的风险。数字化交友大大降低了这一成本。例如，像Tinder和Happn这样的应用，只有两情相悦时才会显示一位用户喜欢另一位用户。

最佳的配对市场是那些参与者众多的“稠密”市场。寻求数字化交友的人越多，找到好对象的机会越大。茫茫人海中还有一个人喜欢瓦格纳、泰国菜或者讨论匹配市场的经济学，这一几率会提高。

许多交友网站要求的大量信息可能有助于找到最佳匹配，但是如果需要花费的力气太大，让潜在的佳偶一开始就不愿加入，那就弊大于利了。

Tinder推出伊始，主要是为了约炮，用户仅靠相貌、年龄和性别评估对方。简单出奇迹，每天Tinder用户中有2600万对成功匹配。

不过如果稠密市场太过“拥堵”，其优势也会丢失，因为用户会因参与者数量过多而不知所措，无法确定良配。一种应对方式是专门化。例如JSwipe专为单身犹太人设计，而由女方主动联系的应用Bumble旨在吸引女性主义者。

但是最流行的应用试图采用更聪明的技术帮助用户筛选出可能的伴侣。例如Tinder仅向用户提供他们附近Tinder用户的资料，这样更方便见面。它还有一项“超赞”的功能，每天只能使用一次，让神魂颠倒的用户表示对某人浓厚的兴趣。而且，去年起这一软件开始允许人们列出职业和教育背景，帮助用户从人群中挑选。用户两方得益，一方面有大量的潜在对象，另一方面有各式各样的工具来筛选他们。

| 速配都市

对那些或是求爱情，或是求戏票，或是求搭车的人来说，匹配应用的出现

让一度艰巨的任务变得更为简便。它们可能也有助于更深刻的经济变革。速配软件可能让“选型配对”更加流行，人们选择与自己收入和技能相似的人结伴。根据一项统计，从1960年到2005年，在导致美国收入不平等加剧的因素中，这一趋势占18%。最近一项关于韩国在线约会的研究显示，它促进了人们通过教育背景选择对象。

配对越成功也可能意味着城市越大。大都市始终是大熔炉，其中的年轻人通过工作、朋友和伴侣互相结识。速配软件，无论是约会软件还是其他，都让人更容易在蔓延扩张的都市中穿行，体验其中百味。反过来，这会让最大的那些城市相对来说更吸引年轻人。

应用程序无法缓解分手的痛苦。爱情依然神秘，即便是最精妙的算法也不能保证会情投意合。但从庞大的用户量来看，它们显然有所帮助。毕竟，被“超赞”过又失去总好过从来没被“超赞”过。 ■



Buttonwood

Ignorance isn't bliss

Dealing with the problem of public misperceptions

IT IS not the “unknown unknowns” that catch people out, but the truths they hold to be self-evident that turn out to be completely wrong. On many issues, the gap between public perceptions and reality is very wide. The polling company Ipsos Mori found that Americans think 33% of the population are immigrants, for example, when the actual number is 14%. A 2013 poll found that Britons thought 24% of the population was Muslim—almost five times the correct figure of 5%.

Misperceptions about economic policy are common, too. Asked to name the top two or three areas of government spending, 26% of Britons cited foreign aid, more than picked pensions or education. In fact, aid spending is a small fraction of the other two and only 1% of the total.

Some of this is to do with innumeracy. Only a quarter of Britons could work out that the odds of throwing two consecutive heads in a coin toss was 25%. People are also heavily influenced by anecdotal evidence and by fears for themselves or their families—hence the tendency to overestimate the prevalence of crime or teenage pregnancy. (Asked how many teenage girls get pregnant each year, Americans plumped for 24%; the actual figure is 3%.)

More worrying is the possibility that people simply do not trust the official numbers. When Britons were asked why they overestimated the percentage of immigrants within the population, two answers dominated. One camp said that the government undercounted the numbers because of illegal immigration; a second group simply insisted their own answer was right, regardless of the evidence.

This points to the difficulty facing mainstream politicians who are trying to halt the rise of populists like Donald Trump. Reasoned presentation of the facts may not help since the source of the information, whether it is the government or the mainstream media, will always be suspect. Those advocating that Britons vote to leave the European Union in this week's referendum, for example, dismiss warnings about the economic impact from the IMF, OECD and Bank of England on the grounds that, "They would say that, wouldn't they?"

If public misperceptions can distort economic debate, they are also a problem when it comes to financial markets. Financial products are often complex and buyers can be confused by the terminology. One survey found that only half of Americans knew that mutual funds did not offer a guaranteed return. A lack of mathematical knowledge is a further difficulty. Another survey asked 50-somethings questions that related to financial literacy; asked to calculate how much each of five prize-winners would get from a lottery jackpot of \$2m, only 56% of respondents could answer the question. More than two-fifths did not know the difference between simple and compound interest.

The trend has been for individuals to shoulder more responsibility for their financial well-being than they did in the past. This is particularly true in the case of pensions, where companies are retreating from the paternalistic approach of offering pensions linked to a worker's final salary. In the brave new world of defined-contribution schemes, workers get a pot at retirement which they must eke out for the rest of their lives.

These are difficult calculations to make. A survey by the Society of Actuaries found that around 40% of Americans underestimated the average life expectancy of retired people by five years or more. Around 77% of Americans are very or somewhat confident that they are well prepared for retirement but only 63% say they have saved any money towards it,

according to the Employee Benefit Research Institute.

These misapprehensions illustrate the problem with the idea of *caveat emptor*, or buyer beware, when it comes to retail customers of financial services. Investment products are not the same as other goods. First, the price is not immediately obvious, given the impact of annual charges and fees on a customer's long-term return. Second, the usefulness of the product may only become apparent after several years. A mutual fund is not like a corked wine that people can hand back to the waiter right away. By the time customers find out things have gone wrong, their financial future may be badly damaged. Third, there is an asymmetry of information between the seller and the buyer.

Educating children and adults to be financially literate might help in the long term. Until then regulators, just like politicians, must deal with the public as they are, not how they might like them to be. ■



梧桐

无知不是福

应对大众的种种误区

让人们落入陷阱的不是“茫茫未知”，而是那些他们认为不证自明、结果却大错特错的“真理”。在许多事情上，公众认知与实际情况之间都存在着相当大的差异。例如，民意调查公司益普索·莫里（Ipsos Mori）调查发现，美国民众认为外来移民占到了总人口的33%，而实际数字是14%。一项2013年的民调显示，英国人认为全国人口的24%都是穆斯林——几乎是实际数字5%的五倍。

人们对经济政策的误解也很普遍。如果让英国人列举出两三个政府支出最多的领域，提及对外援助人达26%，远多于选养老金和教育的。实际上，对外援助上的支出仅相当于其他两项的一小部分，占总支出的1%。

有些误区与民众数学知识的欠缺有关。只有四分之一的英国人能够算出连续两次抛出硬币正面的概率是25%。道听途说以及对自己和家人的担忧也会严重影响他们的判断——于是他们会倾向于高估犯罪和青少年怀孕的普遍程度。（问美国民众每年会有多少少女怀孕，他们认为有24%，而实际数字是3%。）

更让人担忧的是，人们可能根本就不相信官方数字。问英国人他们何以会高估移民占人口的比例，主流答案有两种。一种声音认为，因为非法移民的存在，政府的统计数字偏低；另一方则干脆无视证据，坚持自己的回答是正确的。

那些试图阻止唐纳德·特朗普（Donald Trump）等民粹派崛起的主流政客们也面临着类似的困境。有理有据地陈述事实也许并没有用，因为无论是来自政府还是主流媒体，人们对信息的来源永远都持怀疑态度。例如，国际货币基金组织（IMF）、经合组织（OECD）以及英格兰银行都曾警告脱离欧盟会对经济产生影响，但那些在本周英国公投中主张脱欧的人对此不

予理会，理由是“他们肯定会这么说啊，不是吗？”

公众误区不仅会扭曲对经济的讨论，在金融市场中也成为一个问题。金融产品通常都很复杂，买家很可能被各种术语弄糊涂。一项调查发现，只有一半的美国人知道共同基金并不保证收益。民众数学知识的匮乏令问题更糟。在另一项调查中，调查者向一些五十多岁的人提了些关于财务知识的问题，如“五个得奖者去分两百万美元的彩票头奖，每人可分得多少？”，结果只有56%的被调查者能够答对。超过五分之二的人不清楚单利与复利的区别。

相较以往，如今的趋势是个人要为自己的财务福祉承担更多的责任，在养老金这件事上尤其如此。公司不再实行退休金与员工最终薪水挂钩的照顾做法。在实行固定缴费方案的“美丽新世界”里，员工在退休时会得到一笔钱，余生就只能以此度日。

算清楚退休金这笔账并不容易。北美精算学会（Society of Actuaries）的一项调查发现，约40%的美国人把退休人员的平均预期寿命少估算了五年或更多。根据雇员福利研究所（Employee Benefit Research Institute）的调查，大约有77%的美国人非常或还算自信地表示，自己已为退休做了万全的准备，但只有63%的人称已为退休存了些钱。

鉴于人们的种种错误认知，对购买金融服务的零售客户们实行“买主自负其责”的原则就很有问题。投资性产品和其他商品不同。首先，由于年费及其他费用会对客户的长期收益有影响，其价格并非开始时就一目了然。其次，产品的效用也许要若干年后才会显现。如果发觉一瓶红酒味道不对，即刻就可以让服务生撤走，但对于共同基金却并不能如此。等消费者发觉情况不对，他们未来的经济保障也许已经遭受了严重的破坏。最后，买卖双方之间还存在着信息的不对称。

长远来看，对儿童和成年人进行教育以提高他们的财务素养也许会有用。但眼下监管机构需像政客们一样，接受并应对人们的现状，而不是指望人们的知识水平符合监管者的期待。 ■



Printed electronics

On a roll

Printing with conventional rotary presses will create cheaper electronics

MAKING things with 3D printers is an idea that is being adopted by manufacturers to produce goods ranging from false teeth to jet engines. Conventional printing, though, has not remained idle. Machines that have their origins in the high-speed rotary presses that apply words and images to large reels of paper, like the ones which turn out the physical versions of this newspaper, have started making other things as well.

The extent of this transformation can be seen at a factory in Accrington, a town in one of Britain's former industrial heartlands, Lancashire. Here, Emerson & Renwick, founded in 1918, has expanded beyond its formative business of making wallpaper-printing equipment. The latest piece of kit to which the finishing touches are being added is part of the firm's Genesis range. It is about the size of a shipping container and is designed to coat and print electrical devices. Like a conventional printer it does so on long rolls of material, called webs. Then, just as printed pages are cut by guillotines from such webs for binding into newspapers, magazines or books, these printed items are cut out and used in products ranging from solar cells to display screens to batteries. One customer wants to print some of the main components of a new generation of smartphones.

Roll-to-roll printing of this sort is quick and efficient. Some of the fastest web-offset presses, in which an inked image is transferred to another roller and thence to the surface being printed, can churn out more than 20 newspapers a second. Flexographic presses, which use a flexible relief image on a cylinder to print things such as packaging, can belt along at 500 metres a minute. These methods have already been adapted to print basic electronic circuits, by replacing conventional graphic inks with conductive

inks that can carry an electric current. Scientists and engineers, however, have loftier ambitions than these. They are developing ways to print not just circuits but also sophisticated electronic devices, such as thin-film transistors, using the mass-production capabilities of roll-to-roll processes.

| *Transistorised, at half the price*

The machine in Accrington is one such offering. It puts sequential coatings onto webs of material such as plastic film, flexible glass and metal foil. Some coatings conduct. Some insulate. Some are semiconductors. Some emit light. Emerson & Renwick produces special carts, each the size of a large oven, which are wheeled into the printing system to configure it for different applications. Some carts contain equipment that accelerates ions from a plasma onto a source material, in order to spatter molecules from that source onto the web. That allows printing at the atomic scale. Others perform a similar trick using a beam of electrons. Others still employ chemically reactive gases to etch features such as holes and channels less than 50 nanometres (billionths of a metre) across into the coatings, for electrical connections. To avoid contamination, all of these processes take place in a vacuum.

As exotic as the Genesis machine may seem, though, many of its underlying technologies are, according to Colin Hargreaves, Emerson & Renwick's boss, similar to those found in a conventional graphics press. In particular, careful management of the web through its winding, tension and control is essential. A break in the web, as any newspaperman knows, brings production to a time-consuming and expensive halt. When printing electronics with such exacting processes in a vacuum, a web-break is potentially catastrophic as it could damage a whole reel.

Printing electronics requires special formulations of ink. Often, these are made with silver, which is a better conductor even than copper. But silver is expensive. An alternative, being worked on by Tawfique Hasan and his

research group at Cambridge University, is to include flakes of graphene in such inks. Graphene is a form of carbon made from sheets a single atom thick. The result, Dr Hasan claims, can be manufactured and printed for a fraction of the cost of silver ink and is conductive enough for many applications, such as disposable biosensors used to test samples from patients, and packaging that can track and authenticate a product. Graphene ink could also be used to make electrodes for printed batteries.

Dr Hasan and his colleagues have demonstrated flexographic printing of conductive graphene ink at more than 100 metres a minute. They are working in collaboration with Novalia, a firm in Cambridge that has produced several printed touch-sensitive products, including a musical keyboard and interactive posters. They have also established a company called Inkling Cambridge to commercialise the formulation and develop other electronic inks, coatings and paints.

One idea they are exploring is “smart” wallpaper. In addition to graphene ink, this would use either organic light-emitting diodes (OLEDs) or quantum dots—crystals of semiconducting material just a few atoms across. Both of these emit light when excited by electricity, so wall coverings printed with such materials could be used to illuminate rooms.

Elsewhere, Taiwan’s Industrial Technology Research Institute plans to open a roll-to-roll line in 2017, to make OLED lighting panels for display screens, decorative lighting, signage and exterior car lights. These will be printed on rolls of plastic film or ultra-thin flexible glass. The institute says its system will incorporate seven separate processes, including coating, baking and etching, into a single roll-to-roll machine. At the moment, each process requires a different apparatus, and the products have to be made one at a time, or in batches.

Another use for printed electronics of this sort is solar energy. Several

groups are working on making thin-film solar panels in this way. Such panels, being cheap and lightweight, could readily be attached to walls and roofs, and even built into roofing tiles. In this context, a family of crystalline materials called perovskites is attracting particular interest for roll-to-roll printing. Whereas the best conventionally made silicon-based solar panels convert the energy in sunlight into electricity with an efficiency of just over 20%, researchers at the Lawrence Berkeley National Laboratory, in California, think they can push that to 31% using perovskites. And being small, crystalline grains, perovskites make ideal ingredients of ink.

Inkjet printing is also getting a roll-to-roll makeover, according to David Bird of the Centre for Process Innovation (CPI), a British government-backed organisation that helps companies commercialise new technologies. Inkjet printers are not particularly fast, but they are parsimonious, for they spray ink only where it is needed. Moreover, they are flexible and easily customised. To alter what is being printed requires only a software reload, rather than the changing of a printing plate. And lack of speed is relative. The CPI's inkjet machine can, for example, print copper circuits onto rolls of plastic at a rate of 17 metres a minute. These circuits are used for things like sensors and radio antennae. Electronics can be made with 3D printers, too. These produce objects by depositing successive layers of material. Like inkjet printers, 3D printers are flexible, but they build things one at a time or in small batches and are mostly used to print larger objects.

As Dr Bird points out, printing of any sort at speed demands good quality control. Single-sheet or batch production permits an error to be spotted before it is repeated, but high-speed roll-to-roll systems can churn out a lot of waste if there is any delay in identifying problems. Cameras can be used to detect errors in printed text or graphics, but they are not much cop at spotting faults in microscopic layers of transparent material whizzing past

on a web—not least because there may be nothing to see. To help resolve this for the CPI's machines, researchers at the University of Huddersfield, across the Pennines from Accrington, in Yorkshire, have come up with a method that builds up a three-dimensional model of the web's surface using reflected light, and can raise the alarm if it detects any depressions that might indicate an uncoated spot.

| *A new meaning of "computer printer"?*

How far printed electronics will go remains to be seen. At present such products tend to be used as components rather than complete systems. The technology is a long way from being able to roll-print powerful computer chips, which contain several billion transistors squeezed onto a tiny piece of silicon. These processors are currently made in batches in costly semiconductor fabrication plants.

Using roll-to-roll systems to print lots of transistors in the form of a processor is nevertheless an attractive proposition. In many applications these processors need not be very powerful. But they won't be wimps. Ma Zhenqiang of the University of Wisconsin-Madison and his colleagues recently fabricated a flexible transistor that operates at 110 gigahertz—making it fast enough to use in almost any electronic application. To make this transistor Dr Ma used an electron beam to etch shapes just ten nanometres wide in a mould that was then employed to form the transistor's circuitry in an ultra-thin flexible silicon membrane. As the mould can be reused, Dr Ma reckons his method could easily be scaled up for roll-to-roll processing. Printed media may be going out of style, then, but it looks as if their electronic replacements will still require the presses to roll. ■



印制电子产品

滚滚向前

传统的轮转印刷机将生产出更便宜的电子产品

用3D打印机制造产品的理念正为制造商所接受，以这种方式制成的产品从假牙到喷气发动机，不一而足。然而，传统的印刷业也并没有无所事事。高速轮转印刷机可在大卷纸张上印刷文字和图片，印制本刊纸质版的机器就与之类似。而脱胎于这些印刷机的机器已经开始制造别的产品。

这一转变的程度在阿克林顿（Accrington）的一家工厂可见一斑。阿克林顿是英国前工业中心地带之一兰开夏郡（Lancashire）的一个城镇。在那里，创立于1918年的Emerson & Renwick公司已向制造墙纸印刷设备这一成型业务之外拓展。该公司最新的一件设备正在进行收尾工作，该设备是其“创世”（Genesis）系列产品之一。它大概有一个货运集装箱大小，用于涂覆和印刷电子部件。跟传统印刷机一样，它也是在被称作卷筒的长卷材料上作业。之后，正如印刷好的纸页由切纸机从卷筒上切下，再装订成报纸、杂志或书籍那般，这些印好的材料也被切好，用于从太阳能电池、显示屏到电池等多种产品。一位客户还想印制新一代智能手机的部分主要组件。

这样的卷对卷印刷既快捷又高效。卷筒纸胶印机将着墨图像先转印到另一辊筒上，然后再转印到待印制表面，最快的那些机器每秒钟就能印刷20多份报纸。柔版印刷机使用墨辊上的柔性浮雕印版印制包装材料之类的产品，每分钟可印500米。这些方法已经用来印制基础电路板，只不过传统印刷油墨被替换成了可通过电流的导电油墨。不过科学家和工程师们还有更宏伟的志向。他们正在研究利用卷对卷工艺的大批量生产能力印制更为复杂的电子设备，如薄膜晶体管，而不仅仅是电路板。

| 晶体管化，价格减半

阿克林顿的机器就是这样一种产品。它为塑料薄膜、柔性玻璃和金属箔之类成卷的材料一层层加上涂层。有些涂层导电，有些绝缘，有些是半导

体，有些能发光。Emerson & Renwick还生产了特制的小车，大小相当于一个大烤箱，能够推进印刷系统中，根据不同的应用配置系统。有些小车上装有设备，能让等离子体中的离子加速到达原材料，使原材料中的分子溅射到卷筒材料上，实现原子级印刷。另一些小车则用电子束达到类似的效果。还有一些仍会使用化学活性气体进行蚀刻，例如在涂层上刻出直径小于50纳米（十亿分之一米）的孔洞和沟槽以便导电。为了避免污染，所有这些工序都在真空中完成。

尽管“创世”这样的机器看似标新立异，但Emerson & Renwick的老板科林·哈格里夫斯（Colin Hargreaves）认为，它的很多基础技术都与传统的图像印刷类似。其中最关键的一点就是要通过卷绕、张力和操纵装置仔细管理卷筒材料。每个报业人士都知道卷筒纸断纸造成的停工既耗时又费钱。在真空中以如此精细的工序印制电子产品时，卷筒材料断裂可能引发灾难性后果，因为这可能会损坏整个卷筒。

印制电子产品需要特殊配方的油墨，通常由银制成。银的导电性比铜更好，但价格较高。剑桥大学的陶菲克·哈桑（Tawfique Hasan）和他的研究团队正在开发一种替代品，将石墨烯薄片加入这种油墨中。石墨烯是碳的一种形式，单层石墨烯只有一个碳原子的厚度。据哈桑称，他们的研究成果可以仅用含银油墨几分之一成本来生产和印制产品，而且导电性足以用于许多方面，如用来检测病人样本的一次性生物传感器，以及可以追踪并验证某个产品的包装材料。石墨烯油墨还可以用来制作印制电池的电极。

哈桑和他的同事们展示了采用导电石墨烯油墨的柔版印刷，每分钟可印一百多米。他们正在和剑桥的一家名为Novalia的公司合作。Novalia已经生产出多个印制触摸感应产品，包括一款音乐键盘和一些互动式海报。为了将这一配方商业化并开发出更多的电子油墨、涂层和涂料，他们还成立了一家名为Inkling Cambridge的公司。

他们正在探索的一个想法是“智能”墙纸。除了石墨烯油墨，这种墙纸还可以采用有机发光二极管（OLED）或量子点，即直径仅有几个原子大小的

半导体材料晶体。这两种材料都可在电流激发下发光，因此以这些材料印刷的墙纸可以用于室内照明。

在其他地方，台湾工业技术研究院也计划于2017年开设一条卷对卷生产线，为显示屏、装饰照明、标牌和汽车外灯提供OLED照明面板。这些面板会印在成卷的塑料薄膜或超薄柔性玻璃上。该研究院称这一系统会把包括喷涂、烘干、蚀刻等在内的七道单独工序集成到一台卷对卷设备上。目前每道工序都需要不同的设备，产品需要逐次完成，或者逐批完成。

这类印制电子产品的另一个用途是太阳能。几个机构正在研究如何以这种方式制作薄膜太阳能板。这些太阳能板既便宜又轻巧，可以方便地固定在墙上和屋顶上，甚至嵌入屋顶瓦片里。考虑到这些因素，卷对卷印刷界对一种叫做钙钛矿的晶体材料尤为感兴趣。按照传统方法制作的最好的硅基太阳能板将阳光转换为电能的效率稍高于20%，但加州劳伦斯伯克利国家实验室（Lawrence Berkeley National Laboratory）的研究人员认为他们能用钙钛矿把转换率提升到31%。钙钛矿为晶体状小颗粒，是油墨的理想原料。

工艺创新中心（the Centre for Process Innovation, CPI）是一家英国政府支持的机构，旨在帮助公司将新技术商业化。CPI的大卫·伯德（David Bird）称喷墨打印也正在经历卷对卷的革新。喷墨打印机不是特别快，但非常俭省，因为它们只在需要时喷墨。同时它们灵活多变，易于个性化定制。要更改印制的产品只需重装软件，而不必更换印版。而且速度慢也只是相对的。例如，CPI的喷墨机能以每分钟17米的速度在成卷塑料上印制铜质电路。这些电路可以用于传感器和无线电天线等。电子产品也可以用3D打印机印制——它们通过连续沉积多层材料来制造产品。像喷墨打印机一样，3D打印机很灵活，但它们一次只能制造一件产品或者做小批量生产，通常用来打印较大型的物件。

正如伯德指出的，任何高速印制都需要良好的质量控制。单页或批量生产时，有错误可以及时挑出，避免重复出错。但高速卷对卷系统中，如果在纠错上有任何延误，就可能会造成大量浪费。摄像头可以检测印刷文字或

图像上的错误，但在检测卷筒上飞驰而过的微层透明材料上是否有错误时就没什么用了，尤其是因为上面可能并没有什么可见内容。为了帮CPI的机器解决这一问题，与阿克林顿相隔一道奔宁山脉、位于约克郡的哈德斯菲尔德大学（the University of Huddersfield）的研究人员想出了一个办法。他们运用反射光构建出一个卷筒材料表层的三维模型，检测到某些凹陷时会发出警报，这些凹陷可能表示该处有未喷涂到的点。

| “电脑打印机”的新含义？

印制电子产品能走多远尚有待观察。目前这类产品往往用作部件而非整体系统。这一技术离能够卷筒印制强大的电脑芯片还差得很远——在电脑芯片中，一块小小的硅片上就密布着几十亿个晶体管。这些处理器目前均由造价高昂的半导体制造厂批量制成。

然而采用卷对卷系统印制处理器中大量的晶体管确实是个诱人的设想。在很多应用中，这些处理器并不需要非常强大，但它们的性能也不能太孱弱。威斯康星大学麦迪逊分校的马振强和他的同事们最近研制出一种柔性晶体管，工作频率可达110千兆赫，足够用于几乎所有电子类应用。为了造出这一晶体管，马振强用电子束在模具上蚀刻出宽度仅为十纳米的图形，然后用它在超薄柔性硅膜上形成晶体管的电路。因为模具可以重复使用，马振强认为他的方法能够方便地升级至卷对卷生产。印刷媒体或将成为明日黄花，但看起来替代它们的电子媒体仍需要印刷机开足马力，滚滚向前。■



Energy policy

Hinkley Pointless

Britain should cancel its nuclear white elephant and spend the billions on making renewables work

THE “golden decade” of co-operation between Britain and China, launched last year as Xi Jinping banqueted at Buckingham Palace, seems to have lasted all of nine months. The centrepiece of the new partnership was a deal in which China would invest £6 billion (\$8 billion) in a new French-built nuclear power station at Hinkley Point in south-west England, before building one of its own in the south-east. Yet on July 28th, as the Hinkley project was due to receive final approval, Britain’s new government announced ominously that it was under review.

Putting the brakes on Hinkley has tarnished the golden era with China, whose state-owned news agency complained about Britain’s “suspicious approach”. It risks annoying France, which can complicate Britain’s exit from the EU. And Britain badly needs new sources of energy.

Even so, scrapping the deal would be the right decision. Regardless of security worries about China, which are probably overblown, the Hinkley plan looks extraordinarily bad value for money. What’s more, as renewable sources of energy become more attractive, the days of big, “baseload” projects like Hinkley are numbered. Britain should pull out of the deal, and other countries should learn from its misadventure.

| *The fallout*

EDF, the firm building Hinkley, has yet to finish two similar reactors in France and Finland that, based on a design plagued by problems, are overdue and over-budget. The British government has nonetheless promised to pay about £92.50 per megawatt hour for Hinkley’s output,

compared with wholesale prices of around £40 today. By 2025, when Hinkley is due to open, that may look even pricier; by the time the guarantee runs out, 35 years on, it could look otherworldly. Other technologies are galloping ahead, upsetting all kinds of pricing assumptions. In the past six years Britain's government has reduced the projected cost of producing electricity from onshore wind in 2025 by one-third, and of solar power by nearly two-thirds (see chart). Because nobody knows how the next few decades will unfold, now is not the time to lock in a price

One of the few certainties is that Hinkley is not the sort of power station that any rich country will want for much longer. Nuclear energy has a future, but big, always-on projects like Hinkley, which would aim to satisfy 7% of Britain's energy needs, do not fit the bill. As renewables generate a growing share of countries' power, the demand will be for sources of energy that can cover intermittent shortfalls (for instance, when the wind stops blowing or the sun goes in).

To keep the lights on in the short run it would make more sense to use gas-powered plants. These can be built quickly, run cheaply and turned on or off as required. Meanwhile, the sums earmarked for Hinkley could be put to use in better ways. Improved electricity storage is one answer to the intermittency problem. Battery technology is fast improving; Tesla Motors opened its "Gigafactory" in America last month; and other firms are experimenting with drawing power from unusual stores, such as traffic-light batteries. Interconnectors can link energy-hungry countries like Britain with northern European ones, where there is a wind-energy surplus, or Iceland, which crackles with geothermal energy. The grid operator could pay firms to curb power usage at peak times.

All of these options would be cheaper than Hinkley, which would take ten years to get going and represent a huge, ongoing cost to bill payers, if it ever

worked at all. Such a strategy would also buy time to see what new technologies emerge. The chances are, these would come from China anyway. ■



能源政策

欣克利，无意义

英国应该废弃其昂贵又无用的核能，将数十亿资金用于可再生能源

去年习近平出席白金汉宫的晚宴，开启了英中合作的“黄金十年”，这一关系看来已维持了整整九个月。新伙伴关系的重头戏是一项协议——中国在英格兰东南部自行修建核电站之前，将向一座新核电站投资60亿英镑（80亿美元）。该核电站将建在英格兰西南部的欣克利角（Hinkley Point），由法国承建。不过，到了欣克利项目本应获得最终审批的7月28日，英国新政府却宣布了一个不祥的消息——该项目还在接受审查。

叫停欣克利角项目使英中关系的“黄金时代”蒙上了一层阴影，中国国家通讯社抱怨英国所持的“怀疑态度”。此举也有惹恼法国的风险，进而使英国“脱欧”复杂化。而且，英国迫切需要新的能源。

即便如此，取消协议也应是正确的决定。且不论在安全方面对中国的担忧（很可能有夸大之嫌），欣克利计划本身似乎就特别不划算。更重要的是，随着可再生能源变得越来越有吸引力，像欣克利这样的大型“基本负载”项目已经时日无多。英国应当退出这一合作，而其他国家也应从这一不幸事件中汲取教训。

| 核辐射

承建欣克利核电站的法国电力集团（EDF）尚未完成法国和芬兰的两个类似的反应堆。由于设计上问题不断，这两个反应堆都未能按期交付，且超出预算。尽管如此，英国政府已承诺以每兆瓦时92.5英镑的价格购买欣克利的电力，而目前的批发电价约为40英镑。到欣克利预计投产的2025年，这个价格可能会更显昂贵；在35年后承诺到期时，这可能已成为天价。其他技术的发展正一日千里，颠覆了各种各样的价格设定。过去六年英国政府已经将2025年通过陆上风能发电的预期成本降低了三分之一，而把通过太阳能发电的预期支出降低了近三分之二（见图表）。没人知道今后几十年会如何发展，所以现在并不是锁定价格的时机。

可以确定的事情并不多，但其中之一便是用不了多久任何富裕国家都不会再想要欣克利这样的发电站。核能有它的未来，但像欣克利这种要持续运营的大型项目（预计将满足英国7%的能源需求），并不符合需求。随着可再生能源的发电比例越来越高，那些能应对间歇性的电力不足（比如，没有风或阳光的时候）的能源才是人们所需的。

若要在短时间内保持供电稳定，采用天然气发电站更合情理。这些电站建设迅速，运行成本低，而且能按需开关。同时，拨给欣克利项目的资金还可以有更好的去处。改进电力储存是解决间歇性断电的方法之一。电池技术正在迅猛发展；特斯拉汽车公司的超级电池工厂Gigafactory上月在美国揭幕。其他公司也在试验从一些不寻常的地方获得电力，如红绿灯电池。互连设施可将英国这样能源短缺的国家和风能还有富余的北欧各国连接起来，或者与拥有地热能的冰岛相连。电网公司可以向企业付费，让它们在高峰期控制用电。

所有这些办法都比欣克利便宜。欣克利要十年才能建成，即便它最终发挥作用，也将给电力用户带来持续的高额成本。延搁欣克利核电计划的策略还能够争取时间检验哪些新技术可能崛起。只不过，这些技术很可能还是会来自中国。 ■



Oil-price reporting

Striking it rich

A niche business straddling journalism and oil is proving surprisingly lucrative

TWO lines of business have stood out of late for their inability to make money: journalism and oil. So when it emerged on May 23rd that Argus Media, a British firm that reports global commodities prices, is to be sold to an American investment firm for \$1.4 billion, it aroused a variety of emotions. One was surprise. “Data about oil markets now seem to be worth more than oil itself,” exclaimed one executive of a commodities exchange. Another, in the words of an employee at S&P Global Platts, Argus’s main rival, was “jealousy”. The sale has turned some of Argus’s 750 scribblers, a quarter of whom are said to own shares or options, into millionaires.

Argus began in 1970 as a newsletter reporting on petroleum-product prices in the Netherlands. General Atlantic, which is buying out the family of Jan Nasmyth, its late founder, has made the most aggressive move so far in an industry that is fast consolidating. Its leaders, Platts and Argus, are battling for dominance over reporting prices of the most widely used oil benchmarks, such as Dated Brent and West Texas Intermediate (WTI), against which billions of dollars-worth of oil are priced each day.

The benchmarks are used by oil companies, oil-producing countries, derivatives traders and others to decide at what level they should price hundreds of different grades of oil. Their providers make money by selling subscriptions to their information; the more prominent the benchmark, the more subscribers it generates.

In recent years, Platts has made the running in the oil markets with its Brent assessment, based on four grades of North Sea crude, which is used as a reference for petrol prices stretching from Europe to Asia. WTI, which

sets the price of different grades of oil traded in the Americas, is assessed at a landlocked hub in Oklahoma and has not got the same global reach.

General Atlantic says its interest in Argus grew after 2009, when big producers like Saudi Arabia began using its sour-crude index rather than a rival from Platts to price imports into the United States—an indication that Platts's leadership of the market was not impregnable. In December America lifted a ban on crude exports, giving WTI a new lease of life. General Atlantic hopes Argus's WTI physical assessment will become an international rival to Brent. "The battleground is global," says Adrian Binks, who will remain Argus's boss after over 30 years leading the company.

Asia is a further bone of contention as trade flows have shifted east. Platts's long-established Dubai benchmark, used to price Middle Eastern crude bound for Asia, has been whipped around in the past year by aggressive trading from two big Chinese oil firms, Unipecc and China Oil. India's Reliance is also muscling in, and there is a vigorous new source of demand from China's so-called "teapot" refiners, recently permitted to import oil. Big oil traders like Royal Dutch Shell, long used to calling the shots on Brent crude, have complained about undue Chinese influence on prices in Asia. Platts says it has addressed the problem by adding crudes to make the benchmark more liquid this year.

There are also calls for stronger regulation as the industry consolidates. "There's a huge tension between the economic value of these businesses—both to their shareholders and the broader economy—and the lack of oversight provided by host governments," says Owain Johnson, managing director of the Dubai Mercantile Exchange (DME).

The companies argue that they are media outlets covering physical commodities, and should not be regulated like futures markets such as the Chicago Mercantile Exchange, where WTI futures are traded, or the DME.

Though their benchmarks carry enormous weight, they are gathered by journalists who sit in newsrooms, watching screens and contacting traders by phone and instant messenger. They say they police themselves based on principles set by the International Organisation of Securities Commissions in 2012.

They may be partially reassured that General Atlantic, an investor in Airbnb and Uber, disrupters of hotel and taxi services respectively, understands the importance of trying to keep regulators at bay. In the meantime, it has created a rare species at Argus: the rich and happy journalist. ■



石油价格报告

一夜暴富

横跨新闻业和石油业的利基业务利润之丰厚令人惊讶

近来有两个行业是出了名的不赚钱：新闻业和石油业。因此，当报告全球大宗商品价格的英国公司阿格斯传媒（Argus Media）在5月23日传出将作价14亿美元出售给一家美国投资公司的消息后，人们的反应可谓五花八门。一种是惊讶——某大宗商品交易所的高管感叹道：“石油市场的数据现在似乎比石油本身还要值钱。”另一种，用阿格斯主要竞争对手标普全球普氏（S&P Global Platts）一名员工的话来说，就是“嫉妒”。在阿格斯的750名撰稿人中，据说有四分之一持有该公司的股票或期权。这笔交易已经让其中一部分人跻身百万富翁的行列。

阿格斯于1970年创立，当时是一份报告荷兰石油产品价格的行业通讯。大西洋大众公司（General Atlantic）买断了阿格斯已故创始人詹姆斯·内史密斯（Jan Nasmyth）家族的股权，并在这个快速整合的行业里做出了最激进的举措。两家行业翘楚普氏和阿格斯正在争夺报告“即期布伦特现货价”（Dated Brent）和“西得克萨斯中间基原油”（WTI）等使用最广泛的石油基准价格的主导地位，每天有数十亿美元的石油依靠这些指数定价。

石油公司、石油生产国、衍生品交易员及其他组织都会用这些基准价格来确定数百种不同等级石油的价格水平。信息供应商通过订户来赚钱——基准的名气越大，订阅量就越大。

近年来，普氏利用布伦特标准推动石油市场，该标准基于北海原油的四个等级制定，为从欧洲到亚洲的汽油价格提供参考。WTI则为在美国交易的不同品级石油定价，由俄克拉荷马州的一个内陆中心进行评估，尚没有布伦特那样的全球影响力。

大西洋大众公司表示，自2009年起它对阿格斯的兴趣就越来越大，当时沙特等生产大国开始使用其含硫原油指数，而非与之竞争的普氏指数来定价

美国进口的石油。这说明普氏的市场领导地位并非坚不可摧。十二月，美国解除原油出口禁令，给了WTI新生。大西洋大众公司希望阿格斯的WTI物理评估将成为布伦特的国际竞争对手。阿格斯老板的阿德里安·布因克斯（Adrian Binks）表示：“这个战场是全球性的。”他已执掌公司30余年，且还将继续掌舵阿格斯。

亚洲是另一个争夺的焦点，因为贸易流已经转向东方。普氏历史悠久的迪拜原油指数用于定价运往亚洲的中东原油，其趋势在过去一年里已经被联合石化（UNIPEC）和中联油（China oil）这两家大型中国石油企业激进的买量所扭转。印度的信实集团（Reliance）也跻身进来，而中国最近获准进口石油的所谓“茶壶”炼油厂同样带来了大量新的需求。荷兰皇家壳牌等长期习惯于把持布伦特原油的大石油公司抱怨道，中国对亚洲石油价格的影响力已经过大。普氏表示为了解决问题，今年已经在迪拜原油基准价格中加入更多的原油类别以提高其流动性。

随着行业的整合，也有人呼吁要加强监管。迪拜商品交易所（DME）的董事总经理欧文·约翰逊（Owain Johnson）说：“无论是对其股东还是对整体经济，这些业务的经济价值与属地政府的监管缺失之间存在着很大的矛盾。”

这些公司辩称其只是报道大宗商品的媒体，不应该像交易WTI期货的芝加哥商品交易所或DME那样受到监管。尽管它们的基准价格举足轻重，但收集这些价格的却是记者——坐在编辑部里盯着屏幕，并通过电话和即时通讯来联络交易员。它们表示，自身将按照国际证券事务监察委员会组织（International Organisation of Securities Commissions）在2012制定的原则进行自律。

它们也许可以小小地松一口气——大西洋大众公司还投资了Airbnb和优步这两家酒店与出租车服务业的颠覆者，非常了解避免招惹监管机构的重要性；同时，它还在阿格斯造就了一个罕见的人群——富裕而快乐的记者。





Property taxes

Home bias

A taxing problem for foreign buyers

EVEN in hot markets like Vancouver, property sales normally slow in the summer. But for Sonia Prasad and other estate agents, the last days of July were a blur of hurried sales and paperwork as buyers and sellers rushed to complete transactions before an August 2nd deadline.

On July 25th the provincial government of British Columbia decreed that, after that date, foreign buyers must pay a new 15% tax on any residential purchase. The tax is aimed at stopping these buyers from pushing up prices in Canada's most expensive residential-property market.

Ms Prasad's last-minute buyers included a couple from China who were purchasing a C\$400,000 (\$305,000) condominium in the suburb of New Westminister for their son, a student starting college in September. The extra C\$60,000 they would have had to pay might have killed the deal, Ms Prasad says. Indeed, the tax seems likely to have prompted some foreign buyers to walk away from deals agreed, but not completed, before the deadline.

Governments at all levels, from municipal to federal, have been under pressure over the past two years to curtail foreign ownership in Vancouver. Michael de Jong, the finance minister of British Columbia, says foreign nationals invested more than C\$1 billion in the province's properties in the five weeks between June 10th and July 14th. More than C\$860 million of that was spent in metropolitan Vancouver.

Back in 2011 the median price of a detached home in Vancouver was C\$933,000; now it is C\$1.56m. Household median incomes in the city have

been rising only gently, from C\$69,000 in 2011 to C\$76,000 by 2014. Sherry Cooper, chief economist at Dominion Lending in Toronto, says Vancouver's inflated prices are higher than anywhere else in the country. "When everyone is screaming about affordability, the government has to look like it's doing something," she says.

Other jurisdictions have also implemented policies and surcharges to reduce foreign ownership in their residential markets. In December Australia's Foreign Investment Review Board started to charge application fees for foreign buyers. Hong Kong, the most expensive real-estate market in the world, has added a 15% surcharge on home purchases from non-permanent residents. Britain has raised the stamp duty on homes worth more than £1.5m, the kind of properties bought by rich foreigners.

To some, however, British Columbia's move was poorly thought out. Under the Canada China Foreign Investment Promotion and Protection Agreement which took force in October 2014, foreign investors must be treated as favourably as locals, says Barry Appleton, a trade lawyer. The new tax, which targets all foreigners and not just Chinese buyers, will also violate the terms of the North American Free Trade Agreement, he alleges. This policy could end up being settled in the courts. ■



房产税

卖房也偏心

外国买家的征税问题

即便是在温哥华这样火热的市场，房地产销售在夏季通常也会转淡。但是对于索尼娅·普拉萨德（Sonia Prasad）和其他房产中介来说，7月的最后几天却因匆忙的销售和文书工作而忙得晕头转向，因为买卖双方都想赶在8月2日的最后期限之前完成交易。

7月25日不列颠哥伦比亚（British Columbia）省政府宣布，从8月2日起，外国买家购买任何住房必须额外缴纳15%的税费。该项税收是为了阻止这些买家推高加拿大最昂贵住宅物业市场的价格。

普拉萨德最后一刻接待的买家中有一对来自中国的夫妇，他们为九月份要上大学的儿子购置了一套40万加元（30.5万美元）的独立产权公寓，位于新威斯敏斯特市（New Westminster）的郊区。普拉萨德说，如果他们还得额外支付六万加元的话，这桩交易可能就要泡汤了。其实，这项税收很可能已经促使一些外国买家放弃了之前虽已达成、但在最后期限前无法完成的交易。

从市到联邦的各级政府过去两年都备受压力，要求削减外国人在温哥华拥有产权。不列颠哥伦比亚省财政厅长麦德庄（Michael de Jong）说，6月10日至7月14日的五周内，外籍人士在该省房地产上的投资超过了十亿加元。其中超过8.6亿加元都投入到了温哥华都会区。

回溯至2011年，温哥华一套独立住宅价格的中位数是93.3万加元，而现在则为156万加元。该市的家庭收入中位数仅略有上涨，从2011年的6.9万加元升至2014年的7.6万加元。多伦多Dominion贷款公司（Dominion Lending）总经济师雪莉·库珀（Sherry Cooper）称，温哥华飞涨的物价已高过加拿大任何地方。她说，“每个人都在抱怨房价高得难以承受，政府必须要显出有所作为的样子。”

其他国家和地区也在实施新政并征收附加费，以减少本地区住宅市场上的外国人产权。去年12月，澳大利亚外国投资审查委员会（Foreign Investment Review Board）开始对外国买家征收申请费。世界上最贵的房地产市场香港向购买住房的非永久居民增收15%的附加费。英国则提高了售价超过150万英镑的房屋印花税，这样的房产通常由富裕的外国人购买。

不过，在某些人看来，不列颠哥伦比亚省的举措并未经过深思熟虑。贸易律师巴瑞·阿普尔顿（Barry Appleton）称，根据2014年10月生效的《加中投资促进及保护协议》（the Canada China Foreign Investment Promotion and Protection Agreement），外国投资者必须受到与本地投资者同等的优惠待遇。他还指出，这一针对所有外国人、而并非仅仅是中国买家的新税制还将违反《北美自由贸易协定》（North American Free Trade Agreement）。这一政策最终可能搬到法庭上才能解决。 ■



Fads in corporate architecture

Putting on the glitz

Everyone wants buildings as trendy as those of tech firms

PICTURE a set of Lego that covers 50,000 square metres (540,000 square feet), costs over one billion Danish kroner (\$150m), and has a mini-golf course on its roof. In reality the new global headquarters of the Lego Group will be of real bricks and concrete, but its boss, Jorgen Vig Knudstorp, describes it with childlike glee. It will rise up in Billund, in rural Denmark, he says, as “a great facility, not opulent, very playful, for children too.” “People house” will be a totem of the firm’s success.

Mr Knudstorp is allowed to brag. The toymaker’s annual return on invested capital has topped 100% for each of the past eight years. Pre-tax profits leapt by 28% last year and sales are buoyant. His “stick-to-the-brick” strategy has done handsomely, after an earlier crisis. Warner Brothers makes and owns brand-boosting Lego movies and others run Lego-themed parks, leaving him to sell toys. After years of recruitment, he says the 4,000 staff in Denmark have outgrown their offices.

Getting a glitzy new building with an indoor prairie, open space and bright yellow staircases is a fine way to celebrate. The design is packed full of fads common to others’ new headquarters: staff who get “hot desks” to share, not their own workspaces ; a big atrium and lots of glass to suggest a transparent firm culture and not much hierarchy; space for exercise plus lots of green features, notably low energy use.

That will sound familiar to others. In June, Siemens’s boss, Joe Kaeser, unveiled a pricey new corporate HQ in Munich, and has described it as a place where encounters occur. Airbus, too, just cut the ribbon on its “Wings Campus”, a new group head office in Toulouse. A big canteen, fitness centre

and “collaborative office space” are supposed to get staff talking. Tom Enders, its boss, claimed it all shows his firm is “open-minded, innovative and future-oriented”. Meanwhile Adidas, which makes running shoes, is splashing over €500m (\$550m) on a head office in tiny Herzogenaurach in Germany. It insists the design will ensure workers’ “spontaneous interaction”.

Big, old firms try to package themselves as nimble and open because they have to compete ever harder for talent, including against tech firms. Mr Knudstorp frets that in ageing Europe, labour markets will grow ever tighter for skilled designers, software engineers and others. Offering them a career in a windowless cubicle won’t do. Luka Mucic, chief financial officer of SAP, Europe’s largest software firm, notes a change of attitude among recent graduates, saying recruits care less than previous generations did about status and title. They want to know about a firm’s “vision”, and whether it has “an environment where they have a sense of choice”, he says.

Whether non-tech firms can really win in a battle of the buildings is another thing. Apple is spending an estimated \$5 billion on its new flying saucer-shaped campus in Cupertino, California; nearby Google will erect such futuristic headquarters that one website calls it a “spiderweb canopy utopia”. Amazon, not to be outdone, is putting up tree-filled “spheres” in downtown Seattle so staff can hold meetings in forests. For European firms in out-of-the-way company towns such as Billund or Herzogenaurach, it might be hard to compete, however appealing the minigolf course. ■



企业建筑风潮

添上炫目豪装

人人都期望企业建筑能如科技公司那样新潮

想象一套乐高积木，占地五万平方米（54万平方英尺），造价超过十亿丹麦克朗（1.5亿美元），屋顶还建有迷你高尔夫球场。现实中，乐高集团的全球新总部将以实实在在的砖块和水泥建造，但其老板约尔根·维格·克努斯托普（Jorgen Vig Knudstorp）像孩子一样兴奋地描述道，新总部将在丹麦乡村比隆（Billund）拔地而起，会是“很棒的建筑，不华丽，但很好玩，对孩子们也是一样”。这座名为People house的大楼将成为乐高成功故事的图腾。

克努斯托普确实有资格夸口。过去八年间，该玩具制造商的资本回报率每年均超过100%。去年的税前利润跃升了28%，销售火爆。在之前的一场危机后，其“坚持只做积木”战略颇见成效。提升乐高品牌的系列电影由华纳兄弟制作并持有版权，而乐高主题公园则另由他人经营，克努斯托普只销售玩具。他表示，经过多年的招聘，在丹麦员工人数已达4000名，超出了办公室的容纳能力。

建造带有室内草地、开放式空间、明黄色楼梯的华丽新办公楼是个不错的庆祝方式。该设计充满了其他新总部常见的流行元素：员工共享“热点办公桌”，没有专属工作空间；庞大的中庭及大量的玻璃显示公司文化透明且没有太多层级；此外还设有运动空间及很多低能耗的绿色设计。

这听起来并不陌生。六月，西门子的总裁乔·凯瑟尔（Joe Kaeser）在慕尼黑为造价高昂的公司新总部揭幕，他形容那将是人们相遇相交之地。空客公司在图卢兹的集团新总部“飞翔园”（Wings Campus）也刚刚剪彩落成。大型食堂、健身中心及“协同办公空间”是为了促进员工交流。其老板汤姆·恩德斯（Tom Enders）称这一切都显示公司“开放、创新且面向未来”。同时，制造运动鞋的阿迪达斯正豪掷超过5亿欧元（5.5亿美元）在德国小城黑措根奥拉赫（Herzogenaurach）建造总部。公司强调其设计将确

保员工之间的“自发互动”。

老牌大企业努力把自身包装成灵活开放的模样，因为它们必须比以往更努力地争夺人才，与包括科技公司在内的企业竞争。克努斯托普担心在人口老龄化的欧洲，熟练设计师、软件工程师等人才的劳动力供应将变得更加紧张。让他们在没窗户的小隔间工作可行不通。欧洲最大的软件公司SAP的首席财务官卢卡·穆希克（Luka Mucic）注意到近年毕业生态度的转变，他说新入职员工不像上几代人那么关注地位和头衔。他说，他们希望了解公司的“愿景”及是否具有“让他们感觉有选择自由的环境”。

非科技公司能否在建筑战中胜出则是另一回事。苹果正斥资约50亿美元在加州库比蒂诺（Cupertino）建造飞碟形的新办公园区；谷歌将在附近建立起一座同样未来风格的总部，一家网站称之为“蜘蛛网天幕乌托邦”。亚马逊也不甘示弱，正在西雅图市区建造满布树木的“球屋”，让员工可在丛林中开会。相比之下，不管迷你高尔夫球场有多吸引人，位于比隆或黑措根奥拉赫这类偏远企业城镇的欧洲公司也许都很难与它们一争高下。■



The other side of Warren Buffett

Don't Buff it up

An investing hero is not a model for how to reform America's economy

WARREN BUFFETT has long dabbled in politics. In the mid-1970s he developed a taste for exclusive Washington dinner parties. In the 1980s he spent a weekend being Ronald Reagan's golf partner. He helped Arnold Schwarzenegger become the governor of California in 2003 and in 2008 John McCain and Barack Obama both hinted that they would like Mr Buffett to become their Treasury secretary.

This year America's most famous investor has spoken out loudly on political affairs—aged a liberating 85 and with a left-leaning credo. The latest of his annual letters to investors, which usually confine themselves to folksy jokes and dissections of insurers' reserve ratios, has a passionate repudiation of the bleak national mood. "For 240 years it's been a terrible mistake to bet against America," it declares. On August 1st Mr Buffett was on stage with Hillary Clinton in Omaha and laid into Donald Trump's character and business record.

If the intensity of Mr Buffett's interventions has risen over time, so has the seriousness with which they are taken. This partly reflects his financial clout. Berkshire Hathaway, his investment vehicle, is worth \$363 billion and is the world's sixth-most-valuable firm. He is at least 20 times richer than Mr Trump. It also reflects Mr Buffett's popularity: 40,000 people attended Berkshire's annual meeting in April, compared to 5,000 two decades ago. Since the death of Steve Jobs, the boss of Apple, Mr Buffett has become the lone hero of big business in America. He stands for the promise of a nostalgic, fairer kind of capitalism.

But Mr Buffett is not as saintly as he makes out. He has to act in his own

interests, and he does so legally, but if all companies followed his example America would be worse off. An example is his oft-expressed sympathy for workers. In 2013 Berkshire partnered with 3G, a Brazilian buy-out firm renowned for swinging the axe at acquired firms. Since 3G engineered the merger of Kraft and Heinz (Berkshire owns 27% of the combined firm) last year, staff numbers have dropped by a tenth.

Last year a hedge-funder, Daniel Loeb, attacked what he called a disconnect between Mr Buffett's words and his actions. "He thinks we should all pay more taxes but he loves avoiding them," he said. Mr Loeb was right: Berkshire's tax payments have shrunk relative to its profits. Last year the actual cash it paid to the taxman was equivalent to 13% of its pre-tax profits—this is probably the fairest measure of its burden—making it one of the lightest taxpayers among big firms (see chart).

Mr Buffett is a vocal critic of Wall Street, but during the crisis of 2008 he stepped in to support Goldman Sachs. Berkshire was a core shareholder in Moody's, a credit-rating agency at the heart of the subprime debacle. And the group has a big financial-services business of its own, mostly active in insurance, with \$250 billion of assets, as well as 10% of Wells Fargo, America's largest bank (by market value). This portfolio has escaped being classified as systemically important by national regulators.

Mr Buffett often expresses strong views on how firms are run; he joined 12 other prominent bosses last month to demand better governance. One recommendation was that corporate accounts should follow generally accepted accounting principles (GAAP). But Berkshire encourages investors to use its own performance methodology, based on the concept of "intrinsic value". Mr Buffett's first wife was on Berkshire's board until her death in 2004, and his son may become its next chairman.

Such inconsistencies are inevitable in a long and vigorous business life. But

there is another problem with Mr Buffett: his fondness for oligopolies. After being disappointed by returns from textiles in the 1960s and 1970s, and then by shoe manufacturing and airlines, he concluded his firm should invest in “franchises” that are protected from competition, not in mere “businesses”. In the 1980s and 1990s he bet on dominant global brands such as Gillette and Coca-Cola (as well as Omaha’s biggest furniture store, with two-thirds of the market). Today Berkshire spans micro-monopolies such as a caravan firm and a prison-guard uniform maker, and large businesses with oligopolistic positions such as utilities, railways and consumer goods.

As more money has followed his example, America’s economy has become Buffettised. Among investors there is a powerful orthodoxy that you must own stable, focused businesses with high returns and market shares and low investment needs. Managers have obliged. Of America’s top 900 industries, two-thirds have become more concentrated since the mid-1990s. Last year S&P 500 firms reinvested only 45% of the cashflow they generated. Protecting margins and cutting costs is the priority. Economic growth suffers as a result.

Like Jobs, Mr Buffett seems to be able to create a reality-distortion field around him to deflect criticism. In bookshops, for every copy of Mr Trump’s auto-hagiography, “The Art of the Deal”, or Kim Kardashian’s book of auto-pornography, “Selfish”, there are scores of tributes to a ukulele-playing Nebraskan who reads accounts for fun. And for his investors his career has of course been a triumph, with Berkshire achieving a compound annual return of 21% since 1965, double that of the S&P 500. Parts of Mr Buffett’s approach might benefit society if widely adopted—for example owning shares for long periods. He has been dogged in sniffing out wrong conduct, for example at Valeant, a drugs firm that has run into trouble. His plan to pass on most of his wealth to the Gates Foundation, a charity, is exemplary.

But he is far from a model for how capitalism should be transformed. He is

a careful, largely ethical accumulator of capital invested in traditional businesses, preferably with oligopolistic qualities, whereas what America needs right now is more risk-taking, lower prices, higher investment and much more competition. You won't find much at all about these ideas in Mr Buffett's shareholder letters. ■



巴菲特的另一面 且勿贴金

投资大佬并非美国经济改革的榜样

巴菲特涉足政治由来已久。20世纪70年代中期，他开始热衷于华盛顿的高端晚宴。到了80年代，他花了一个周末陪里根打高尔夫球。他在2003年帮助阿诺德·施瓦辛格成为加州州长，到了2008年，约翰·麦凯恩和奥巴马都曾暗示希望巴菲特成为自己的财政部长。

今年，这位美国最著名的投资人对政治问题直言不讳——85岁的他再没有什么好顾忌，也不遮掩自己的左倾信条。他每年致股东的信中通常只有些平易近人的笑话和对保险公司储备金比率的剖析，然而最近的一封信却热情洋溢地驳斥了低落的国民情绪。信中宣称：“240年来，看空美国都是大错特错。”8月1日，巴菲特在奥巴马与希拉里同台亮相，并痛斥唐纳德·特朗普的人品和经商经历。

如果说巴菲特干预政治的力度越来越大，人们重视他的程度也是越来越高。这一部分是源自其金融上的影响力。他的投资公司伯克希尔·哈撒韦公司价值3630亿美元，是全球市值第六大的公司。他比特朗普至少要富有20倍。这同时反映出巴菲特的声望：40000人参加了伯克希尔在四月份召开的年会，而20年前参加者只有5000人。自从苹果公司的老板乔布斯去世之后，巴菲特已成为美国大企业的孤胆英雄，代表了对于那种令人怀念且更为公平的资本主义的希望。

不过巴菲特并不像他表面装出来的那样圣洁。他得为自己的利益行事，而他的做法都是合法的。但如果所有的公司都效仿他，那美国反而会受损。一个例子是他经常表达对工人的同情。然而2013年，伯克希尔与巴西收购公司3G合作，而后者以大刀阔斧在收购的公司中裁员而闻名。自从3G去年策划了卡夫与亨氏的合并后（伯克希尔拥有合并后公司的27%），新公司的员工人数削减了十分之一。

去年，对冲基金经理丹尼尔·勒布（Daniel Loeb）抨击他眼中的巴菲特言行不一：“他认为大家都应该多缴税，但他自己却喜欢避税。”勒布先生说的没错：伯克希尔缴纳的税款相对于其利润缩水了。去年，该公司支付给税务部门的实际现金相当于其税前利润的13%——这很可能是最公平地衡量其税负的方式了。照这一标准，它是大企业中税负最轻的公司之一（见图表）。

巴菲特激烈抨击华尔街，但2008年金融危机期间，他却出手支持高盛。伯克希尔公司是评级机构穆迪的核心股东，而穆迪恰恰身处次贷崩溃的中心。伯克希尔自身拥有庞大的金融服务业务，资产达2500亿美元，在保险行业最为活跃；它还持有美国最大的银行（按市值计）富国银行10%的股份。这套资产组合却逃脱了被国家监管者判定为具有“系统重要性”。

巴菲特常常对公司的运营方式表达强烈的意见。上个月，他与其他12位知名老板联名要求公司改善治理。其中一个建议是，公司账户应遵循一般公认会计原则（GAAP）。不过伯克希尔却鼓励投资者使用其自有的基于“内在价值”概念的业绩评价方法。巴菲特的第一任妻子直至2004年去世都是伯克希尔的董事，他的儿子则可能接任董事长。

在长久而蓬勃的商业生涯中，这种不一的确难以避免。但巴菲特还有一个问题：他钟爱寡头垄断。先是20世纪60年代和70年代时纺织品行业的回报让他感到失望，然后是制鞋业和航空公司——他由此得出结论，即他的公司应该投资于那些不受竞争的“特许经营权”，而不是单纯的“业务”。在20世纪80年代和90年代，他赌上了吉列和可口可乐等全球霸主品牌（以及奥马哈最大的家具店，独占三分之二的市场）。如今伯克希尔的投资对象横跨微垄断（如一家大篷车公司和一家狱警制服生产商）和具有寡头垄断地位的大型企业（如公用事业、铁路和消费品）。

随着越来越多的资金效仿他的榜样，美国的经济已经巴菲特化了。在投资者中有一种强大的“正统”观念，即你必须持有回报高、市场份额高、投资需求低的那些稳定而专注的企业。在美国前900个行业中，有三分之二已经在90年代中期以后变得更为集中。去年，标准普尔500公司仅仅把其产

生的现金流中的45%用于再投资。保护利润和降低成本是头等大事，而这却影响了经济增长。

和乔布斯一样，巴菲特似乎也自带扭曲现实的气场来抵挡批评。在书店里，每看到一本特朗普的自吹型自传《交易的艺术》或是金·卡戴珊的色情自传《自私》，都会有数十本书献给这位会弹尤克里里（四弦小吉他）、以阅读账本为乐的内布拉斯加人。对于他的股东而言，其职业生涯自然是金光闪闪——伯克希尔自1965年来实现了21%的复合年均回报率，比标准普尔500指数高出一倍。如果巴菲特的方法被广泛采用——例如长期持有股份，那也可能造福社会。他对于嗅出恶行坚定不移，比如对遇到了麻烦的制药公司Valeant。他计划将大部分财富捐赠给慈善机构盖茨基金会，这一做法堪称典范。

然而他还远远不是资本主义改革的榜样。通过投资于传统企业，最好是有寡头性质的企业，他小心翼翼、基本中规中矩地积累资本。但美国如今需要的是更愿意冒险的心态、更低的价格、更高的投资和比现在多得多的竞争。在巴菲特致股东的信中，却难以看到这些观念的踪迹。■



Airlines and technology

All systems stop

Why big firms like Delta find it so hard to eliminate glitches from their IT systems

EARLY in the morning of August 8th, streams of bleary-eyed passengers arrived at London's Heathrow airport, hoping for a smooth ride across the Atlantic with Delta Air Lines, America's second-largest carrier. But most did not realise they were the first victims of the most disruptive IT glitch that has hit an airline in recent years until they got to check-in desks unable to access their details. The snafus—caused by a computer outage 4,000 miles away in Delta's Atlanta HQ—prompted the airline to cancel more than 2,000 flights, delay several hundred thousand passengers' journeys, and in some places go back to printing boarding passes on dot-matrix machines fit to be museum pieces.

The chaos highlights how vulnerable big firms are to their IT systems crashing. Delta initially blamed its electricity supplier for the outage. But the airline's chief operating officer, Gil West, later admitted that a malfunctioning power-control system at its data centre was really to blame. The 22-year-old piece of kit started a small fire, knocking out its primary and backup systems. Either way, unable to access customer records or to compile passenger lists ahead of aircraft take-offs to meet security requirements, the entire airline ground to a halt for around five hours.

Such accidents can happen, even to an company such as Delta whose systems were thought by aviation analysts to be better than those of its rivals. Only last month Southwest was forced to cancel 2,300 flights because of a faulty router that brought its systems down for 12 hours. Last September American Airlines suspended flights for several hours from Dallas/Fort Worth, its largest hub, after a similar glitch. And since the merger of United and Continental in 2010, their tacked-together IT systems

have failed regularly.

What is more surprising is that it took Delta so long to get its computers running again. It has lately spent hundreds of millions of dollars on IT upgrades. But airlines' systems are hugely complex beasts. If data is not properly backed up, for instance, it can take days to reload and make sure hundreds of connected subsystems work. "Technology is like painting a bridge. Work is never done," Delta's chief information officer, Rahul Samant, said in June.

One reason for the complexity is that airlines were early adopters of computerised systems. They built their first electronic reservation systems in the early 1950s; Delta's current system once belonged to a defunct airline that went bust in 1982. But as airlines merged and more new functions were added—from crew scheduling to passenger check-in and bag tracing—they have come to resemble technological hairballs in which one small problem quickly spirals into bigger ones that even experts struggle to disentangle.

Airlines are not the only firms plagued by such problems. Banks, too, were among the first companies to invest in IT. And they too grapple with systems cobbled together over decades. When RBS, a British bank, tried to upgrade its systems in 2012, a malfunction left many thousands of customers without access to their accounts.

Yet bosses in both industries say they are reluctant to replace their systems. For an airline, it would cost billions of dollars and take five years to do. Worse still, no single IT firm has the skills to provide all the software needed for a complete replacement. With the average tenure of airline CEOs so short, the risks of such a project going wrong outweigh the benefits. It is hard for any firm to entirely eliminate IT glitches; for many it simply isn't worth it. ■



航空公司与技术

所有系统都宕机

为何像达美航空这样的大公司都难以完全消除IT系统故障

8月8日清晨，一批又一批睡眠惺忪的乘客抵达伦敦希思罗机场，希望能顺利搭乘美国第二大航空公司达美航空的班机飞越大西洋。但是，大多数人直到在登机柜台前无法查到乘机信息时，才意识到自己遭殃了——这是近年来航空公司遭受的破坏性最大的一次IT故障。在4000英里以外的亚特兰大达美总部，计算机断电所造成的混乱导致该公司取消了2000多个航班，延误了数十万乘客的出行，在一些地方甚至倒退到要用老古董一样的针式打印机打印登机牌。

这场混乱突显了大公司的IT系统有多么脆弱。达美最初将此次事故归咎于供电公司。但它的首席运营官吉尔·韦斯特（Gil West）后来承认，真正要怪的是其数据中心的一个电力控制系统。这个使用了22年的装置起火，破坏了它的主系统和备用系统。由于无法获取乘客记录或者在起飞前编制乘客名单以满足安全要求，整个航空公司陷入约五个小时的停顿。

达美的系统被航空分析师认为优于其竞争对手，即便如此，也还是会发生这种事故。就在上个月，由于一台路由器故障导致系统瘫痪12个小时，西南航空公司（Southwest Airlines）被迫取消了2300个航班。去年9月，一次类似的故障发生之后，美国航空（American Airlines）将由其最大枢纽达拉斯沃思堡（Dallas/Fort Worth）机场出港的航班暂停了几小时。联合航空（United Airlines）和大陆航空（Continental Airlines）2010年合并以来，它们拼凑在一起的IT系统也经常出现故障。

更令人惊讶的是，达美航空居然花了如此之长的时间才使其计算机系统恢复运行。最近它刚花费数亿美元进行了IT升级。但是，航空公司的系统非常复杂且难以控制。例如，如果数据没有正确备份，需用上好几天才能重新加载并确保数百个相连的子系统能够运作。达美的CIO拉胡·沙曼特（Rahul Samant）六月份曾表示：“技术就像油漆一座桥。永远都有做不

完的活。”

情况如此复杂，原因之一是航空公司较早采用了电脑化的系统。它们在20世纪50年代初建立了行业第一个电子预订系统；达美现在的系统曾经属于一家在1982年倒闭湮没的航空公司。但是，随着航空公司不断合并，更多新功能也陆续添加进来——从机组调度到旅客登机办理和包裹追踪等。这些系统所采用的不同技术越来越相互交结，一个小问题会迅速演变成多个大问题，乃至专家都难以解决。

并不是只有航空公司正饱受这种问题的困扰。银行也属首批投资IT的公司之列，它们也在努力应付几十年来修修补补而成的系统。2012年，英国的苏格兰皇家银行（RBS）试图升级其系统时，一次故障导致成千上万的客户无法访问自己的帐户。

然而，这两个行业的老板们表示，他们并不是特别愿意更换自家的系统。对于一家航空公司来说，系统更换将会花费数十亿美元，且耗时五年。更糟糕的是，没有一家IT公司有能够提供彻底更换系统所需的所有软件。航空公司CEO的平均任期很短，他们更多会考量这样一个项目出错的风险，而非可能带来的收益。任何一家公司都很难完全杜绝IT故障；对于很多公司来说，这种努力根本也不值得。 ■



Recycling

A cracking yarn

How to put broken eggshells to use

LIKE any other businessman, Pankaj Pancholi abhors waste. In his case it was the mountain of broken eggshells he was paying some £45,000 (\$64,000) a year to have carted away to be buried as landfill. Mr Pancholi is the founder of Just Egg, of Leicester, Britain, a firm that hard-boils up to 1.5m eggs a week for sale in supermarkets and for use in such foodstuffs as sandwiches, mayonnaise and Scotch eggs (a British culinary classic consisting of an egg wrapped in sausage meat). Surely, thought Mr Pancholi, the shells could be used for something, thus earning revenue rather than draining it? So, he teamed up with Andy Abbott of the University of Leicester, to hatch a plan to recycle them.

Pure eggshells consist almost entirely of a tough, crystalline form of calcium carbonate (the chemical of which chalk is composed). Just Eggs's automated peeling equipment, though, removes not only the shell but also the membrane beneath, which is attached to the shell. The shells can contain broken bits of egg, too. All that makes the leftovers a potentially smelly industrial by-product, which is why they are buried. What Dr Abbott and his colleagues in the university's chemistry department whisked up was a way to cleanse the shells and grind them into a fine powder that might be added to various plastics as a filler material to make them more hard-wearing.

What worked in a laboratory, however, had to be scaled up into an industrial process that could cope with the output from Just Egg's busy production line. For that, Mike McNamara of Delta Engineering, a firm based near Grimsby, put together the necessary equipment to go into a special extension to Mr Pancholi's factory. The whole caboodle has just

been switched on.

The process begins with the shells travelling along a conveyor belt, to be tipped into tanks where they are mixed with water and attacked by rotating blades. The chopped material is then washed with a solvent to remove leftover protein. (Both the water and the solvent are recycled.) After this, the shells are dried and ground into a fine powder, the consistency of which can be varied according to the type of plastic to be filled.

Mr Pancholi is now egging Dr Abbott on to ask if flakes of membrane the process generates as waste can be useful, too. These flakes are rich in keratin, which is also the main substance of human skin, so they may have medical applications in, for example, wound dressings.

Moreover, Dr Abbot and Mr Pancholi are not the only ones enthralled by eggshells. Vijaya Rangari of Tuskegee University, Alabama, told a recent meeting of the American Chemical Society about his use of ultrasound to break eggshells up into particles mere billionths of a metre across. He and his colleagues found that by mixing such particles into polymers, including some derived from cornstarch, they could bolster both the strength and the flexibility of biodegradable plastics, making them more suitable for use as food packaging—including egg cartons. Faced with ever increasing costs for transport and landfill, finding such useful roles for shells makes Mr Pancholi eggstatic. (This is eggcruciating—Ed.) ■



回收

碎蛋奇谈

如何利用破碎的蛋壳

和任何其他商人一样，潘卡·潘卓理（Pankaj Pancholi）痛恨浪费。他面临的情况是每年要花费约4.5万英镑（6.4万美元）来把堆积如山的碎蛋壳运到垃圾场填埋。潘卓理是英国莱斯特市（Leicester）Just Egg公司的创始人，这家公司每周最多能销售150万只白煮蛋，供应给超市，也用于制作三明治、蛋黄酱和苏格兰蛋（一种用香肠肉包蛋的经典英国食品）等食品。潘卓理觉得，这些蛋壳总该有些用处，可以用来赚钱而不是白白扔掉吧？于是他和莱斯特大学（University of Leicester）的安迪·阿伯特（Andy Abbott）联手策划了一个回收蛋壳的计划。

纯蛋壳几乎完全由坚硬的结晶态碳酸钙（组成粉笔的化合物）构成。不过，Just Eggs的自动去壳设备不仅会去掉蛋壳，也会剥离蛋壳里面那层膜，有时候蛋壳上还沾有一些蛋液。这导致剩下来的东西变成可能很难闻的工业副产品，所以它们就被填埋掉了。阿伯特和他在大学化学系的同事们想出一种方法来清理蛋壳并将其研磨成细粉，这些粉末可以作为填充材料，添加到各种塑料中使其更加耐磨。

然而，实验室的成果还得转变为规模化的工业过程，才能跟得上Just Egg繁忙生产线的的需求。因此，总部位于格里姆斯比市（Grimsby）附近的“三角洲工程”公司（Delta Engineering）的迈克·迈克纳马拉（Mike McNamara）把一些必要的设备安装到潘卓理的工厂中一个特殊的扩建区内。整套设备刚刚启动。

这套流程先是用传送带带动蛋壳，使其落入大缸中与水混合。经旋转的叶片搅碎后，用溶剂洗涤以去除残留的蛋白质（水和溶剂都会回收再利用）。之后再把蛋壳烘干并磨成细粉，其稠度可以根据填充塑料的类型不同而加以调整。

潘卓理正在鼓动阿伯特继续研究，看看生产中产生的蛋膜碎片是不是也有用。这些碎片角蛋白含量丰富，而角蛋白是人体皮肤的主要成分，因此它们或许有医学应用，例如用于伤口敷料等。

此外，迷上蛋壳的还不只阿伯特和潘卓理二人。在美国化学学会（American Chemical Society）最近一次会议上，美国阿拉巴马州塔斯基吉大学（Tuskegee University）的维嘉亚·然贾里（Vijaya Rangari）介绍说，他用超声波把蛋壳分解为直径仅为十亿分之一米的微粒。他和同事们发现，将这些微粒混合进聚合物，如一些提取自玉米淀粉的聚合物，可以提高生物降解塑料的强度和柔韧性，让其更适合用于食品包装——包括鸡蛋的包装盒。面对日益增加的运输和填埋成本，为蛋壳找到这么好的用途令潘卓理欣喜若狂。（编者按：这可真是为蛋所苦啊。） ■



Marine management

Net positive

How to stop overfishing on the high seas

FISH are slippery characters, with little regard for international agreements or borders. The speediest, such as crescent-tailed bluefin tuna, can slice through the ocean at 70 kilometres per hour. Their routes take them beyond areas that come under the jurisdiction of individual coastal states, and into the high seas. These wildernesses were once a haven for migratory species. No longer.

Under international law the high seas, which span 64% of the surface of the ocean, are defined as “the common heritage of mankind”. This definition might have provided enough protection if the high seas were still beyond mankind’s reach. But the arrival of better trawlers and whizzier mapping capabilities over the past six decades has ushered in a fishing free-for-all. Hauls from the high seas are worth \$16 billion annually. Deprived of a chance to replenish themselves, stocks everywhere pay the price: almost 90% are fished either to sustainable limits or beyond. And high-seas fishing greatly disturbs the sea bed: the nets of bottom trawlers can shift boulders weighing as much as 25 tonnes.

Introducing private property rights is the classic answer to this “tragedy of the commons”. That is the principle behind the exclusive rights given to coastal states to maintain territorial waters. A clutch of regional organisations have been set up to try to manage fish stocks in the high seas. But as a result of overlapping remits, vested interests and patchy data, the plunder continues apace. Since 2010 the proportion of tuna and tuna-like species being overexploited has grown from 28% to 36%.

A fresh approach is needed. Slashing fishing subsidies is the most urgent

step. In total these come to \$30 billion a year, 70% of which are doled out by richer countries. By reducing fuel costs, subsidies bring the high seas within reach for a few lucky trawlers, largely from the developed world. Just ten countries, including America, France and Spain, received the bulk of the bounty from high-seas catches between 2000 and 2010, even though Africa has more fishermen than Europe and the Americas combined. That is unfair and short-sighted.

The next step is to close off more areas to fishing. As of 2014 less than 1% of the high seas enjoyed a degree of legal protection. A review of 144 studies published since 1994 suggests that to preserve and restore ecosystems, 30% of the oceans should be designated as “marine protected areas” (MPAs). Individual countries can play their part, by creating reserves within territorial waters: last year Britain created the world’s largest MPA, an area bigger than California off the Pitcairn Islands in the South Pacific. But to get anywhere near that 30% share, mechanisms must be found to close off bits of the high seas, too. The UN’s members have rightly agreed to work out how to do so.

| *Scaling up*

Progress towards even these limited goals, let alone more ambitious ones such as a total ban on high-seas fishing, will not be easy. The fishing industry is adept at protecting its interests. Questions of governance and enforcement dog every effort to police the high seas. Demand for fish is rising: humans are each consuming 20kg on average a year, more than ever before.

So in parallel with efforts to protect wild stocks, another push is needed: to encourage the development of aquaculture, the controlled farming of fish. In 2014, for the first time, more fish were farmed for human consumption than were caught in the wild; farmed-fish output now outstrips global beef production. Unfortunately, feedstocks are often poor and storage facilities

inadequate. By boosting basic research and infrastructure for aquaculture, governments could hasten a welcome trend. Eventually, efficient fish-farming will be the best guardian of stocks on the high seas. ■



海洋管理

网得好结果

如何阻止在公海上过度捕捞

鱼滑溜溜的，丝毫不理会国际协定或边界。游得最快的鱼，像尾鳍呈新月形的蓝鳍金枪鱼，能以70公里的时速在海中穿梭。它们的行迹超越沿海国家的管辖海域，进入公海范围。这些不受管辖的区域一度是迁徙物种的天堂，如今却好景不再。

根据国际法，公海（占海洋总面积64%）被确定为“人类共同财产”。假如人类仍然到不了公海，这一定义也许还能提供足够的保护。但过去六十年来，随着日益先进的拖网渔船和更为强大的测绘能力的出现，人们迎来了争相捕捞的狂欢。每年从公海所得的渔获价值高达160亿美元。各地渔业资源因此失去了休养生息的机会，并付出了代价：约90%达到或超出了捕捞的可持续临界线。而且公海捕捞对海床造成了极大的破坏：底拖网捕捞船的渔网可移动重达25吨的巨石。

引入私有产权是这一“公地悲剧”的经典解决方案。这正是沿海国家管辖领海的专属权利背后的原则。一批地区性组织相继成立，试图管理公海的鱼类资源。但由于职权范围重叠、既得利益因素以及数据的缺失，对公海资源的掠夺还在迅速蔓延。自2010年以来，金枪鱼及其同类鱼种被过度捕捞的比例已从28%上升至36%。

我们需要新办法。削减渔业补贴是最迫切的一步。这些补贴每年总计达300亿美元，其中70%由较富裕的国家发放。这些补贴降低了燃油成本，让主要来自发达国家的一些幸运的拖网渔船得以驶入公海。在2000年至2010年间，公海捕捞的收益大部分为美国、法国及西班牙等仅仅十个国家所瓜分，即便非洲的渔民比欧美的加起来还要多。这不公平而且短视。

下一步是在更多海域禁止捕捞。截至2014年，只有不足1%的公海受到一定程度的法律保护。对1994年以来发表的144项研究的分析显示，要保持

及恢复生态系统，30%海洋都应划定为“海洋保护区”（MPA）。各国均可通过在其领海上设立保护区来尽一份力：去年，英国在南太平洋上皮特凯恩群岛（Pitcairn Islands）附近海域建立了世界上最大的海洋保护区，面积比加州还大。但要接近30%这一目标比例，必须找寻机制令部分公海也成为禁渔区域。联合国成员国已同意商讨如何开展这一工作，这是正确之举。

| 扩大规模

即使在这些有限的目标上取得进展都已非易事，更遑论像公海全面禁渔这样更宏大的目标。渔业善于保护自身的利益。管理公海的任何努力都为管辖及执法权的问题所困扰。而对鱼类的需求还在增长：人类人均每年食用鱼类达20公斤，比以往任何时候都要多。

所以，在努力保护野生渔业资源的同时，还需要另一推动力：鼓励发展水产养殖，即在受控条件下进行鱼类养殖。2014年，供食用的养殖鱼类总量首次超过野生捕捞量；养殖鱼类产量现已超过全球牛肉产量。不幸的是，鱼饲料往往不好，存储设备也不足。通过提升水产养殖的基础研究及基础设施，各国政府可加快向理想的方向发展。最终，高效的水产养殖业将是公海渔业资源的最佳守护者。 ■



Schumpeter

Squeezing the tube

Instead of disrupting their industries, firms should look for opportunities under their noses

BUSINESS theorists routinely instruct managers to look over the horizon. “Blue Ocean Strategy” is the most successful book on business master-planning in recent years. In it W. Chan Kim and Renée Mauborgne of INSEAD, a business school in France, argue that companies should trawl for profits in “blue oceans” that their rivals ignore rather than “red oceans” that they squabble over. Companies often search for ways to disrupt their industries lest a rival or new entrant does the same and pulls the rug from beneath them. But reinventing a business from the ground up, to avoid being consumed by the fires of new technology, comes with huge risks as well as a potential for great rewards.

Ships that set sail for blue oceans are often becalmed in the middle of nowhere. AOL-Time Warner’s catastrophic merger in 2000 failed to remake the media business for the internet age. News Corp’s foray into social networking ended with the sale of Myspace for a small fraction of its purchase price. Sometimes being cautious, incremental and pragmatic when others are gambling on bold and visionary thinking is more sensible. Why take the chance when there is lots of money to be made closer to home? That is the argument of “Edge Strategy”, a new book by Alan Lewis and Dan McKone from LEK Consulting. They argue that before turning themselves upside down firms should think harder about profiting from the “edges” of existing businesses.

The authors focus on three such edges. The first is products: how can you stretch merchandise so that it generates more income or appeals to more people? An obvious way is to make accessories. Apple is praised as

revolutionary but one secret of its success is its tight control of the bits and pieces that adorn its main products. Once purchased, an iPhone or iPad needs a fancy leather case or fashionable headphones. Apple's own accessories come at considerable expense to the user and give the firm a steady revenue stream.

Another is to link services to products, a tactic made easier by the internet of things. Cars are increasingly connected. Onstar is an in-car service offered by General Motors whose features include automatic calls to emergency services after a crash and over-the-air diagnosis of mechanical problems. Caterpillar can monitor the performance of its excavators, bulldozers and other equipment via sensors, in return for a monthly fee.

The second edge is the "customer journey". This sounds nebulous but is, in fact, simple. Customers usually buy goods and services to solve a problem. They purchase pneumatic drills because they want to dig a hole in the road, not because they like the way they look. The authors argue that firms have lots of opportunities to make money if they walk in customers' shoes and keep their eyes open. ESAB, a company that sells welding equipment, also sells general education in welding, training for specific products and engineering consulting. Whole Foods Market, a swanky grocery store, used to specialise in the raw ingredients needed for healthy eating. It now gets around a fifth of its revenue from selling ready-to-eat foods from an ever-expanding range of sushi bars, barbecue stands, Mexican-food stations and espresso bars.

The third edge is exploiting underused parts of the enterprise. One example would be farmers renting out marginal land to energy companies for wind turbines: the farmer stays in the business of agriculture but also boosts income by finding a new use for some of his acres. Many firms routinely collect data in the course of running core operations. Sensible ones use the data to provide more services (or sell them to third parties, with due

protections for privacy). Cargill, a commodity-trading firm, has used its agricultural expertise and data to develop software that guides farmers on how best to plant their fields on the basis of 250 variables such as soil type, weather conditions and seed performance. Toyota, a Japanese carmaker, sells traffic information generated by its vehicles to local governments and businesses.

Many of these edge businesses started as an afterthought but have become vast sources of revenue. In the early 2000s Amazon started building servers for its own business. Today it makes \$5 billion a year selling cloud-computing capacity to Netflix, Pinterest and the CIA, among many others. UnitedHealthcare sells information culled from its enormous database, OptumInsight, to various customers. OptumInsight's revenue increased from \$956m in 2006 to \$6.2 billion in 2015, a much faster rate of growth than its parent company.

| *Living on the edge*

The strategy is not new: visit the cinema and you will spend more on popcorn and Coca-Cola than on tickets. Buy a car and a wily salesman will engage in a frenzy of "upselling" leather seats or after-sales services. But that is the point. The authors say that firms risk forgetting about long-established sources of growth in the pursuit of disruption. Rather than obsessing about the new, firms need to make the most of their existing businesses.

Firms must resist the temptation merely to charge for what hitherto has come free, however. American airlines dramatically increased revenues by charging customers to put their bags in the hold. This scheme earned them \$3.5 billion in baggage fees in 2014 alone but came with heaps of complaints from unhappy customers. Lots of other firms are also charging for services formerly included in the price: having paid more than \$400 for a hotel room in Manhattan recently, Schumpeter was then asked for an

extra \$10 to store his bag for a few hours between checking out and going to the airport. What next? Extra charges for soap and sheets?

In its customer-friendly forms, however, edge strategy is a valuable corrective to the obsession with transformational ideas. Firms are right to worry that their businesses are about to be shaken up by the digital revolution or by upstarts from emerging markets. But their priority should be squeezing more money out of their existing assets, not taking a leap into the unknown. ■



熊彼特

物尽其用

与其颠覆行业，不如先寻找眼前的机遇

商业理论家会例行公事地嘱咐经理人去眺望远方的地平线。《蓝海战略》是近年来关于商业总体规划最成功的一本著作。法国英士国际商学院（INSEAD）的金伟灿（W. Chan Kim）和勒妮·莫博涅（Renée Mauborgne）在书中论述道，企业应该到被竞争对手忽略的“蓝海”中拉网捕鱼，谋求利润，而不应在各方竞争激烈的“红海”中掐架。企业经常想方设法颠覆其所在行业，以免对手或新进入者先下手为强，导致自己被釜底抽薪。但彻底重塑一个行业以避免被新科技之火所吞噬，既有可能带来巨大的潜在回报，也可能带来巨大的风险。

扬帆向蓝海进发的船只经常在茫无涯际的大海上停滞不前。美国在线时代华纳（AOL-Time Warner）在2000年灾难式的合并没能重塑网络时代的媒体业。新闻集团（News Corp）涉足社交网络，最后以出售MySpace告终，售价仅为当初收购价的零头。有时，在其他搏胆识、搏远见的时候，谨慎小心、稳扎稳打、讲求实际更为明智。眼前就有大把赚钱的机会为什么还要舍近求远去冒险呢？这就是由艾意凯咨询（LEK Consulting）的阿兰·刘易斯（Alan Lewis）和丹·麦科（Dan McKone）合著的新书《优势战略》（Edge Strategy）中的观点。作者认为在企业彻底颠覆自身之前，应该更仔细地考虑如何利用现有业务的“优势”来谋求利润。

两位作者重点关注三种优势。第一是产品：如何能够扩展产品，以产生更多收入或吸引更多人？一个显而易见的做法便是经营配件。苹果因其革命性而广受赞颂，但它成功的秘诀之一就是严密控制其主产品的各种小配饰。一旦购买iPhone或iPad之后，还需要一个漂亮的皮套或者一副时尚的耳机。苹果自产的配件售价不菲，为公司提供了稳定的收入流。

另一种做法是将服务与产品挂钩，这种策略因物联网而变得容易实施。现在汽车联网的程度越来越高，安吉星便是通用汽车提供的一项车内服务，

包括自动撞车报警和远程机械故障诊断。卡特彼勒（Caterpillar）每月收取一定费用就可以通过传感器监控其挖土机、推土机和其他设备的运作情况。

第二种优势是“客户旅程”。这个听起来很玄乎，但事实上很简单。通常客户购买产品和服务是为了解决问题。他们买风钻不是因为它好看，而是想在路面钻一个洞。《优势战略》的作者认为，如果企业能够站在客户的立场上睁大眼睛洞察其需求，赚钱的机会就会有很多。销售焊接设备的伊萨（ESAB）公司同时也做焊接基础教育、具体产品培训和工程咨询。时尚高端食品超市Whole Foods Market曾专门销售健康饮食的原材料。如今该公司五分之一的收入来自其超市中不断扩大的寿司台、烧烤台、墨西哥食品站和咖啡站所销售的即食食品。

第三种优势是开发企业中尚未充分利用的资源。举个例子来说，农夫将自己农田边缘的土地租给能源公司安装风力发电机，这样农夫可以继续务农，但通过为一些土地找到新用途增加了自己的收入。很多公司在运营核心业务的过程中会定期收集数据，聪明的公司会利用数据提供更多的服务（或在保证恰当隐私保护的前提下卖给第三方）。大宗商品贸易公司嘉吉（Cargill）利用自身的农业专长及数据来开发软件，指导农夫根据包括土壤类型、天气条件和种子性能等在内的250种变量来决定如何最好地耕种自己的田地。日本汽车公司丰田将其汽车收集到的交通信息出售给地方政府和企业以获利。

很多优势业务开始时只是作为补充，但如今已成为巨额收入的来源。21世纪初的几年里，亚马逊（Amazon）开始为自身的业务打造服务器。如今通过向Netflix、Pinterest、美国中情局（CIA）及众多其他客户销售云计算能力，它每年能从中赚取50亿美元。联合健康保险

（UnitedHealthcare）将其巨大的数据库OptumInsight中采集到的信息卖给各种客户。OptumInsight的收入从2006年的9.69亿美元激增到2015年的62亿美元，增长速度远快于其母公司。

| 依赖优势

这个战略并不新颖：去看场电影，花在看爆米花和可乐上的钱比电影票价还多。买辆汽车，精明的销售员会卖力地“追加销售”皮椅或售后服务。但是道理就在于此，作者认为企业如果追求颠覆，就可能会忘记经营多年的增长源头。企业不应一味求新，而需要尽量发展已有业务。

但是，企业必须顶住诱惑，不应只是对以前一直免费的服务收费。美国航空公司通过向乘客收取客舱行李费，大幅提升了收入。仅2014年一年的行李费收入就达35亿美元，但也招致不满乘客的大量投诉。很多其他企业也开始对以前免费的服务收费：最近，熊彼特专栏记者在曼哈顿以400美元的房价入住酒店，后来在退房和出发去机场之间的几个小时内寄存行李还要额外支付10美元。接下来会怎样？肥皂和床单也要另行收费吗？

不过只要保持客户友好，这种优势战略对执迷于变革理念的企业有很大矫正价值。企业有理由担心其业务将被数字革命或新兴市场的新晋公司动摇，但它们应首先从现有资产中挤出更多价值，而不是盲目跃入未知领域。■



Israel's tech industry

Talent search

The "startup nation" is running out of steam

ISRAEL'S high-tech sector seems to be a land of milk and honey. Scarcely a month passes without another announcement of a foreign tech giant buying a local firm. In 2015 Israeli startups raised a record \$4.4 billion in venture capital, up by 30% from the previous year. Yet the country once christened the "startup nation" is losing steam. Between 1998 and 2012 the tech industry grew on average by 9% annually, more than double the rate of Israel's GDP. In all but one of the past six years, the tech sector has expanded at a slower rate than the overall economy.

The main cause for the slowdown is a growing shortage of trained workers, according to a recent report by the chief economist of the ministry of finance. This may come as a surprise, given the country's reputation for having a deep pool of tech talent, mainly because of the Israel Defence Forces (IDF), which rely heavily on technology and churn out thousands of highly skilled workers. But a complex mix of social, educational and business factors is increasingly constraining the size of Israel's tech workforce.

There is a limit to the size of any industry a small country of only 8m people can sustain. Until recently, the tech industry was helped by two trends: academics and employees of state-owned industries moving into the private sector and the arrival of tens of thousands of Jewish engineers emigrating from the former Soviet Union. Both these sources of fresh talent have now dried up, even as others remain obstructed. Two growing parts of the Israeli population are underrepresented in the job market: Israeli Arabs and the ultra-Orthodox, who together make up around 25% of the population. Israel's universities are producing fewer engineers, too: the

share of graduates with science degrees is down from 12% in 1998 to 9% in 2014.

At the same time, demand for skilled tech workers continues to grow, and not just in the private sector. The IDF need to keep their trained operatives longer, for instance to expand their cyber-warfare capabilities. Competition for such personnel is fierce: many are snapped up by firms offering twice the pay the army does.

Moreover, the Israeli tech industry doesn't make the best use of the talent available. Many workers want to start their own firm, rather than toiling at a big one, meaning that most firms are tiny with only a handful of employees. Israeli entrepreneurs also tend to seek swift "exits" and quickly sell their startup to foreign companies. As a result, the country's tech firms are not creating training schemes, points out Yigal Erlich of Yozma, the outfit that seeded many Israeli venture-capital funds.

The government has started to take action. Naftali Bennett, the education minister and a former high-tech entrepreneur himself, has launched an emergency plan to boost the number of students studying mathematics. For the first time in Israeli history, government economists are considering long-term work visas for foreign engineers. The IDF, for their part, have streamlined their training courses and now provide soldiers with the option of online distance-learning, so they can enhance their skills on the job. "But there is a limit to what we can do. Conscription is down due to demographic reasons and few of the new conscripts arrive with basic tech skills," says Danny Bren, a former commander of the IDF's Lotem Unit, the main provider of computer and networking services for the army.

Israel may have to take still more radical steps. One could be to provide more Israeli Arabs and ultra-Orthodox Jews with the skills necessary to work in the tech industry. Another potential source of talent are the more

than 4m Palestinians living in the West Bank and the Gaza Strip, over 50,000 of whom are already allowed to work in Israel, but mainly on building sites and other low-paid jobs. Before Israel imports engineers from Asia, it should consider its closest neighbours. ■



以色列科技行业 求贤若渴

“创业国度”后劲不足

以色列的高科技行业看似一片富饶之地，几乎每个月都有海外科技巨头宣布收购一家当地企业。2015年，以色列创业公司创下44亿美元的风险投资融资纪录，较上年提高了30%。然而，这个一度被誉为“创业之国”的国家如今却有些发展乏力。1998至2012年之间，以色列科技行业年均增长为9%，是其GDP增速的两倍有余。而在过去六年中，其科技行业增速有五年都慢于整体经济的增长水平。

以色列财政部首席经济学家最近的一份报告指出，其高科技行业发展放缓的主要原因是熟练工人日益缺乏。这个结论可能有点出人意料，因为以色列素以深厚的高技能人才储备著称。以色列国防军（IDF）非常依赖科技，每年会培养出大量高级熟练工人。但各种社会、教育和经济因素错综复杂地结合在一起，令以色列高技术劳动力的规模越来越受到限制。

对于一个只有800万人口的小国而言，它能维持的任何一个产业的规模都会有局限。直到最近，以色列高科技产业一直受到两种趋势的推动：国企研究人员和雇员流向私人部门，以及来自前苏联数以万计的犹太工程师移民。这两种新鲜人才的源头如今都已枯竭，与此同时其他源头仍然受阻。以色列人口中两类不断增长的群体在其劳动市场中未得到充分体现：以色列阿拉伯人和极端正统犹太人，这两者加起来约占以色列总人口的25%。以色列的大学培养的工程师人才也越来越少：理科毕业生占总毕业生人数的比重由1998年的12%下降到2014年的9%。

同时，对熟练技术工人的需求持续增长，而且不只在私人部门。以色列国防军需要延长熟练技工的服役时间以满足其需求，如提升网络作战的能力。对此类人才的竞争十分激烈：很多人才被企业以两倍于军队水平的高薪挖走了。

另外，以色列科技行业也没能最好地利用可用的人才。很多工人不愿为大公司卖力，而是想开创自己的公司，这就意味着很多公司都规模很小，员工很少。同时，以色列企业家们还倾向于寻求快速“退出”，很快便将其创业企业卖给外国公司。孕育了很多以色列风投基金的Yozma基金的创始人伊盖尔·埃利希（Yigal Erlich）指出，正是由于这种倾向，以色列的科技公司不愿制定培训计划。

政府已经开始采取措施。曾是高科技企业家的教育部长纳夫塔利·贝内特（Naftali Bennett）已经启动了一项旨在增加数学专业学生人数的紧急计划。在以色列历史上，政府经济学家首次开始考虑为外国工程师提供长期工作签证。以色列国防军方面也调整了它们的培训课程，现在士兵可以选择线上远程学习，在岗位上增强技能。“但我们能做的也很有限。由于人口结构原因，入伍人数下降，而且新兵中没有几个是入伍时便具备基本技能的。”以色列国防军Lotem部门（Lotem Unit）的前指挥官丹尼·布伦（Danny Bren）说道。该部门是国防军计算机和网络服务的主要提供者。

以色列可能还需要采取更加激进的措施。一种做法是为更多的以色列阿拉伯人和极端正统犹太人提供在科技行业工作所需的技能。另一个可能的人才来源就是生活在约旦河西岸和加沙地带的400多万巴勒斯坦人，他们当中超过5万人已经获准在以色列工作，但主要是在建筑工地和其他低薪岗位上。在以色列从亚洲引进工程师之前，应当先考虑最近的邻居。 ■



China's budget deficit

Augmented reality

The fiscal hole is much bigger than meets the eye—but under control

IF A country's fiscal deficit hit 10% of GDP five years running, you might reasonably conclude that its public finances were parlous. So it is understandable that China has bristled at suggestions that it is veering into such territory. Officially, China is a paragon of fiscal rectitude: its annual deficits have averaged just 1.8% in the past half-decade. But the IMF, Goldman Sachs and others have come up with “augmented” estimates of nearer to a tenth of GDP, more than five times the official number.

At face value, these estimates imply that China is suffering from a budget gap—not to mention a credibility gap—of Greek proportions. Are things really that bad? Almost certainly not. The augmented figures form a clearer picture of China's fiscal health. But they also differ from conventional measures in important ways, and so are potentially misleading.

The IMF devised the alternative concept a few years ago, to track the vast amount of spending that occurs off China's public balance-sheet. Because the central government places tight limits on local-government debts, provinces and cities have long used arm's length companies, known as local-government financing vehicles (LGFVs), to borrow from banks and issue bonds. That these are really just stand-ins for public borrowing is an open secret. The augmented deficit is a way of making this explicit. Consider the projections for 2016: the government is on course for an official deficit of roughly 3% of GDP. But adding in LGFV borrowing, the IMF forecasts that it will rise to 8.4%.

The augmented estimates also catch other forms of quasi-fiscal spending. Over the past year the authorities have made liberal use of China

Development Bank, a “policy bank” specifically charged with supporting government initiatives. Land sales are also an important source of funding. Totting up all the different items, the IMF says China’s augmented deficit will rise to a jaw-dropping 10.1% of GDP in 2016 (see chart). The government is thus giving the economy a fiscal push more than triple the size of its official target.

Although that stimulus may be welcome now, an obvious question is whether public debt is far greater than advertised. Repeated fiscal blow-outs—declared or not—will eventually appear on the balance-sheet. Sure enough, the Chinese government tacitly confirmed the augmented estimates, at least in part, when it added off-balance-sheet debts to its official tally a couple of years ago. Its debt jumped to 38.5% of GDP in 2014 from 15.9% in 2013.

But the augmented deficit is not as frightening as it looks—and certainly not as worrisome as China’s vast corporate debts. First, it does not represent new hidden debt: it is an attempt to assign responsibility, putting the government on the hook for implicit liabilities. Second, spending funded by land sales does not add to debt. Sales must be handled prudently—once an asset is sold, it’s gone—but they are like a development bonus, topping up the coffers so long as urbanisation continues.

Finally, China’s deficit is different from those of developed economies. Outlays on social programmes, though rising, are still low. Much of the deficit stems instead from investment in roads, railways and so forth. “These are not just general spending,” says Helen Qiao, an economist with Bank of America Merrill Lynch. “They generate assets for the government.” So long as the assets are decent, net debt will remain under control, allowing China slowly to rein in its deficits. Indeed, the IMF expects the augmented deficit to average 9% until 2021.

This, however, raises a different concern: that the deficit should in fact be more like those elsewhere. At around a tenth of GDP, social spending is half of what it is in rich countries. And with China's population about to age rapidly, the gaps in pension, welfare and health-care systems will soon get much wider without more public money. A strong state backstop would also give people confidence to spend more, supporting the economy's rebalancing towards consumption. So while China can afford to tame its deficit gradually, it must be quicker to shift its spending habits. More should go on hospitals and pensions, less on power stations. ■



中国的预算赤字

增强现实

财政缺口比呈现在眼前的大得多，但仍在控制之下

如果一个国家的财政赤字连续五年达到GDP的10%，那么你可能有理由得出这样的结论：该国的公共财政形势严峻。由此可以理解为什么一提到中国正转向这样的境况，中国就会火冒三丈。从官方统计来看，中国是财政稳健的模范：过去五年其年赤字率平均仅为1.8%。但是国际货币基金组织（IMF）、高盛集团和其他机构提出的“增强”版赤字估算结果更接近GDP的十分之一，比官方数字的五倍还高。

表面看来，这些估算结果意味着中国正经受着严重的预算缺口——更不用提公信力缺口——程度堪比希腊。形势真的如此糟糕吗？几乎可以肯定地说，不是。增强版赤字数字为中国财政的健康状况描绘出一幅更清晰的图景。但它们仍然在很多重要方面不同于传统的计算标准，因此可能会令人误解。

几年前，IMF设计出增强版赤字这一概念，以追踪中国公共资产负债表之外的庞大支出。因为中央政府严格限制地方政府的债务，各省市一直使用独立自主的公司从银行借款并发行债券，即利用所谓的地方政府融资平台。这些平台实际上不过是公共借款的替身——这是公开的秘密。增强版赤字把这些摆在了明面上。试看2016年的预测：政府即将公布的官方赤字约为GDP的3%。但是加上地方政府融资平台借款，IMF预计赤字率会升至8.4%。

增强版估算结果也包括了其他形式的准财政支出。去年政府各部门大量利用国家开发银行，这家“政策银行”专门负责支持政府举措。土地出售也是筹措资金的重要来源。IMF把各种不同类目汇总起来，预测中国2016年的增强版赤字将升至GDP的10.1%，令人咋舌（见图表）。因此中国政府正给予经济超官方目标三倍的财政刺激。

尽管这一刺激目前可能受到欢迎，但一个突出的问题是公共债务是否会远超过所公布的数字。一次又一次的财政挥霍，无论是否公之于众，最终都将显现在资产负债表上。毫无疑问，当中国政府将几年前资产负债表外的债务加到官方账目上时，它至少部分默认了增强版的估算结果。中国政府债务占GDP的比例从2013年的15.9%飙升至2014年的38.5%。

但是增强版赤字并不像看起来那么可怕，肯定也不像中国庞大的公司债务一样令人担忧。首先，它不代表有新的隐藏债务：推出增强版赤字是为了分清责任，使政府为隐含的负债负责。第二，由卖地收入支持的开支并未增加债务。土地出售必须谨慎，因为资产一旦卖掉就没有了，但只要城市化继续，卖地所得就像发展奖金，还能填满金库。

最后，中国的赤字不同于发达国家的赤字。社会事业的开支尽管有所上升，但仍然很少。相反，很多赤字来自公路、铁路等方面的投资。美银美林（Bank of America Merrill Lynch）的经济学家乔虹说：“这些不仅仅是一般性支出。它们为政府创造资产。”只要资产情况尚好，净负债仍将在掌控之下，这会让中国得以慢慢控制住赤字。实际上，IMF预计，到2021年增强版赤字将平均达到9%。

不过，这提出了另一种担忧：这些赤字实际上应该和其他地区的差不多。即便占了GDP的十分之一，社会支出却也只是发达国家的一半。考虑到中国人口将迅速老化，如果没有更多公共投资，退休金、福利和医保系统的缺口会很快变得更大。坚实的国家支持会给人们信心，让他们消费更多，以此支持经济往消费的方向再平衡。因此，在中国必须趁尚能逐步控制赤字之时加速转变支出习惯。支出应该更多投向医疗和养老，而减少向发电站的投入。■



Web browsers

Window dressing

The world's most popular computer programs are becoming less boring

BROWSERS, pieces of internet software that people probably spend more time with than they do in bed, have long been boring affairs. Save for occasional innovations such as tabs, these programs have remained fundamentally the same since the release of Mosaic, the first mainstream browser, nearly a quarter of a century ago. Just four browsers account for nearly all users: Apple's Safari, Google's Chrome, Microsoft's Internet Explorer and Mozilla's Firefox. It is difficult to tell them apart.

New, more interesting browsers have started cropping up. In August internet users will be able to download the first full version of Brave, the brainchild of a co-founder of Mozilla. Mozilla itself is working on a new type of browser which will give users suggestions on where to navigate next. Both are only the latest in a series of such efforts: last year Microsoft unveiled Edge, meant to replace Internet Explorer; March saw the release of Cliqz, a browser developed in Germany; a month later came Vivaldi.

If most browsers are boring and unwieldy, it is because they are expected to do more than ever before: not just surfing the web, but editing documents, streaming music and much more besides. As a result, priority is given to stability and ease of use. Too many fiddly buttons could scare away novice users. Innovation is outsourced to developers of "plug-ins", which add features to a browser.

Building a new browser from scratch is a fiendishly difficult and expensive undertaking. Only Apple, Google and Microsoft have the money and resources to throw at developing a fast "engine", as the core of a browser is called. Their dominance also scares off investors. Few venture capitalists

are foolhardy enough to invest in a product that needs to take on three of the world's most powerful tech companies. Mozilla is a non-profit which partially relies on volunteer developers and donations.

Insurgents are trying to overcome the obstacles in three ways. To reduce development costs, their products are based on existing open-source projects, such as Chromium, which also powers Google's Chrome. They get money from angel investors, who have an appetite for risk. And most important, they aim their products at niche segments. Brave, for instance, is for surfers who prize privacy. It can block annoying online advertisements and privacy-invading "trackers", which lurk on websites to follow users around. Cliqz also blocks trackers and is integrated with a new search engine. Vivaldi pitches itself as a browser for "power users". It is packed with customisable features and comes bundled with an e-mail client.

Such small browser-makers do not need the scale of their competitors to make money (Chrome has more than 1 billion users). Both Vivaldi and Brave say they can break even with a few million users apiece. The easiest source of revenue is search deals. Companies such as Google pay roughly one dollar per user per year to be the default search engine on rival browsers. Vivaldi is also experimenting with charging firms to be featured on its home page. Brave is trying to subvert the dominant online-advertising model: it blocks intrusive advertisements such as self-starting videos, replaces them with less irksome ones and shares the revenues with publishers and users.

The market for browsers has grown large enough to sustain such niche players. But the chances that these small fry will turn into big businesses are low. Most people will continue using the boring browsers—if only because they are too lazy to install a slightly more interesting one. ■



浏览器

装点窗口

全球最流行的电脑程序正变得不那么乏味

人们花在浏览器这种互联网软件上的时间很可能比在床上的时间还多，然而它一直以来都没什么意思。除了像标签页之类偶尔的创新之外，这些程序从根本上来讲与将近25年前发布的第一代主流浏览器Mosaic并无二致。区区四款浏览器瓜分了几几乎所有的用户：苹果的Safari、谷歌的Chrome、微软的Internet Explorer和Mozilla的火狐（Firefox）浏览器。它们看起来并没有多大区别。

更有趣的新浏览器开始出现。8月，互联网用户将可以下载首个完整版的Brave，这款浏览器是Mozilla一位联合创始人智慧结晶。Mozilla自己也在着手准备新型浏览器，该浏览器可以建议用户下一步去哪里。这两款仅仅是一系列此类努力中的最新举措：去年微软推出了Edge，意在取代IE；德国打造的Cliqz浏览器于3月面世，Vivaldi浏览器则在一个月后发布。

如果说大部分浏览器无聊且使用不便，那是因为人们对它们的期待之高前所未有：不只是上网浏览，还要能做文档编辑、流媒体音乐播放以及很多其他的事。因此，优先要考虑的是稳定性和易用性。太多精巧复杂的按钮可能会吓跑新用户。创新则外包给了“插件”的开发者，由他们给浏览器增添功能。

从零开始打造一个浏览器极其困难又代价高昂。只有苹果、谷歌和微软既有钱也有资源投在研发高速“引擎”，也就是浏览器的内核上。它们的统治地位也让投资者望而却步。极少有风险资本家会鲁莽到投资一款要和三家世界上最强大的科技公司抗衡的产品。Mozilla是一家非盈利公司，部分依靠志愿开发者和捐款。

“叛乱分子”试着用三种方式克服障碍。为了降低开发成本，它们的产品是

基于已有的开源项目，如Chromium——它也是谷歌Chrome浏览器的引擎。它们从渴求风险的天使投资者那里拿到资金。最关键的是，它们的产品瞄准利基市场。例如，Brave的目标用户是看重隐私的上网者。它可以拦截烦人的在线广告，以及网站中潜伏的那些侵犯隐私的用户跟踪软件。Cliqz也拦截追踪软件，而且它集成了一款新的搜索引擎。Vivaldi称自己是为“高级用户”准备的浏览器。它包括一些可以自定义的功能，并且绑定了一个电子邮件客户端。

这些小的浏览器开发者并不需要有它们竞争对手那么大的规模（Chrome有超过10亿用户）才能赚钱。Vivaldi和Brave都说自己有几百万用户就能收支平衡。最简单的收入来源是搜索合作。要成为竞争浏览器上的默认搜索引擎，像谷歌这样的公司大约要为每个用户每年支付一美元。Vivaldi也在尝试向其首页上展示的公司收费。Brave正试着颠覆主流的在线广告模式：它拦截了自动播放的视频这类侵入式广告，代之以不那么让人反感的广告，并且与发布者和用户共同分享收益。

浏览器的市场已经非常庞大，足够支持这样的利基市场参与者。但是这些小公司长成参天大树的几率很低。大部分人还会继续使用乏味的浏览器——即便仅仅是因为他们懒得再去装一款稍微有趣一些的浏览器了。■



Information asymmetry

Secrets and agents

George Akerlof's 1970 paper, "The Market for Lemons", is a foundation stone of information economics. The first in our series on seminal economic ideas

IN 2007 the state of Washington introduced a new rule aimed at making the labour market fairer: firms were banned from checking job applicants' credit scores. Campaigners celebrated the new law as a step towards equality—an applicant with a low credit score is much more likely to be poor, black or young. Since then, ten other states have followed suit. But when Robert Clifford and Daniel Shoag, two economists, recently studied the bans, they found that the laws left blacks and the young with fewer jobs, not more.

Before 1970, economists would not have found much in their discipline to help them mull this puzzle. Indeed, they did not think very hard about the role of information at all. In the labour market, for example, the textbooks mostly assumed that employers know the productivity of their workers—or potential workers—and, thanks to competition, pay them for exactly the value of what they produce.

You might think that research upending that conclusion would immediately be celebrated as an important breakthrough. Yet when, in the late 1960s, George Akerlof wrote "The Market for Lemons", which did just that, and later won its author a Nobel prize, the paper was rejected by three leading journals. At the time, Mr Akerlof was an assistant professor at the University of California, Berkeley; he had only completed his PhD, at MIT, in 1966. Perhaps as a result, the *American Economic Review* thought his paper's insights trivial. The *Review of Economic Studies* agreed. The *Journal of Political Economy* had almost the opposite concern: it could not stomach the paper's implications. Mr Akerlof, now an emeritus professor at

Berkeley and married to Janet Yellen, the chairman of the Federal Reserve, recalls the editor's complaint: "If this is correct, economics would be different."

In a way, the editors were all right. Mr Akerlof's idea, eventually published in the *Quarterly Journal of Economics* in 1970, was at once simple and revolutionary. Suppose buyers in the used-car market value good cars—"peaches"—at \$1,000, and sellers at slightly less. A malfunctioning used car—a "lemon"—is worth only \$500 to buyers (and, again, slightly less to sellers). If buyers can tell lemons and peaches apart, trade in both will flourish. In reality, buyers might struggle to tell the difference: scratches can be touched up, engine problems left undisclosed, even odometers tampered with.

To account for the risk that a car is a lemon, buyers cut their offers. They might be willing to pay, say, \$750 for a car they perceive as having an even chance of being a lemon or a peach. But dealers who know for sure they have a peach will reject such an offer. As a result, the buyers face "adverse selection": the only sellers who will be prepared to accept \$750 will be those who know they are offloading a lemon.

Smart buyers can foresee this problem. Knowing they will only ever be sold a lemon, they offer only \$500. Sellers of lemons end up with the same price as they would have done were there no ambiguity. But peaches stay in the garage. This is a tragedy: there are buyers who would happily pay the asking-price for a peach, if only they could be sure of the car's quality. This "information asymmetry" between buyers and sellers kills the market.

Is it really true that you can win a Nobel prize just for observing that some people in markets know more than others? That was the question one journalist asked of Michael Spence, who, along with Mr Akerlof and Joseph Stiglitz, was a joint recipient of the 2001 Nobel award for their work on

information asymmetry. His incredulity was understandable. The lemons paper was not even an accurate description of the used-car market: clearly not every used car sold is a dud. And insurers had long recognised that their customers might be the best judges of what risks they faced, and that those keenest to buy insurance were probably the riskiest bets.

Yet the idea was new to mainstream economists, who quickly realised that it made many of their models redundant. Further breakthroughs soon followed, as researchers examined how the asymmetry problem could be solved. Mr Spence's flagship contribution was a 1973 paper called "Job Market Signalling" that looked at the labour market. Employers may struggle to tell which job candidates are best. Mr Spence showed that top workers might signal their talents to firms by collecting gongs, like college degrees. Crucially, this only works if the signal is credible: if low-productivity workers found it easy to get a degree, then they could masquerade as clever types.

This idea turns conventional wisdom on its head. Education is usually thought to benefit society by making workers more productive. If it is merely a signal of talent, the returns to investment in education flow to the students, who earn a higher wage at the expense of the less able, and perhaps to universities, but not to society at large. One disciple of the idea, Bryan Caplan of George Mason University, is currently penning a book entitled "The Case Against Education". (Mr Spence himself regrets that others took his theory as a literal description of the world.)

Signalling helps explain what happened when Washington and those other states stopped firms from obtaining job-applicants' credit scores. Credit history is a credible signal: it is hard to fake, and, presumably, those with good credit scores are more likely to make good employees than those who default on their debts. Messrs Clifford and Shoag found that when firms could no longer access credit scores, they put more weight on other signals,

like education and experience. Because these are rarer among disadvantaged groups, it became harder, not easier, for them to convince employers of their worth.

Signalling explains all kinds of behaviour. Firms pay dividends to their shareholders, who must pay income tax on the payouts. Surely it would be better if they retained their earnings, boosting their share prices, and thus delivering their shareholders lightly taxed capital gains? Signalling solves the mystery: paying a dividend is a sign of strength, showing that a firm feels no need to hoard cash. By the same token, why might a restaurant deliberately locate in an area with high rents? It signals to potential customers that it believes its good food will bring it success.

Signalling is not the only way to overcome the lemons problem. In a 1976 paper Mr Stiglitz and Michael Rothschild, another economist, showed how insurers might “screen” their customers. The essence of screening is to offer deals which would only ever attract one type of punter.

Suppose a car insurer faces two different types of customer, high-risk and low-risk. They cannot tell these groups apart; only the customer knows whether he is a safe driver. Messrs Rothschild and Stiglitz showed that, in a competitive market, insurers cannot profitably offer the same deal to both groups. If they did, the premiums of safe drivers would subsidise payouts to reckless ones. A rival could offer a deal with slightly lower premiums, and slightly less coverage, which would peel away only safe drivers because risky ones prefer to stay fully insured. The firm, left only with bad risks, would make a loss. (Some worried a related problem would afflict Obamacare, which forbids American health insurers from discriminating against customers who are already unwell: if the resulting high premiums were to deter healthy, young customers from signing up, firms might have to raise premiums further, driving more healthy customers away in a so-called “death spiral”.)

The car insurer must offer two deals, making sure that each attracts only the customers it is designed for. The trick is to offer one pricey full-insurance deal, and an alternative cheap option with a sizeable deductible. Risky drivers will balk at the deductible, knowing that there is a good chance they will end up paying it when they claim. They will fork out for expensive coverage instead. Safe drivers will tolerate the high deductible and pay a lower price for what coverage they do get.

This is not a particularly happy resolution of the problem. Good drivers are stuck with high deductibles—just as in Spence’s model of education, highly productive workers must fork out for an education in order to prove their worth. Yet screening is in play almost every time a firm offers its customers a menu of options.

Airlines, for instance, want to milk rich customers with higher prices, without driving away poorer ones. If they knew the depth of each customer’s pockets in advance, they could offer only first-class tickets to the wealthy, and better-value tickets to everyone else. But because they must offer everyone the same options, they must nudge those who can afford it towards the pricier ticket. That means deliberately making the standard cabin uncomfortable, to ensure that the only people who slum it are those with slimmer wallets.

| *Hazard undercuts Eden*

Adverse selection has a cousin. Insurers have long known that people who buy insurance are more likely to take risks. Someone with home insurance will check their smoke alarms less often; health insurance encourages unhealthy eating and drinking. Economists first cottoned on to this phenomenon of “moral hazard” when Kenneth Arrow wrote about it in 1963.

Moral hazard occurs when incentives go haywire. The old economics, noted

Mr Stiglitz in his Nobel-prize lecture, paid considerable lip-service to incentives, but had remarkably little to say about them. In a completely transparent world, you need not worry about incentivising someone, because you can use a contract to specify their behaviour precisely. It is when information is asymmetric and you cannot observe what they are doing (is your tradesman using cheap parts? Is your employee slacking?) that you must worry about ensuring that interests are aligned.

Such scenarios pose what are known as “principal-agent” problems. How can a principal (like a manager) get an agent (like an employee) to behave how he wants, when he cannot monitor them all the time? The simplest way to make sure that an employee works hard is to give him some or all of the profit. Hairdressers, for instance, will often rent a spot in a salon and keep their takings for themselves.

But hard work does not always guarantee success: a star analyst at a consulting firm, for example, might do stellar work pitching for a project that nonetheless goes to a rival. So, another option is to pay “efficiency wages”. Mr Stiglitz and Carl Shapiro, another economist, showed that firms might pay premium wages to make employees value their jobs more highly. This, in turn, would make them less likely to shirk their responsibilities, because they would lose more if they were caught and got fired. That insight helps to explain a fundamental puzzle in economics: when workers are unemployed but want jobs, why don’t wages fall until someone is willing to hire them? An answer is that above-market wages act as a carrot, the resulting unemployment, a stick.

And this reveals an even deeper point. Before Mr Akerlof and the other pioneers of information economics came along, the discipline assumed that in competitive markets, prices reflect marginal costs: charge above cost, and a competitor will undercut you. But in a world of information asymmetry, “good behaviour is driven by earning a surplus over what one

could get elsewhere,” according to Mr Stiglitz. The wage must be higher than what a worker can get in another job, for them to want to avoid the sack; and firms must find it painful to lose customers when their product is shoddy, if they are to invest in quality. In markets with imperfect information, price cannot equal marginal cost.

The concept of information asymmetry, then, truly changed the discipline. Nearly 50 years after the lemons paper was rejected three times, its insights remain of crucial relevance to economists, and to economic policy.

Just ask any young, black Washingtonian with a good credit score who wants to find a job. ■



信息不对称

秘密与代理

1970年，乔治·阿克洛夫（George Akerlof）发表的论文《柠檬市场》堪称信息经济学的奠基之作。本刊将对一系列开创性经济学思想作专题报道，此为开篇。

2007年，美国华盛顿州出台了一项旨在令劳动力市场更公平的新规则：禁止公司审查求职者的信用评分。拥护此举的社运人士额手相庆，认为这是迈向平等的一步，因为信用评分较低的求职者多为穷人、黑人或年轻人。此后，另外十个州也纷纷效法。然而两位经济学家罗伯特·克利福德（Robert Clifford）及丹尼尔·施奥格（Daniel Shoag）最近对该禁令的研究发现，该法规反而使黑人和年轻人的就业机会变少，而非增多。

换在1970年前，经济学家们在其研究范畴内似乎并不能找到太多理据以解开这一谜题。事实上，他们在过去根本未曾细想信息所扮演的角色。以劳动力市场为例，教科书大多假设雇主了解员工（或求职者）的生产力，并会在竞争的作用下按其产生的价值来支付相等的报酬。

你或许以为颠覆上述论断的研究会立即被奉为重大突破。但上世纪60年代末，乔治·阿克洛夫撰写的《柠檬市场》一文就已做到了这一点，他随后更因此获得了诺贝尔奖。然而，该论文当初却遭到三家权威期刊的拒绝。当时，阿克洛夫在加州大学伯克利分校任助理教授，1966年才刚在麻省理工学院取得博士学位。也许是出于这个原因，《美国经济评论》（American Economic Review）认为他的论文见解浅白不值一提。

《经济研究评论》（Review of Economic Studies）也持同样的观点。《政治经济学期刊》（Journal of Political Economy）的疑虑却是出于几乎截然相反的原因：它难以接受这篇论文如果结论正确可能带来的影响。阿克洛夫如今是加州大学伯克利分校的退休教授，妻子是美联储主席珍妮特·耶伦（Janet Yellen），他回想起当年期刊编辑的抱怨：“假如你这是对的，经济学就是另一回事了。”

某种程度上，那些编辑们都没错。阿克洛夫的想法最终于1970年发表在

《经济学季刊》（Quarterly Journal of Economics）上，内容简单而又具革命性。假设二手车市场的买家对好车（“桃子”）的估价为1000美元，卖家估价稍低一点。而问题二手车（“柠檬”）对买家而言只值500美元（同样，卖家估价相对低一点）。假如买家能分辨出柠檬和桃子，那么这两类车的买卖都可以很兴旺。但在现实中，买家却可能难以区分好坏：刮痕可以被修补涂饰，引擎问题可以隐而不宣，甚至里程表数字也可被篡改。

为防买到的车是“柠檬”，买家会压价。比如说，他们可能愿意付750美元买一辆感觉上“柠檬”或“桃子”几率各半的二手车。但经销商若深知手中汽车实为“桃子”，就会拒绝这一出价。结果，买家只得面对“逆向选择”：只有知道自己要脱手的车是“柠檬”的卖家才愿意接受750美元的出价。

聪明的买家会预见到这一问题。他们知道买到的只会是“柠檬”，因而只肯出价500美元。如此一来，“柠檬”卖家的最后所得和能够明辨好车坏车的情况下是一样的，但“桃子”却积压在车库里。这是个悲剧：有的买家还是乐意按要价购买“桃子”的，只要他们能够确定汽车的质量。买卖双方之间的这种“信息不对称”扼杀了市场。

观察到市场上部分人比他人更了解实情，真的只凭这个就能获得诺贝尔奖？一位记者向迈克尔·斯宾塞（Michael Spence）提出了这样的问题。他与阿克洛夫及约瑟夫·斯蒂格利茨（Joseph Stiglitz）因有关信息不对称的研究共同获得了2001年的诺贝尔奖。那位记者的怀疑可以理解。《柠檬市场》一文甚至还算不上是对二手车市场的准确描述：显然并非每辆售出的二手车都是问题车。保险公司早已认识到顾客也许最清楚自己面临怎样的风险，因而投保最积极的人大概也就是风险最高的。

但该理念是主流经济学家前所未闻的，他们很快便意识自己的许多模型随之变得多余。随着研究人员探索如何解决不对称问题，进一步的突破也接踵而来。斯宾塞的标志性贡献是其于1973年发表的研究劳动力市场的论文《就业市场信号》（Job Market Signalling）。雇主可能难以辨别哪些才是最佳求职者。斯宾塞指出，优秀劳动者可通过积累资历及证书（如大学学位）来向公司显示自己的才能。重要的是，信号必须可信才行：假如低效

的劳动者能轻易获取学位，他们便有可能伪装成禀赋优秀者。

这一理念完全推翻了传统认知。人们往往认为，教育可以提高劳动者的生产效率从而造福社会。但是，如果教育仅仅是显示才华的信号，那么教育投资的回报就流向了学生——他们可以比能力稍逊者赚取更高的薪酬；受惠的也可能是大学，但并不会是社会整体。乔治梅森大学的布赖恩·卡普兰（Bryan Caplan）便是这一理念的信徒，他目前正在撰写一本书，名为《反对教育的理由》（The Case Against Education）。（对于他人望文生义、将其理论视为对世界的客观描述，斯宾塞本人感到很遗憾。）

“信号论”有助解释华盛顿及其他州禁止企业获取求职者信用评分后所发生的一切。信用记录是可信的信号：它们难以伪造，并且我们大致可以推断，高信用评分者比存在债务违约记录者更有可能成为优秀员工。克利福德和施奥格发现，在被禁止审查求职者信用评分后，企业会更着重关注其他信号，如教育背景和经验。而弱势群体在这些方面更为乏善可陈，所以他们若要向雇主证明自己的价值没有变得容易，反而更难了。

“信号论”可用于解释各种行为。公司分红给股东，股东必须就股息缴纳所得税。假如公司留存收益，推高股价，给股东们带来税率较轻的资本收益，不是更好么？“信号论”解开了这一谜题：分红是实力的信号，显示一家公司认为没必要囤积现金。同样的道理，一家餐厅为何特意选址在高租金地区？那是在向潜在顾客发出信号，显示餐厅相信其上乘的菜品会带来成功。

“信号论”并非解决柠檬问题的唯一途径。斯蒂格利茨与另一位经济学家迈克尔·罗斯柴尔德（Michael Rothschild）在1976年发表的一篇论文展示了保险公司是如何“筛选”顾客的。筛选的实质是提供只会吸引某一类型顾客的产品。

假设一家汽车保险公司面对高风险和低风险的两类不同顾客——他们无法分辨两者，只有顾客知道自己是不是安全驾驶者。罗斯柴尔德和斯蒂格利茨发现，在竞争激烈的市场，保险公司如果向两类顾客提供同样的产品是

无法盈利的。假如他们真的这么做，安全驾驶者所付的保费就会被用以补贴对鲁莽驾驶者的赔付。对手可能会提供承保范围略减而保费稍低的产品，但这只会抢走安全驾驶者的保单，因为高风险驾驶者宁愿得到全面保障。这样一来，只剩下高风险顾客的保险公司就有可能面临亏损。（有人担心另一相关问题将拖累奥巴马医改。该方案禁止美国医疗保险公司差别对待已经患病的顾客：假如因此产生的高保费令健康的年轻客户不愿投保，保险公司或许不得不进一步提高保费，进而吓跑更多健康顾客，形成“死亡螺旋”式的恶性循环。）

汽车保险公司必须提供两套产品，确保每个产品都只会吸引相应的目标客户。个中诀窍就是提供一款费用高昂的全面保险产品，同时提供另一款保费低而自负额高的产品。高危驾驶者很清楚自己索赔时很可能得自掏腰包，面对免赔项目时就可能会迟疑，转投较为昂贵但保障全面的产品。安全驾驶者会容忍高自负额，以较低保费购买相应承保范围的产品。

这并非是特别皆大欢喜的解决方案。安全驾驶者被迫接受高自负额——就如斯宾塞关于教育的模型一样，高效劳动者为证明自己的价值必须大把掏钱以获取学历。但每当公司向顾客提供各式产品选择时，几乎都存在着筛选。

例如航空公司，它们想以高价从富裕顾客身上赚取利润，但又不能把不宽裕的顾客吓跑。如果航空公司能预先知道每位顾客钱袋的深浅，便可只向富裕顾客提供头等舱机票，向其他客人提供高性价比的机票。但由于它们必须向所有人提供同样的选择，因此就得想方设法促使有实力的顾客购买高价机票。它们的手段就是故意把标准舱变得不舒适，确保只有钱包干瘪的人愿意忍受。

| 风险伤及乐土

逆向选择还有个“表亲”。保险公司早就知道，买保险的人更有可能去冒险。买了家居保险的人就不会那么频繁地检查家中的烟雾警报器；医疗保险也促使人们养成不健康的饮食习惯。1963年，肯尼斯·阿罗（Kenneth Arrow）撰文阐述了“道德风险”这一现象，使经济学家们首次对其有所了

解。

当激励失灵时，道德风险便会出现。斯蒂格利茨在其诺贝尔奖演讲中指出，旧经济学就激励问题泛泛而谈，却鲜有深入研究。在完全透明的世界，你无须担心如何激励某人去行动，因为可以通过合同准确规定其行为。只有在信息不对称、你无法观察其所作所为的时候（你的工匠是否在偷工减料？你的员工是否在偷懒？），你才必须费心确保双方利益一致。

这种情形造成了所谓的“委托-代理”问题。委托人（比如经理）怎样才能让代理人（如员工）在自己无法全程监督的情况下按要求行动呢？确保员工努力工作最简单的方法就是给予他部分或全部利润。举个例子，发型师往往会在美发店租个位置，自留劳动所得。

然而辛勤工作不一定确保成功：例如，一家咨询公司的明星分析师也许为争取某一项目做了出色的工作，但最终项目还是落入对手囊中。所以，另一种选择是支付“效益工资”。斯蒂格利茨和另一位经济学家卡尔·夏皮罗（Carl Shapiro）的研究显示，公司可能会向员工支付高薪，以使其更加重视自己的工作。员工敷衍塞责的几率也会相应降低，因为万一被发现而遭解雇，他们的损失会更大。这一见解有助解释经济学中的一个基础谜题：若劳动者失业而想要求职，在有人愿意聘用他们之前，市场薪酬水平为什么不会下降？一个答案是，高于市场水平的工资是“胡萝卜”，而高薪者的失业则是“大棒”。

而且这揭示了更深层的一个问题。在阿克洛夫及信息经济学的其他先驱出现前，经济学界认为，在竞争性市场中，价格反映了边际成本：要价若高于成本，竞争对手就会以低价争抢市场。但在信息不对称的世界，斯蒂格利茨认为，“在这里能比别处赚得更多’才会驱使人们展现良好的行为。”要使员工主动避免怠工，付出的薪酬必须比他能从其他雇主那里得到的更高。而且公司真要投资于质量，一定会对劣质产品造成客户流失的情形感到痛心。在信息不完善的市场，价格不可能等于边际成本。

如此说来，信息不对称这一概念确实改变了经济学。距《柠檬市场》一文

的三次被拒已近50年了，但文中的见解与经济学家及经济政策仍然息息相关。

不信，随便找个华盛顿州信用评级良好的黑人年轻求职者问问便知。 ■



Financial stability

Minsky's moment

The second article in our series on seminal economic ideas looks at Hyman Minsky's hypothesis that booms sow the seeds of busts

FROM the start of his academic career in the 1950s until 1996, when he died, Hyman Minsky laboured in relative obscurity. His research about financial crises and their causes attracted a few devoted admirers but little mainstream attention: this newspaper cited him only once while he was alive, and it was but a brief mention. So it remained until 2007, when the subprime-mortgage crisis erupted in America. Suddenly, it seemed that everyone was turning to his writings as they tried to make sense of the mayhem. Brokers wrote notes to clients about the “Minsky moment” engulfing financial markets. Central bankers referred to his theories in their speeches. And he became a posthumous media star, with just about every major outlet giving column space and airtime to his ideas. *The Economist* has mentioned him in at least 30 articles since 2007.

If Minsky remained far from the limelight throughout his life, it is at least in part because his approach shunned academic conventions. He started his university education in mathematics but made little use of calculations when he shifted to economics, despite the discipline's growing emphasis on quantitative methods. Instead, he pieced his views together in his essays, lectures and books, including one about John Maynard Keynes, the economist who most influenced his thinking. He also gained hands-on experience, serving on the board of Mark Twain Bank in St Louis, Missouri, where he taught.

Having grown up during the Depression, Minsky was minded to dwell on disaster. Over the years he came back to the same fundamental problem again and again. He wanted to understand why financial crises occurred. It

was an unpopular focus. The dominant belief in the latter half of the 20th century was that markets were efficient. The prospect of a full-blown calamity in developed economies sounded far-fetched. There might be the occasional stockmarket bust or currency crash, but modern economies had, it seemed, vanquished their worst demons.

Against those certitudes, Minsky, an owlish man with a shock of grey hair, developed his “financial-instability hypothesis”. It is an examination of how long stretches of prosperity sow the seeds of the next crisis, an important lens for understanding the tumult of the past decade. But the history of the hypothesis itself is just as important. Its trajectory from the margins of academia to a subject of mainstream debate shows how the study of economics is adapting to a much-changed reality since the global financial crisis.

Minsky started with an explanation of investment. It is, in essence, an exchange of money today for money tomorrow. A firm pays now for the construction of a factory; profits from running the facility will, all going well, translate into money for it in coming years. Put crudely, money today can come from one of two sources: the firm’s own cash or that of others (for example, if the firm borrows from a bank). The balance between the two is the key question for the financial system.

Minsky distinguished between three kinds of financing. The first, which he called “hedge financing”, is the safest: firms rely on their future cashflow to repay all their borrowings. For this to work, they need to have very limited borrowings and healthy profits. The second, speculative financing, is a bit riskier: firms rely on their cashflow to repay the interest on their borrowings but must roll over their debt to repay the principal. This should be manageable as long as the economy functions smoothly, but a downturn could cause distress. The third, Ponzi financing, is the most dangerous. Cashflow covers neither principal nor interest; firms are betting only that

the underlying asset will appreciate by enough to cover their liabilities. If that fails to happen, they will be left exposed.

Economies dominated by hedge financing—that is, those with strong cashflows and low debt levels—are the most stable. When speculative and, especially, Ponzi financing come to the fore, financial systems are more vulnerable. If asset values start to fall, either because of monetary tightening or some external shock, the most overstretched firms will be forced to sell their positions. This further undermines asset values, causing pain for even more firms. They could avoid this trouble by restricting themselves to hedge financing. But over time, particularly when the economy is in fine fettle, the temptation to take on debt is irresistible. When growth looks assured, why not borrow more? Banks add to the dynamic, lowering their credit standards the longer booms last. If defaults are minimal, why not lend more? Minsky's conclusion was unsettling. Economic stability breeds instability. Periods of prosperity give way to financial fragility.

With overleveraged banks and no-money-down mortgages still fresh in the mind after the global financial crisis, Minsky's insight might sound obvious. Of course, debt and finance matter. But for decades the study of economics paid little heed to the former and relegated the latter to a sub-discipline, not an essential element in broader theories. Minsky was a maverick. He challenged both the Keynesian backbone of macroeconomics and a prevailing belief in efficient markets.

It is perhaps odd to describe his ideas as a critique of Keynesian doctrine when Minsky himself idolised Keynes. But he believed that the doctrine had strayed too far from Keynes's own ideas. Economists had created models to put Keynes's words to work in explaining the economy. None is better known than the IS-LM model, largely developed by John Hicks and Alvin Hansen, which shows the relationship between investment and

money. It remains a potent tool for teaching and for policy analysis. But Messrs Hicks and Hansen largely left the financial sector out of the picture, even though Keynes was keenly aware of the importance of markets. To Minsky, this was an “unfair and naive representation of Keynes’s subtle and sophisticated views”. Minsky’s financial-instability hypothesis helped fill in the holes.

His challenge to the prophets of efficient markets was even more acute. Eugene Fama and Robert Lucas, among others, persuaded most of academia and policymaking circles that markets tended towards equilibrium as people digested all available information. The structure of the financial system was treated as almost irrelevant. In recent years, behavioural economists have attacked one plank of efficient-market theory: people, far from being rational actors who maximise their gains, are often clueless about what they want and make the wrong decisions. But years earlier Minsky had attacked another: deep-seated forces in financial systems propel them towards trouble, he argued, with stability only ever a fleeting illusion.

| *Outside-in*

Yet as an outsider in the sometimes cloistered world of economics, Minsky’s influence was, until recently, limited. Investors were faster than professors to latch onto his views. More than anyone else it was Paul McCulley of PIMCO, a fund-management group, who popularised his ideas. He coined the term “Minsky moment” to describe a situation when debt levels reach breaking-point and asset prices across the board start plunging. Mr McCulley initially used the term in explaining the Russian financial crisis of 1998. Since the global turmoil of 2008, it has become ubiquitous. For investment analysts and fund managers, a “Minsky moment” is now virtually synonymous with a financial crisis.

Minsky’s writing about debt and the dangers in financial innovation had

the great virtue of according with experience. But this virtue also points to what some might see as a shortcoming. In trying to paint a more nuanced picture of the economy, he relinquished some of the potency of elegant models. That was fine as far as he was concerned; he argued that generalisable theories were bunkum. He wanted to explain specific situations, not economics in general. He saw the financial-instability hypothesis as relevant to the case of advanced capitalist economies with deep, sophisticated markets. It was not meant to be relevant in all scenarios. These days, for example, it is fashionable to ask whether China is on the brink of a Minsky moment after its alarming debt growth of the past decade. Yet a country in transition from socialism to a market economy and with an immature financial system is not what Minsky had in mind.

Shunning the power of equations and models had its costs. It contributed to Minsky's isolation from mainstream theories. Economists did not entirely ignore debt, even if they studied it only sparingly. Some, such as Nobuhiro Kiyotaki and Ben Bernanke, who would later become chairman of the Federal Reserve, looked at how credit could amplify business cycles. Minsky's work might have complemented theirs, but they did not refer to it. It was as if it barely existed.

Since Minsky's death, others have started to correct the oversight, grafting his theories onto general models. The Levy Economics Institute of Bard College in New York, where he finished his career (it still holds an annual conference in his honour), has published work that incorporates his ideas in calculations. One Levy paper, published in 2000, developed a Minsky-inspired model linking investment and cashflow. A 2005 paper for the Bank for International Settlements, a forum for central banks, drew on Minsky in building a model of how people assess their assets after making losses. In 2010 Paul Krugman, a Nobel prize-winning economist who is best known these days as a *New York Times* columnist, co-authored a paper that included the concept of a "Minsky moment" to model the impact of

deleveraging on the economy. Some researchers are also starting to test just how accurate Minsky's insights really were: a 2014 discussion paper for the Bank of Finland looked at debt-to-cashflow ratios, finding them to be a useful indicator of systemic risk.

| *Debtor's prism*

Still, it would be a stretch to expect the financial-instability hypothesis to become a new foundation for economic theory. Minsky's legacy has more to do with focusing on the right things than correctly structuring quantifiable models. It is enough to observe that debt and financial instability, his main preoccupations, have become some of the principal topics of inquiry for economists today. A new version of the "Handbook of Macroeconomics", an influential survey that was first published in 1999, is in the works. This time, it will make linkages between finance and economic activity a major component, with at least two articles citing Minsky. As Mr Krugman has quipped: "We are all Minskyites now."

Central bankers seem to agree. In a speech in 2009, before she became head of the Federal Reserve, Janet Yellen said Minsky's work had "become required reading". In a 2013 speech, made while he was governor of the Bank of England, Mervyn King agreed with Minsky's view that stability in credit markets leads to exuberance and eventually to instability. Mark Carney, Lord King's successor, has referred to Minsky moments on at least two occasions.

Will the moment last? Minsky's own theory suggests it will eventually peter out. Economic growth is still shaky and the scars of the global financial crisis visible. In the Minskyan trajectory, this is when firms and banks are at their most cautious, wary of repeating past mistakes and determined to fortify their balance-sheets.

But in time, memories of the 2008 turmoil will dim. Firms will again race to

expand, banks to fund them and regulators to loosen constraints. The warnings of Minsky will fade away. The further we move on from the last crisis, the less we want to hear from those who see another one coming. ■



金融稳定性

明斯基时刻

本刊开创性经济学思想系列报道的第二篇文章着眼海曼·明斯基（Hyman Minsky）的假说——繁荣埋下萧条的祸根

海曼·明斯基从20世纪50年代开始学术生涯至1996年去世，一直在相对寂寂无闻中工作。他有关金融危机及其成因的研究吸引了一些忠实拥趸，但几乎并未赢得主流关注：明斯基在世时，本刊仅援引他一次，而且只是一笔带过。直至2007年美国爆发次贷危机，突然间，似乎人人都把目光投向了他的著作，试图藉此解读眼前的乱象。证券经纪人致信客户称“明斯基时刻”席卷金融市场。央行官员们在发言中纷纷引用其理论。明斯基成了媒体追认的明星，几乎所有主要媒体都辟出专栏版面和时段探讨其理论。《经济学人》杂志自2007年以来至少有30篇文章提到了他。

明斯基一生不受瞩目，至少一定程度上是因为他不循学术常规。他在大学一开始攻读数学，后来转到经济学，却很少运用计算，尽管该学科日益强调定量方法。相反，他通过论文、讲座及著书把自己的观点构筑成一套理论，其中一本书是关于对他思想影响最深的经济学家凯恩斯的。他也在任教地密苏里州圣路易斯市的马克吐温银行（Mark Twain Bank）里担任董事，从中获得实践经验。

明斯基成长于大萧条时期，总爱琢磨有关灾难的问题。多年来，他一再回到同一个根本性的问题——他要了解金融危机缘何发生。这一关注点在当时并不受欢迎。在20世纪后半叶，主导理念认为市场是有效的。要说发达经济体将全面陷入灾难，似乎是危言耸听。或许股市泡沫破裂或者货币崩溃偶尔还是会出现，但现代经济体似乎已经击败了其最凶险的恶魔。

满头灰发的明斯基面容严肃，他反对那些断言，发展出自己的一套“金融不稳定性假说”，研究长期繁荣如何为下一次危机埋下祸根。这一假说是审视过去十年市场动荡的重要视角，而理论本身的历史也同样重要。其从边缘学术理论到主流辩论议题的发展轨迹显示，自2008年全球金融危机爆

发以来，现实已发生巨变，经济学也正随之调整。

明斯基一开始先解释了何为“投资”。就本质而言，那是用今天的钱换取明天的钱。一家公司现在付费建造工厂，假如一切顺利，工厂运作得来的利润将转化为其未来的资金。简单来说，今天的钱可得自两个来源之一：公司自有资金或他人的资金（例如公司从银行获得的贷款）。两者之间的平衡是金融体系的关键问题。

明斯基区分出三类融资。第一是他所谓的“对冲融资”，是最安全的：公司以未来现金流收入偿还借款本息。要顺利做到这一点，它们的借款必须很有限度，而且要有健康的利润。第二种是投机型融资，风险大一点：公司以现金流收入偿还借款的利息，但必须续借新债来偿还旧债的本金。经济运行平稳之时，这问题不大，不过一旦发生衰退便会带来困扰。第三类是庞氏融资，最为危险。现金流收入既不还本也不付息；公司孤注一掷，期望相关资产的升值足以偿还负债。假如无法做到，它们将陷入违约风险。

“对冲融资”占主流的经济体（拥有较强现金流收入及低负债水平）最为稳定。当投机型融资和庞氏融资成为市场主流时（尤其是后者），金融系统会变得更加脆弱。假如因货币紧缩政策或某些外部冲击，资产价值开始下降，最为过度扩张的公司将被迫出售资产头寸。这将进一步打压市场的资产价值，拖累更多公司。为避免陷入此危机，企业可限制自己只做对冲融资。但随着时间推移，尤其是在经济风调雨顺之时，借债的诱惑就会变得难以抗拒。增长看似必然，何不多借点资金？繁荣期越长，银行就越会降低信贷标准，为借贷添加动力。假如违约只是极少数情况，何不多贷款出去？明斯基的结论让人不安。经济稳定滋生不稳定，繁荣期会也向金融脆弱期过渡。

2008年全球金融危机过后，银行过度放贷及零首付按揭的恶果仍历历在目，明斯基的观点也许看起来清楚明白。当然，债务和融资很重要。但几十年来经济学研究甚少关注前者，并把后者归入到子学科中，而非视其为更广泛理论的基本要素。明斯基是个特立独行的人。他既质疑凯恩斯学派宏观经济理论的支柱，也挑战了人们对有效市场的普遍信念。

明斯基本人视凯恩斯为偶像，如果说他的理念是对凯恩斯主义的批判，这也许显得奇怪。然而他认为凯恩斯主义已大大偏离了凯恩斯自己的想法。此前，经济学家们建立起模型套用凯恩斯的论点来解释经济。最著名的是主要由约翰·希克斯（John Hicks）和阿尔文·汉森（Alvin Hansen）创建、显示投资与资金之间关系的IS-LM模型，它至今仍是教学及政策分析的有力工具。然而，尽管凯恩斯深刻意识到市场的重要性，希克斯和汉森的模型却在很大程度上忽略了金融部门。明斯基认为，这是“对凯恩斯微妙而复杂见解的不公平且幼稚的表述”。明斯基的金融不稳定性假说有助于填补这些漏洞。

他对主张“市场有效论”的先知们提出的挑战更为尖锐。尤金·法玛（Eugene Fama）和罗伯特·卢卡斯（Robert Lucas）等人说服大多数学术界和政界人士相信，随着人们接受所有可用的信息，市场会趋向均衡。金融体系的结构几乎被视为毫不相关。最近几年，行为经济学家们已对有效市场理论的一大要点做出攻击：人们远非懂得最大化收益的理性行为人，而且往往不清楚自己想要什么，还会做出错误的决定。但多年前明斯基就已经抨击过另一要点：他认为，金融体系中的深层次力量驱使系统陷入危机，稳定只是转瞬即逝的幻象。

| 从外而内

在有时显得封闭隔绝的经济学界，作为局外人的明斯基影响力一直有限，这直到近期才有所改观。相比教授们，投资者更迅速地被其观点吸引。最不遗余力推广其理念的是基金管理集团太平洋投资管理公司（PIMCO）的保罗·麦卡利（Paul McCulley）。他创造了“明斯基时刻”（Minsky moment）一词来描述债务水平到达崩溃点且资产价格开始全面暴跌的情况。麦卡利最初以这一术语解释1998年俄罗斯的金融危机。自从2008年全球市场动荡以来，这个词已无处不在。对投资分析师和基金经理而言，如今“明斯基时刻”已基本成为金融危机的代名词。

明斯基的债务及金融创新风险论的一大优点是和经验相符。但该优点也可能被一些人视为缺点。为描绘更细致入微的经济图景，明斯基放弃运用优雅简洁的模型，而使说服力有所削弱。在他看来，这并没有问题。他认

为，可以概括归纳的理论都是夸夸其谈。他想解释的是具体情况，而非一般性的经济学现象。他认为金融不稳定性假说与市场深入而复杂的发达资本主义经济体的情况相关。该假说并无意解释所有情景。例如，近期流行的问题是，中国过去十年债务增长惊人，如今是否面临明斯基时刻。但一个从社会主义向市场经济转型且金融体系不成熟的国家并不在明斯基的构想之中。

不借用方程式和模型的力量是有代价的。这导致明斯基的假说被孤立于主流理论之外。经济学家没有完全忽视债务因素，但他们只做了有限度的研究。清泷信宏和本·伯南克（后来成为美联储主席）等一些经济学家研究了信贷如何加速商业周期。明斯基的论说本来可对两人的研究起补充作用，但他们并未参考，就好像明斯基的理论不存在。

自明斯基去世后，其他人开始纠正对他的忽视，将其理论嫁接到一般模型中。纽约巴德学院（Bard College）的利维经济研究所（Levy Economics Institute）是明斯基结束职业生涯之地，该所每年仍召开会议以纪念明斯基，并已发表研究报告，把他的理念融入计算模型中。利维研究所于2000年发表了一篇论文，以明斯基理论启发所创立的模型将投资和现金流联系起来。2005年，该所为国际清算银行（各国央行组成的合作平台）撰写的一篇论文引用明斯基的理论构建模型，解释人们如何在亏损后评估自己的资产。2010年，诺贝尔奖获奖经济学家保罗·克鲁格曼（Paul Krugman，如今其最为人熟知的身份是纽约时报专栏作家）参与撰写了一篇论文，融入“明斯基时刻”的概念建模解释去杠杆对经济的冲击。一些研究人员也开始测试明斯基的见解实际上有多准确：2014年，为芬兰银行撰写的一份论文审视了债务现金流比率，发现这是显示系统性风险的有益指标。

| 债务人的棱镜

但若认为金融不稳定性假说会就此变成经济学理论的新基石，则未免牵强。明斯基留下的成果更在于启发人们专注于对的事情上，而非恰当地构建量化模型。其主要关注点——债务及金融稳定性，现已成为经济学者们探讨的主要议题，能看到这些就足够了。首次出版于1999年、影响广泛的

概论《宏观经济学手册》（Handbook of Macroeconomics）已在编写新版。新版手册将把金融与经济活动之间的关联做为一大内容版块，至少有两篇文章援引明斯基的理论。正如克鲁格曼打趣道：“现在我们都是明斯基主义者了。”

央行官员们似乎也同意。珍妮·耶伦（Janet Yellen）成为美联储主席前，在2009年的一次演讲中表示，明斯基的著作已“成为必读内容”。2013年，时任英国央行行长的默文·金（Mervyn King）在一次演说时赞同明斯基的观点，认为信贷市场的稳定将导致经济过度活跃，最终引发不稳定。其继任者马克·卡尼（Mark Carney）至少已在两个场合提到过“明斯基时刻”。

明斯基时刻会持续吗？明斯基自己的理论表明它将逐渐平息。经济增长仍然不稳，全球金融危机的伤痕也尚未愈合。按明斯基理论的轨道，这是企业和银行最为谨慎的时期，它们都害怕重蹈覆辙，并决心巩固其资产负债表。

时过境迁，2008年的动荡记忆终将会日渐模糊，公司又将竞相扩张，银行会为其提供资金，监管机构会放松限制。明斯基的警告将被抛诸脑后。离上一次危机越远，我们越是不愿听取那些预见到下一次危机来临的箴言。





Tariffs and wages

An inconvenient iota of truth

The third in our series looks at the Stolper-Samuelson theorem

IN AUGUST 1960 Wolfgang Stolper, an American economist working for Nigeria's development ministry, embarked on a tour of the country's poor northern region, a land of "dirt and dignity", long ruled by conservative emirs and "second-rate British civil servants who didn't like business".

In this bleak commercial landscape one strange flower bloomed: Kaduna Textile Mills, built by a Lancashire firm a few years before, employed 1,400 people paid as little as £4.80 (\$6.36) a day in today's prices. And yet it required a 90% tariff to compete.

Skilled labour was scarce: the mill had found only six northerners worth training as foremen (three failed, two were "so-so", one was "superb"). Some employees walked ten miles to work, others carried the hopes of mendicant relatives on their backs. Many quit, adding to the cost of finding and training replacements. Those who stayed were often too tired, inexperienced or ill-educated to maintain the machines properly. "African labour is the worst paid and most expensive in the world," Stolper complained.

He concluded that Nigeria was not yet ready for large-scale industry. "Any industry which required high duties impoverished the country and wasn't worth having," he believed. This was not a popular view among his fellow planners. But Stolper's ideas carried unusual weight. He was a successful schmoozer, able to drink like a fish. He liked "getting his hands dirty" in empirical work. And his trump card, which won him the respect of friends and the ear of superiors, was the "Stolper-Samuelson theorem" that bore his name.

The theorem was set out 20 years earlier in a seminal paper, co-authored by Paul Samuelson, one of the most celebrated thinkers in the discipline. It shed new light on an old subject: the relationship between tariffs and wages. Its fame and influence were pervasive and persistent, preceding Stolper to Nigeria and outlasting his death, in 2002, at the age of 89. Even today, the theorem is shaping debates on trade agreements like the Trans-Pacific Partnership (TPP) between America and 11 other Pacific-rim countries.

The paper was “remarkable”, according to Alan Deardorff of the University of Michigan, partly because it proved something seemingly obvious to non-economists: free trade with low-wage nations could hurt workers in a high-wage country. This commonsensical complaint had traditionally cut little ice with economists. They pointed out that poorly paid labour is not necessarily cheap, because low wages often reflect poor productivity—as Kaduna Textile Mills showed. The Stolper-Samuelson theorem, however, found “an iota of possible truth” (as Samuelson put it later) in the hoary argument that workers in rich countries needed protection from “pauper labour” paid a pittance elsewhere.

To understand why the theorem made a splash, it helps to understand the pool of received wisdom it disturbed. Economists had always known that tariffs helped the industries sheltered by them. But they were equally adamant that free trade benefited countries as a whole. David Ricardo showed in 1817 that a country could benefit from trade even if it did everything better than its neighbours. A country that is better at everything will still be “most better”, so to speak, at something. It should concentrate on that, Ricardo showed, importing what its neighbours do “least worse”.

If bad grammar is not enough to make the point, an old analogy might. Suppose that the best lawyer in town is also the best typist. He takes only ten minutes to type a document that his secretary finishes in 20. In that

sense, typing costs him less. But in the time he spent typing he could have been lawyering. And he could have done vastly more legal work than his secretary could do, even in twice the time. In that sense typing costs him far more. It thus pays the fast-typing lawyer to specialise in legal work and “import” typing.

In Ricardo’s model, the same industry can require more labour in one country than in another. Such differences in labour requirements are one motivation for trade. Another is differences in labour supplies. In some nations, such as America, labour is scarce relative to the amount of land, capital or education the country has accumulated. In others the reverse is true. Countries differ in their mix of labour, land, capital, skill and other “factors of production”. In the 1920s and 1930s Eli Heckscher and his student, Bertil Ohlin, pioneered a model of trade driven by these differences.

In their model, trade allowed countries like America to economise on labour, by concentrating on capital-intensive activities that made little use of it. Industries that required large amounts of elbow grease could be left to foreigners. In this way, trade alleviated labour scarcity.

That was good for the country, but was it good for workers? Scarcity is a source of value. If trade eased workers’ rarity value, it would also erode their bargaining power. It was quite possible that free trade might reduce workers’ share of the national income. But since trade would also enlarge that income, it should still leave workers better off, most economists felt. Moreover, even if foreign competition depressed “nominal” wages, it would also reduce the price of importable goods. Depending on their consumption patterns, workers’ purchasing power might then increase, even if their wages fell.

| *Working hypothesis*

There were other grounds for optimism. Labour, unlike oil, arable land, blast furnaces and many other productive resources, is required in every industry. Thus no matter how a country's industrial mix evolves, labour will always be in demand. Over time, labour is also versatile and adaptable. If trade allows one industry to expand and obliges another to contract, new workers will simply migrate towards the sunlit industrial uplands and turn their backs on the sunset sectors. "In the long run the working class as a whole has nothing to fear from international trade," concluded Gottfried Haberler, an Austrian economist, in 1936.

Stolper was not so sure. He felt that Ohlin's model disagreed with Haberler even if Ohlin himself was less clear-cut. Stolper shared his doubts with Samuelson, his young Harvard colleague. "Work it out, Wolfie," Samuelson urged.

The pair worked it out first with a simple example: a small economy blessed with abundant capital (or land), but scarce labour, making watches and wheat. Subsequent economists have clarified the intuition underlying their model. In one telling, watchmaking (which is labour-intensive) benefits from a 10% tariff. When the tariff is repealed, watch prices fall by a similar amount. The industry, which can no longer break even, begins to lay off workers and vacate land. When the dust settles, what happens to wages and land rents? A layman might assume that both fall by 10%, returning the watchmakers to profit. A clever layman might guess instead that rents will fall by less than wages, because the shrinkage of watchmaking releases more labour than land.

Both would be wrong, because both ignore what is going on in the rest of the economy. In particular, wheat prices have not fallen. Thus if wages and rents both decrease, wheat growers will become unusually profitable and expand. Since they require more land than labour, their expansion puts

more upward pressure on rents than on wages. At the same time, the watch industry's contraction puts more downward pressure on wages than on rents. In the push and pull between the two industries, wages fall disproportionately—by more than 10%—while rents, paradoxically, rise a little.

This combination of slightly pricier land and much cheaper labour restores the *modus vivendi* between the two industries, halting the watchmakers' contraction and the wheat-farmers' expansion. Because the farmers need more land than labour, slightly higher rents deter them as forcefully as much lower wages attract them. The combination also restores the profits of the watchmakers, because the much cheaper labour helps them more than the slightly pricier land hurts them.

The upshot is that wages have fallen by more than watch prices, and rents have actually risen. It follows that workers are unambiguously worse off. Their versatility will not save them. Nor does it matter what mix of watches and wheat they buy.

Stolper, Samuelson and their successors subsequently extended the theorem to more complicated cases, albeit with some loss of crispness. One popular variation is to split labour into two—skilled and unskilled. That kind of distinction helps shed light on what Stolper later witnessed in Nigeria, where educated workers were vanishingly rare. With a 90% tariff, Kaduna Textile Mills could afford to train local foremen and hire technicians. Without it, Nigeria would probably have imported textiles from Lancashire instead. Free trade would thus have hurt the “scarce” factor.

In rich countries, skilled workers are abundant by international standards and unskilled workers are scarce. As globalisation has advanced, college-educated workers have enjoyed faster wage gains than their less educated

countrymen, many of whom have suffered stagnant real earnings. On the face of it, this wage pattern is consistent with the Stolper-Samuelson theorem. Globalisation has hurt the scarce “factor” (unskilled labour) and helped the abundant one.

But look closer and puzzles remain. The theorem is unable to explain why skilled workers have prospered even in developing countries, where they are not abundant. Its assumption that every country makes everything—both watches and wheat—may also overstate trade’s dangers. In reality, countries will import some things they no longer produce and others they never made. Imports cannot hurt a local industry that never existed (nor keep hurting an industry that is already dead).

Some of the theorem’s other premises are also questionable. Its assumption that workers will move from one industry to another can blind it to the true source of their hardship. Chinese imports have not squeezed American manufacturing workers into less labour-intensive industries; they have squeezed them out of the labour force altogether, according to David Autor of the Massachusetts Institute of Technology and his co-authors. The “China shock”, they point out, was concentrated in a few hard-hit manufacturing localities from which workers struggled to escape. Thanks to globalisation, goods now move easily across borders. But workers move uneasily even within them.

| *Grain men*

Acclaim for the Stolper-Samuelson theorem was not instant or universal. The original paper was rejected by the *American Economic Review*, whose editors described it as “a very narrow study in formal theory”. Even Samuelson’s own textbook handled the proposition gingerly. After acknowledging that free trade could leave American workers worse off, he added a health warning: “Although admitting this as a slight theoretical possibility, most economists are still inclined to think that its grain of truth

is outweighed by other, more realistic considerations,” he wrote.

What did Stolper think? A veteran of economic practice as well as principles, he was not a slave to formalism or blind to “realistic considerations”. Indeed, in Nigeria, Stolper discovered that he could “suspend theory” more easily than some of his politically minded colleagues (perhaps because theory was revealed to them, but written by him).

He was nonetheless sure that his paper was worth the fuss. He said he would give his left eye to produce another one like it. By the paper’s 50th anniversary, he had indeed lost the use of that eye, he pointed out wistfully.

The other side of the bargain was, however, left unfulfilled: he never did write another paper as good. Not many people have. ■



关税与工资

一丝无奈真相

经济学思想系列报道第三篇，介绍斯托尔珀-萨缪尔森定理

1960年8月，受聘于尼日利亚政府发展部的美国经济学家沃尔夫冈·斯托尔珀（Wolfgang Stolper）造访了该国北部的穷困地区——长期由保守的土王酋长和“厌恶工商业的二流英国公务员”管治的“卑污与尊严并存”之地。

这片萧瑟的商业土地上曾经绽放过一朵奇葩：卡杜纳纺织厂（Kaduna Textile Mills），几年前由英国兰开夏郡的一家公司投资兴建，曾雇有1400名员工。按今天的水平折算，工人的日薪仅仅为4.80英镑（6.36美元）。然而，关税需高达90%，该工厂才能与外国对手竞争。

这里技术工人稀缺：该工厂只找到六个值得培养为工头的尼日利亚北方人（其中三个未达标，两个“一般般”，一个“表现一流”）。有些工人需要走十英里的路来上班，有些则背负着行乞亲人的厚望。许多人中途放弃，加重了寻找及培训替代工人的成本。留下来的工人往往因为过度劳累、缺乏经验或者文化水平低下而无法妥善维护机器。斯托尔珀抱怨道，“非洲劳动力在全世界收入最低，但成本却是最高的。”

他总结道，尼日利亚仍没有为大规模工业做好准备。他认为，“依赖高关税维持的产业只会陷国家于困境，并不值得拥有。”其他规划专家并不普遍认同这一看法，但斯托尔珀的观点有着不同寻常的分量。他很健谈，酒量过人。他喜欢参与实证研究，“亲力亲为”。而他赢得朋友敬重和高层赏识的王牌则是以其名字命名的“斯托尔珀-萨缪尔森定理”。

该定理出自距当时20年前斯托尔珀与保罗·萨缪尔森（Paul Samuelson，最著名的经济学家之一）合撰的一篇影响深远的论文。这篇文章为理解一个老问题提供了新思路：关税与工资之间的关系。从斯托尔珀去尼日利亚前到他去世后（逝于2002年，终年89岁），该定理始终保持着广泛而持久的名声和影响力，直至今日仍主导着有关贸易协定的讨论，如美国与环太

平洋11国签订的跨太平洋伙伴关系协议（TPP）。

密歇根大学的艾伦·迪尔多夫（Alan Deardorff）称赞该论文“非同凡响”，原因之一是它证明了在非经济学家看来似乎显而易见的现象：与低工资水平国家进行自由贸易会损害高工资水平国家工人的利益。经济学者对这一合乎常理的怨言历来不以为然。他们指出，劳工的工资低并不一定意味着成本也会低，因为低工资往往是生产力低下的反映，正如卡杜纳纺织厂的情况所示。然而斯托尔珀-萨缪尔森定理发现，一个老掉牙的观点中“可能蕴含着一丝真理”（萨缪尔森后来如此形容道）：面对其他地方收入极低的“穷人劳工”，富裕国家的工人需要保护。

要知道该定理为何引起轰动，可以先了解下它所撼动的一些传统理念。经济学家们向来都明白关税的保护有助于产业发展。但他们同样也坚定地认为，整体而言，自由贸易能使各国获益。大卫·李嘉图（David Ricardo）在1817年证明，一国即使各行各业都优于邻国也可以从自由贸易中得益。他认为，所有行业都较胜一筹的这个国家仍会在某个行业“胜出最多”。该国应专注在这一方面，并从邻国进口“差距最小的产品”。

如果以上说法表达不清的话，一个惯用的比喻应该能帮助理解。假设城中最好的律师同时也是最好的打字员。他的秘书需二十分钟才能打完的文件他只需花十分钟。如此看来，他做打字的成本更低。但他花在打字上的时间本可用于律师工作。而且他原本能完成的律师工作即使他的秘书花两倍时间也远远做不到。在这个意义上，他把时间用于打字的成本就高得多了。因此，这位“打字飞快”的律师应该“进口”打字服务而自己专注法律事务才更合算。

李嘉图的模型认为，同一行业在不同国家所需劳动力可能存在多寡之分。这类劳动力需求差异正是跨境贸易的动机之一。另一驱动因素则是劳动力供应的差异。在美国等一些国家，相对于本国土地面积、已累积资本或教育水平，劳动力较为稀缺。而在其他国家，情况则相反。各国的劳动力、土地、资本、技能及其他“生产要素”各不相同。在上世纪二三十年代，伊莱·赫克歇（Eli Heckscher）和他的学生贝蒂尔·奥林（Bertil Ohlin）率

先针对这些差异所驱动的交易活动构建了模型。

他们的模型显示，通过贸易，美国可以集中于劳动力需求不大的资本密集型生产，从而节省劳动力消耗。需要大量辛苦劳动的行业可以留给外国人做。如此一来，贸易就缓解了劳动力稀缺的问题。

这对国家是有好处，但是否也有利于工人？稀缺性是价值的源泉之一。如果贸易会降低工人的稀缺价值，那么也或将削弱他们的议价能力。自由贸易很有可能导致工人收入在国民收入中所占份额下降。但多数经济学家认为，由于贸易能扩大国民收入总额，工人的福祉应该还是会有所提高。而且，即便外国竞争压低了“名义”工资水平，但进口产品的价格也会下降。所以，在一些消费模式情况下，即使工资下降，工人的购买力也可能会提高。

| 工作假说

还有其他理由可支持这种乐观的看法。不同于石油、耕地、高炉等其他生产资源，劳动力是所有行业都必需的。因此，不管一个国家的产业结构如何调整，始终都会需要劳动力。从长期看，劳动力也有多面性及适应性。假如贸易导致某一行业扩张而另一行业收缩，新增劳工将抛弃夕阳行业，转而投奔阳光照耀的产业高地。“长远来看，国际贸易对工人阶级整体不会造成什么威胁。”奥地利经济学家戈特弗里德·哈伯勒（Gottfried Haberler）在1936年总结道。

斯托尔珀则不太认同。他觉得奥林的模型与哈伯勒的论调不一致，即便奥林本人没那么明确地否认过。斯托尔珀向哈佛的年轻同事萨缪尔森透露了自己的质疑。萨缪尔森鼓励道，“好好研究是怎么回事吧，老兄。”

两人首先以一个简单的例子作推导：拥有充足资本（或土地）但劳动力稀缺，制造手表并种植小麦的一个小型经济体。后续的经济学家们进一步解释了该模型的核心直觉判断。其中一个解释是，手表制造业（劳动密集型）因10%的关税而获利。当关税被取消，手表价格会以相应幅度下降。该行业因收支不再平衡而开始裁员，让出土地。尘埃落定后，工资和租金

会发生怎样的变化？外行人士也许会以为两者将分别下降10%，制表商因而重新盈利。聪明的外行人也许会猜想，租金的下降比率会低于工资的降幅，因为制表业收缩释放的劳动力多于土地。

两者都不对，因为他们都忽略了经济体内其他方面的变化，尤其是小麦的价格并没有下降。因此，假如工资和租金都下降，小麦种植者的盈利会异常高涨，并将扩大经营。由于他们需要土地资源甚于劳动力，其扩张对租金造成的上行压力也甚于工资。同时，制表业的收缩对工资造成的下行压力则大于租金。随着两个产业的一推一拉，工资将不成比例地下降（超过10%），而租金则反而会略微上升。

土地价格微涨，加之劳动力成本大降，令两个行业之间暂时达到平衡，制表商的收缩及小麦农场主的扩张因而终止。相比劳动力，农场主更需要土地，因此尽管租金只是略微上涨，对他们的牵绊却和大幅下降的工资产生的好处相当。这两个因素的组合也使得制表商重获盈利，因为劳动力成本大降带来的利益超过租金微升造成的损害。

结果是工资跌幅大于手表价格跌幅，而租金则有所上升。随之而来的是，工人的境况无疑变得更糟糕。这种情况不会因他们的灵活多才而改善，也不受他们改变采购篮中手表和小麦的比例影响。

斯托尔珀、萨缪尔森及其后继者之后把该定理扩展至更复杂的例子，尽管分析起来没那么简洁易懂。其中一个流行的变体是把劳动力分为技术工人和非技术工人。这样的区分有助解释斯托尔珀后来在尼日利亚所见到的现象，在那里，接受过教育的工人极度稀缺。由于有90%的关税，卡杜纳纺织厂尚能负担培训当地工头及聘请技术人员的费用。如果没有关税，尼日利亚就很可能不在本地生产，而是直接从兰开夏郡进口纺织品。自由贸易因而会伤害“稀缺”要素。

按国际标准，富裕国家技术工人充足，非技术工人稀缺。随着全球化的推进，受过大学教育的劳动者工资增幅要比教育程度较低的同胞高，后者中许多人的实际收入都处于停滞状态。表面上看，这一工资模式与斯托尔珀

-萨缪尔森定理一致。全球化损害了稀缺“要素”（非技术劳工），而有益于充足要素。

但细察之下，疑问仍然存在。该定理无法解释为何技术工人可以从中获益，即使在技术工人并不充足的发展中国家也是如此。定理假定每个国家都会生产各种产品（既做手表，也产小麦），这可能会夸大贸易威胁论。实际上，各国会进口一些自己不再生产和从来没有生产过的产品。进口不会损害根本不存在的当地产业，也不会持续伤害早已式微的行业。

该定理的一些其他前提也有问题。认为工人会从一个行业转到另一行业的假设使定理忽视了工人困境的真正源头。麻省理工学院的大卫·奥特尔（David Autor）及其合著者认为，来自中国的进口产品并未迫使美国制造业工人转移至劳动密集度较低的产业，而是把他们完全排挤出劳动力市场。他们指出，“中国冲击”集中在几个制造业重灾区，工人难以逃离。全球化令货物的跨境流动变得容易，但工人的流动即使在国境之内也困难重重。

| 点滴真相

对斯托尔珀-萨缪尔森定理的称颂既没有迅速到来，也并非普遍存在。最初那篇论文被《美国经济评论》（American Economic Review）拒登，其编辑认为文章是“对正式理论极为狭隘的研究”。连萨缪尔森自己编写的教科书提到该定理时也显得小心翼翼。在承认自由贸易可能导致美国工人境况变糟后，他补充了一个提醒，这样写道：“虽然大部分经济学家都承认这种情况在理论上存在一定可能，但他们仍倾向于认为，相对其他更现实的考量，这一点真相的影响并不会太大。”

斯托尔珀又如何认为？作为经济学理论和实践的资深专家，他并没有盲从形式主义或无视“现实考量”。实际上，在尼日利亚，斯托尔珀发现，相比那些政治意识浓重的同事，他自己更能轻松地“搁置理论”。（或许是因为他们只是接受理论，而他却在创造理论。）

但是，他仍确信自己的论文并非小题大做。他表示，要是能再写出一篇像

那样的文章，他愿意牺牲自己的左眼。在论文发表50周年之际，他不无伤感地指出，他的左眼确实失明了。

然而，交换并未兑现：他再也没能写出可媲美之前那篇的文章。这样的大作，没有多少人能写就。 ■



Fiscal multipliers

Where does the buck stop?

Fiscal stimulus, an idea championed by John Maynard Keynes, has gone in and out of fashion

AT THE height of the euro crisis, with government-bond yields soaring in several southern European countries and defaults looming, the European Central Bank and the healthier members of the currency club fended off disaster by offering bail-outs. But these came with conditions, most notably strict fiscal discipline, intended to put government finances back on a sustainable footing. Some economists argued that painful budget cuts were an unfortunate necessity. Others said that the cuts might well prove counterproductive, by lowering growth and therefore government revenues, leaving the affected countries even poorer and more indebted.

In 2013 economists at the IMF rendered their verdict on these austerity programmes: they had done far more economic damage than had been initially predicted, including by the fund itself. What had the IMF got wrong when it made its earlier, more sanguine forecasts? It had dramatically underestimated the fiscal multiplier.

The multiplier is a simple, powerful and hotly debated idea. It is a critical element of Keynesian macroeconomics. Over the past 80 years the significance it has been accorded has fluctuated wildly. It was once seen as a matter of fundamental importance, then as a discredited notion. It is now back in vogue again.

The idea of the multiplier emerged from the intense argument over how to respond to the Depression. In the 1920s Britain had sunk into an economic slump. The first world war had left prices higher and the pound weaker. The government was nonetheless determined to restore the pound to its pre-

war value. In doing so, it kept monetary policy too tight, initiating a spell of prolonged deflation and economic weakness. The economists of the day debated what might be done to improve conditions for suffering workers. Among the suggestions was a programme of public investment which, some thought, would put unemployed Britons to work.

The British government would countenance no such thing. It espoused the conventional wisdom of the day—what is often called the “Treasury view”. It believed that public spending, financed through borrowing, would not boost overall economic activity, because the supply of savings in the economy available for borrowing is fixed. If the government commandeered capital to build new roads, for instance, it would simply be depriving private firms of the same amount of money. Higher spending and employment in one part of the economy would come at the expense of lower spending and employment in another.

As the world slipped into depression, however, and Britain’s economic crisis deepened, the voices questioning this view grew louder. In 1931 Baron Kahn, a British economist, published a paper espousing an alternative theory: that public spending would yield both the primary boost from the direct spending, but also “beneficial repercussions”. If road-building, for instance, took workers off the dole and led them to increase their own spending, he argued, then there might be a sustained rise in total employment as a result.

Kahn’s paper was in line with the thinking of John Maynard Keynes, the leading British economist of the day, who was working on what would become his masterpiece, “The General Theory of Employment, Interest and Money”. In it, Keynes gave a much more complete account of how the multiplier might work, and how it might enable a government to drag a slumping economy back to health.

Keynes was a singular character, and one of the great thinkers of the 20th century. He looked every inch a patrician figure, with his tweed suits and walrus moustache. Yet he was also a free spirit by the standards of the day, associating with the artists and writers of the Bloomsbury Group, whose members included Virginia Woolf and E.M. Forster. Keynes advised the government during the first world war and participated in the Versailles peace conference, which ended up extracting punitive reparations from Germany. The experience was dispiriting for Keynes, who wrote a number of scathing essays in the 1920s, pointing out the risks of the agreement and of the post-war economic system more generally.

Frustrated by his inability to change the minds of those in power, and by a deepening global recession, Keynes set out to write a *magnum opus* criticising the economic consensus and laying out an alternative. He positioned the “General Theory” as a revolutionary text—and so it proved.

The book is filled with economic insights. Yet its most important contribution is the reasoning behind the proposition that when an economy is operating below full employment, demand rather than supply determines the level of investment and national income. Keynes supposed there was a “multiplier effect” from changes in investment spending. A bit of additional money spent by the government, for instance, would add directly to a nation’s output (and income). In the first instance, this money would go to contractors, suppliers, civil servants or welfare recipients. They would in turn spend some of the extra income. The beneficiaries of that spending would also splash out a bit, adding still more to economic activity, and so on. Should the government cut back, the ill effects would multiply in the same way.

Keynes thought this insight was especially important because of what he called “liquidity preference”. He reckoned that people like to have some liquid assets on hand if possible, in case of emergency. In times of financial

worry, demand for cash or similarly liquid assets rises; investors begin to worry more about the return *of* capital rather than the return *on* capital. Keynes posited that this might lead to a “general glut”: a world in which everyone tries to hold more money, depressing spending, which in turn depresses production and income, leaving people still worse off.

In this world, lowering interest rates to stimulate growth does not help very much. Nor are rates very sensitive to increases in government borrowing, given the glut of saving. Government spending to boost the economy could therefore generate a big rise in employment for only a negligible increase in interest rates. Classical economists thought public-works spending would “crowd out” private investment; Keynes saw that during periods of weak demand it might “crowd in” private spending, through the multiplier effect.

Keynes’s reasoning was affirmed by the economic impact of increased government expenditure during the second world war. Massive military spending in Britain and America contributed to soaring economic growth. This, combined with the determination to prevent a recurrence of the Depression, prompted policymakers to adopt Keynesian economics, and the multiplier, as the centrepiece of the post-war economic order.

Other economists picked up where Keynes left off. Alvin Hansen and Paul Samuelson constructed equations to predict how a rise or fall in spending in one part of the economy would propagate across the whole of it. Governments took it for granted that managing economic demand was their responsibility. By the 1960s Keynes’s intellectual victory seemed complete. In a story in *Time* magazine, published in 1965, Milton Friedman declared (in a quote often attributed to Richard Nixon), “We are all Keynesians now.”

But the Keynesian consensus fractured in the 1970s. Its dominance was eroded by the ideas of Friedman himself, who linked variations in the

business cycle to growth (or decline) in the money supply. Fancy Keynesian multipliers were not needed to keep an economy on track, he reckoned. Instead, governments simply needed to pursue a policy of stable money growth.

An even greater challenge came from the emergence of the “rational expectations” school of economics, led by Robert Lucas. Rational-expectations economists supposed that fiscal policy would be undermined by forward-looking taxpayers. They should understand that government borrowing would eventually need to be repaid, and that stimulus today would necessitate higher taxes tomorrow. They should therefore save income earned as a result of stimulus in order to have it on hand for when the bill came due. The multiplier on government spending might in fact be close to zero, as each extra dollar is almost entirely offset by increased private saving.

| *Rubbing salt in*

The economists behind many of these criticisms clustered in colleges in the Midwest of America, most notably the University of Chicago. Because of their proximity to America’s Great Lakes, their approach to macroeconomics came to be known as the “freshwater” school. They argued that macroeconomic models had to begin with equations that described how rational individuals made decisions. The economic experience of the 1970s seemed to bear out their criticisms of Keynes: governments sought to boost slow-growing economies with fiscal and monetary stimulus, only to find that inflation and interest rates rose even as unemployment remained high.

Freshwater economists declared victory. In an article published in 1979 and entitled “After Keynesian Economics”, Robert Lucas and Tom Sargent, both eventual Nobel-prize winners, wrote that the flaws in Keynesian economic models were “fatal”. Keynesian macroeconomic models were “of no value

in guiding policy”.

These attacks, in turn, prompted the emergence of “New Keynesian” economists, who borrowed elements of the freshwater approach while retaining the belief that recessions were market failures that could be fixed through government intervention. Because most of them were based at universities on America’s coasts, they were dubbed “saltwater” economists. The most prominent included Stanley Fischer, now the vice-chairman of the Federal Reserve; Larry Summers, a former treasury secretary; and Greg Mankiw, head of George W. Bush’s Council of Economic Advisers. In their models fiscal policy was all but neutered. Instead, they argued that central banks could and should do the heavy lifting of economic management: exercising a deft control that ought to cancel out the effects of government spending—and squash the multiplier.

Yet in Japan since the 1990s, and in most of the rich world since the recession that followed the global financial crisis, cutting interest rates to zero has proved inadequate to revive flagging economies. Many governments turned instead to fiscal stimulus to get their economies going. In America the administration of Barack Obama succeeded in securing a stimulus package worth over \$800 billion.

As a new debate over multipliers flared, freshwater types stood their ground. John Cochrane of the University of Chicago said of Keynesian ideas in 2009: “It’s not part of what anybody has taught graduate students since the 1960s. They are fairy tales that have been proved false. It is very comforting in times of stress to go back to the fairy tales we heard as children, but it doesn’t make them less false.”

The practical experience of the recession gave economists plenty to study, however. Scores of papers have been published since 2008 attempting to estimate fiscal multipliers. Most suggest that, with interest rates close to

zero, fiscal stimulus carries a multiplier of at least one. The IMF, for instance, concluded that the (harmful) multiplier for fiscal contractions was often 1.5 or more.

Even as many policymakers remain committed to fiscal consolidation, plenty of economists now argue that insufficient fiscal stimulus has been among the biggest failures of the post-crisis era. Mr Summers and Antonio Fatas suggest, for example, that austerity has substantially reduced growth, leading to levels of public debt that are higher than they would have been had enthusiastic stimulus been used to revive growth.

Decades after its conception, Keynes's multiplier remains as relevant, and as controversial, as ever. ■



财政乘数

由谁担当重任？

约翰·梅纳德·凯恩斯所倡导的财政刺激理念的入时与过时

欧债危机深重之时，多个南欧国家的政府债券收益率飙升，违约风险隐现。欧洲央行及欧元区较为稳健的成员国提供纾困援助，助它们避过一劫。为了让受助国的政府财政重建可持续的根基，这些援助不无附带条件，其中最明显的当属实施严格的财政纪律。一些经济学家认为，痛苦的预算削减不得不做。其他经济学家则表示，削减预算可能适得其反，导致增长放缓，政府收入减少，受影响国家会因而更加穷困，负债更重。

2013年，国际货币基金组织（以下简称IMF）对这些紧缩计划作出如下评判：它们造成的经济损害远超人们最初的预期，包括IMF自身的预估。IMF之前相对乐观的预测哪里出错了？它大大低估了财政乘数。

财政乘数是一个简单、强大而备受热议的概念，也是凯恩斯宏观经济学的一个关键要素。在过去80年里，人们对其重要性的评价变化甚大——一度视其为至关重要，之后却又将之贬得一文不值。如今，该理念再度风行。

财政乘数的概念诞生于当年关于如何应对大萧条的激辩中。上世纪20年代，英国深陷经济衰退。第一次世界大战后物价上涨，英镑走弱。然而，政府仍决心让英镑价值重回战前水平。为此，政府维持过紧的货币政策，导致长期通缩及经济疲弱。当时的经济学家就如何改善困顿工人的境况展开了争论。其中一个建议是推出公共投资项目，有人认为，这可以让失业的英国人重新就业。

英国政府不会接受这样的建议。它信奉当时的传统智慧——如今常被称为“财政部观点”，即通过借款融资而来的公共支出不会刺激整体经济活动，因为经济体内可供借出的存款供应量是固定的。举例来说，如果政府调用资金修建新公路，就剥夺了私营企业能得到的等量资金。经济体中某部门支出及就业的提高是以另一部门支出及就业的下降为代价的。

然而，随着世界陷入萧条及英国经济危机的加深，质疑这一观点的呼声日益高涨。1931年，英国经济学家卡恩男爵（Baron Kahn）发表了一篇论文，支持另一理论：公共支出不但通过直接开支对经济起主要推动作用，还带来其他“有益的反应”。举例说，假如修路可以让工人摆脱福利救济，并使他们的个人消费有所增加，那么，他认为，整体就业可能因此而持续上升。

卡恩的文章和当年英国著名经济学家约翰·梅纳德·凯恩斯（John Maynard Keynes）的理念相契合。当时凯恩斯正在撰写日后成为其代表作的《就业、利息和货币通论》。在此书中，他更完整地阐述了财政乘数发挥作用的原理，以及政府可以怎样利用该乘数让颓败的经济起死回生。

凯恩斯是位独特的人物，同时也是20世纪最伟大的思想家之一。他一身花呢西服，蓄着海象胡子，处处散发着贵族气息。然而，按当时标准来看，他也是位自由无拘的人，与艺术家和包括弗吉尼亚·伍尔夫（Virginia Woolf）及爱德华·摩根·福斯特（E.M. Forster）在内的布卢姆茨伯里派文人团体（Bloomsbury Group）过从甚密。凯恩斯在一战时期做过政府顾问，参与过最终向德国索取惩罚性赔款的凡尔赛和谈。这一过程让凯恩斯感到沮丧，他在上世纪20年代写过一些尖刻的文章，更广泛地指出凡尔赛和约及战后经济体系的风险。

因无法劝说当权者改变主意，加上全球经济衰退加剧，深感懊恼的凯恩斯开始撰写一部鸿篇巨著，批评当时的经济共识，并提出另外一种理念。他视这本《通论》为革命性作品，事实也被证明的确如此。

该书满是深刻的经济见解。然而最重要的贡献是书中命题背后的推理。该命题是，当一个经济体在非充分就业下运作，决定投资水平及国民收入的是需求而非供给。凯恩斯认为在投资支出的变化上存在一个“乘数效应”。举例说，政府额外支出的一些资金将直接带来国家产出（及收入）的增加。起初，这部分资金会流向承包商、供应商、公务员或福利救济受益人。他们继而会把一部分的额外收入花掉。赚了这些钱的受益者也会多花一些，从而使经济活动进一步增加，如此继续。假如政府削减开支，负面

影响将以相同方式扩大。

凯恩斯认为，由于他称之为“流动性偏好”的因素，上述见解更显重要。他猜测，人们在可能的情况下都希望持有一些流动资产做应急之用。在金融前景不乐观之时，对现金或类似流动性资产的需求就会上升；投资者开始更担忧本钱不保，而非利钱高低。凯恩斯假定，这可能会导致“普遍过剩”：在这种环境下，每个人都把钱紧紧捂在手中，花销减少，生产及收入继而受到压抑，令人们境况更糟。

如此情境下，靠降低利率来刺激经济增长并没有太大帮助。由于存款过剩，利率也不太会因政府借款增长而灵敏地发生变动。因此，政府为刺激经济而投入的支出便可能带动就业大幅上升，而造成的利率上行则微不足道。古典经济学者认为，公共工程开支对私人投资有“挤出效应”；凯恩斯则觉得，在需求疲弱时，公共工程开支反而能通过乘数效应“挤入”私人支出。

二战期间，政府支出增加造成的经济效应印证了凯恩斯的推理。英美庞大的军费开支促使两国经济快速增长。这样的实证，加上政府决心防范大萧条再现，促使决策者采用凯恩斯主义经济理论及“财政乘数”作为战后经济秩序的核心理念。

其他经济学家继续拓展了凯恩斯的理论。阿尔文·汉森（Alvin Hansen）和保罗·萨缪尔森（Paul Samuelson）构建公式预测经济体内部某一部门支出的增减将如何传导至整个经济体。各国政府想当然地把管理经济需求视为己任。到了60年代，凯恩斯理论似乎已大获全胜。1965年，在《时代》杂志发表的一篇文章中，米尔顿·弗里德曼（Milton Friedman）引述他人的话（一般认为原话出自理查德·尼克松），宣称“我们现在都是凯恩斯主义者了”。

但在70年代，凯恩斯主义的共识开始破裂。其霸主地位受到弗里德曼本人观点的侵蚀，后者把商业周期的各个阶段与货币供应的增减联系起来。他认为，要使经济保持正轨，不需要花哨的凯恩斯乘数。相反，政府推行稳

健的货币增长政策便可。

更大的挑战来自罗伯特·卢卡斯（Robert Lucas）为首的“理性预期”经济学派。理性预期经济学者们认为，爱未雨绸缪的纳税人会令财政政策失效。他们会知道，政府借款最终是需要偿还的，而今天的刺激政策必然导致明日更高的税率。因此，他们应该把因刺激政策而赚取的收入存起来，以备来日付账之需。政府支出的乘数实际可能接近于零，因为额外支出的每一分钱几乎完全都被私人储蓄的增加抵消。

| 抹上盐

提出这类批评的经济学者大多集中在美国中西部地区的高校，尤其是芝加哥大学。由于地理位置接近美国五大湖区，其宏观经济学论调因而被称为“淡水”学派。他们认为，宏观经济学模型必须首先用公式来描述理性个体是如何做决定的。上世纪70年代的经济发展历程似乎印证了他们对凯恩斯的批判：政府通过财政及货币刺激手段提振增长缓慢的经济，结果在失业率高居不下的情况下，通胀及利率都上升了。

淡水学派经济学者宣告胜利。在发表于1979年的一篇题为《凯恩斯主义经济学之后》（After Keynesian Economics）的文章中，罗伯特·卢卡斯（Robert Lucas）和汤姆·萨金特（Tom Sargent，两人后来都成为诺贝尔奖得主）写道，凯恩斯主义经济学模型的缺陷是“致命的”，凯恩斯主义宏观经济学模型“对指导政策制订并无价值”。

这些攻击反过来又催生出一批“新凯恩斯主义”经济学者，他们借用淡水学派论调的部分元素，但又坚持认为，衰退是市场失灵的表现，可通过政府干预来解决。他们大多来自美国沿海地区的大学，因而被冠以“咸水”学派之名。其中最著名的人士包括现任美联储副主席斯坦利·费希尔（Stanley Fischer）、美国前财长拉里·萨默斯（Larry Summers），以及小布什政府首席经济顾问格里高利·曼昆（Gregory Mankiw）。在他们的模型里，财政政策几乎无所作用。相反，他们认为，央行不仅可以也应该肩负起经济管理的重任：实施巧妙的控制，抵消政府支出的效应，并压低财政乘数。

但在上世纪90年代以来的日本以及自2008年全球金融危机后陷于衰退的大部分富裕国家，把利率降至零已被证明并不足以振兴颓废的经济。许多国家政府转而利用财政刺激手段推动经济。在美国，奥巴马政府一项价值超过8000亿美元的经济刺激计划成功获得国会通过。

有关财政乘数的新一轮争论爆发，淡水学派坚守立场。芝加哥大学的约翰·科克伦（John Cochrane）在2009年就凯恩斯派观点表示：“上世纪60年代后，就没有人给研究生教这一套了。那是童话故事，已经被证明并不靠谱。在艰难时期重温儿时听过的童话故事会很舒心，但还是一样不靠谱。”

然而，经济衰退给经济学者们提供了大量实践经验做研究。自2008年以来有众多研究论文试图估算财政乘数。它们大多认为，在利率接近为零的情况下，财政刺激带来的乘数至少为1。例如，IMF得出结论，认为财政紧缩的（负面）乘数往往在1.5或以上。

尽管许多决策者依然致力于进行财政整顿，很多经济学者如今认为，财政刺激不足是后危机时代最大的失误之一。例如，萨默斯和安东尼奥·法塔斯（Antonio Fatas）指出，紧缩政策已令增长大为减弱，导致公共债务水平比运用刺激手段提振增长的情况下要高。

诞生至今已有数十年，凯恩斯乘数依然具现实意义，也从来都伴有争议。





Free exchange

The problematic proposal

Shifts in global-trade patterns are fuelling a new anti-trade fervour

THESE are difficult times for America's free-traders. Donald Trump has put anger at "globalism" at the heart of his campaign. Even Democrats have turned against the Trans-Pacific Partnership (TPP)—an ambitious new agreement between 12 Pacific-rim countries, and one of Barack Obama's signature second-term achievements. Hillary Clinton, once a backer, has withdrawn her support, while left-wing activists rail against the deal at every opportunity. The changing structure of global trade is partly to blame for the souring of public opinion. Unfortunately, that evolution will make any new effort to liberalise trade devilishly hard.

Trade between America and China has grown explosively since 2000, over which time manufacturing employment in America has fallen from just over 17m workers to around 12m, while wages for less-skilled workers have stagnated. In a recent paper David Autor, David Dorn and Gordon Hanson examined the performance of cities where industry was most exposed to Chinese competition. They found depressed wages and labour-force participation and elevated unemployment persisted for a decade or more after rapid growth in trade with China began. Resentment at this experience, and at the perception that too little has been done by American leaders to mitigate these harms, certainly motivates some trade warriors. The wonder, arguably, is that politicians have taken so long to exploit these trends.

However, polling actually shows that Americans favour freer trade—more so, in fact, than they did a few years ago, when Mr Obama prioritised the TPP negotiations. But the recognition of the value of trade agreements does not extend to acceptance of TPP. Recent surveys find that the majority of

Americans are against it. If worker angst and Sinophobia were determining what people think, then you might expect more anger about overall trade but less hostility to TPP, which excludes China. Instead, the public—and even Republicans, now America’s most trade-hostile party—see more opportunity than cost to expanded trade, while at the same time distrusting TPP.

This odd divergence in opinion may be linked to a globalisation of supply chains. Production of traded goods has become “unbundled”, says Richard Baldwin of the Graduate Institute in Geneva. Firms once tended to design new gadgets and order the supplies needed to build them in a single factory or city. In the past few decades, more efficient global shipping and improvements in communications allowed firms to spread production across far-flung locations: to design a phone in America, source parts from several Asian economies, and assemble it in China. The share of parts and components in trade rose from 22% to 29% between 1980 and 2000. In 2005 trade in “intermediate inputs” accounted for an estimated 56% of trade in goods and 73% in services across rich countries. This dispersion of production chains contributed to a dramatic acceleration in global trade growth. It also changed the way many workers view trade. Where once it meant the choice between Japanese and American gadgetry, it now means iPhones, but built with cheap foreign labour.

As production has spread around the world, countries have specialised in different segments of the supply chain. While those, such as China, with lots of low-cost labour, focused on manufacturing and assembly, more advanced economies followed a different path. Cities like New York and San Francisco enjoyed an initial advantage in the most lucrative bits of the modern supply chain: research and development, engineering and finance. As a result, growth in supply-chain trade has been a boon for the powerful and profitable firms with headquarters in those cities, and for the highly skilled, well-compensated workers they employ. To the extent that further

trade integration is seen as likely to reinforce these trends, TPP helps motivate opposition among red-state Republicans who are contemptuous and suspicious of big, blue-state metropolitan areas, and also among left-leaning Americans worried about inequality.

Worse still, from a strictly political perspective, is the focus within new trade agreements on stripping away non-tariff barriers. After decades of multinational diplomacy, tariff rates on most goods traded by most members of the WTO are too low to mention. Yet all sorts of obstacles to free exchange remain. Tradable services—in finance, or information industries—are subject to thickets of domestic regulation, for example conditions that must be satisfied before a firm can invest across borders. Simplifying and harmonising such rules should reduce trade costs. But when voters get a peek at such negotiations, they see their government offering to alter domestic standards—to sacrifice autonomy and sell out domestic interests, even—just to help the big firms make a few more bucks. Multinational companies do indeed exercise plenty of influence over what such pacts will entail. Yet even if they did not, the nature of the bargaining would make such dealmaking politically vulnerable.

| *What's in it for me*

America's lot in this new world is, on the whole, a happy one. Many countries envy its fortunate position as a hub for innovative cities. Most studies of the potential effects of TPP conclude that the deal would raise American output by a small but meaningful amount: just under a percentage point of GDP, perhaps, over the next 15 years. But the obstacles confronting new trade deals are formidable. More generous redistribution, perhaps through an expanded programme of trade-adjustment assistance, could help neutralise some opposition. But discomfort with TPP is mostly rooted in a mistrust of the elite. Voters who are sceptical of the value of TPP will be unlikely to change their stripes without some demonstration that

pacts of its kind benefit the many rather than just the few. ■



自由交流

有问题的提议

全球贸易模式的变迁激起了新一轮反贸易热潮

现在是美国自由贸易主义者的艰难时刻。唐纳德·特朗普已经将对“全球主义”的愤怒之情作为其竞选的核心。即便是民主党人也转而反对跨太平洋伙伴关系协定（TPP）——这一雄心勃勃的新协议由环太平洋的12个国家达成，也是奥巴马第二任期的一项标志性政绩。希拉里曾是该协定的支持者，但也已不再予以支持，而左翼活跃分子更是抓住一切时机痛责这一协定。公共舆论不断恶化，一定程度上是受到全球贸易结构变化的影响。不幸的是，这样的演变会使贸易自由化的任何新努力都变得无比困难。

自2000年开始，中美贸易迅猛增长，在此期间美国制造业员工从略超过1700万人降至1200万左右，同时低技术工人的工资水平也陷入停滞。在一篇最新的论文中，大卫·奥特尔（David Autor）、大卫·多恩（David Dorn）和高登·汉森（Gordon Hanson）研究了多个城市的表现，这些城市的产业受中国竞争的影响最深。他们发现，对中贸易开始飞速发展之后，低迷的工资和劳动力参与度以及升高的失业率持续了十年甚至更久。对这一经历的愤恨，以及对美国领导人在缓解这些伤害上少有作为的不满，必然激起一些反自由贸易斗士的斗志。可以说，令人讶异的是政治家们竟然过了这么久才来利用这些趋势。

然而民调显示，其实美国人喜欢更加自由的贸易，甚至比几年前奥巴马优先考虑TPP谈判时更喜欢。不过对贸易协定价值的肯定并不意味着对TPP的接受。最新调查显示大部分美国人都反对这一协定。如果工人的焦虑和恐华情绪在决定人们的想法，那么人们应当对整体贸易更为愤慨，而不那么敌视将中国排除在外的TPP才对。但是，公众乃至如今美国最仇视贸易的党派共和党都认为，贸易扩大带来的机遇要多于付出的成本，但同时他们又不相信TPP。

这一奇怪的意见分歧或许可以和供应链的全球化联系起来。日内瓦国际关

系及发展高等学院（The Graduate Institute, Geneva）的理查德·鲍德温（Richard Baldwin）认为贸易货物的生产已呈现“非绑定的”形式。公司曾经倾向于设计新奇物件，并只从一个工厂或城市订购生产所需的物资。在过去几十年里，更高效的全球运输加上通信的进步，让公司能够将生产分布到更广阔的地区：在美国设计手机，从几个亚洲经济体采购零件，然后在中国组装。从1980年到2000年间，零部件在贸易中的比重从22%升至29%。2005年“中间投入”的贸易估计占富裕国家货物贸易的56%、服务贸易的73%。生产链的分散极大地促进了全球贸易的增长，也改变了很多工人对贸易的看法。贸易曾经意味着是选日本还是美国产的小玩意，现在它意味着iPhone手机，但由便宜的外国劳工生产。

随着生产扩展到全世界，各个国家专精负责供应链的不同环节。像中国这样有大量低成本劳动力的国家专注于制造和组装，而更发达的经济体走的则是不同的道路。纽约和旧金山等城市有着初始优势，处于现代供应链最赚钱的部分：研发、工程和金融。因此，对于总部位于这些城市、既实力强大又获利丰厚的公司，以及它们雇佣的技术娴熟、待遇优厚的雇员来说，供应链贸易的增长已成为一种福利。鉴于更深入的贸易一体化被认为可能会强化这些趋势，TPP不仅会激起红州共和党人的反对——他们蔑视且怀疑广大蓝州的大都市地区，还会激起对不平等状况忧心忡忡的左倾美国人的反对。

从严格的政治角度看，更糟糕的是新贸易协定的重点是破除非关税贸易壁垒。在几十年多边外交之后，WTO大部分成员国的大多数货物关税已经低到不值一提，但自由贸易的种种阻碍仍然存在。金融或信息产业可交易的服务受制于错综复杂的国内法规。例如一家公司在跨境投资前必须满足种种条件，简化并且协调这些法规应该可以降低贸易成本。但是选民们只需对这样的谈判稍加了解，便会认为政府提出更改国内标准（甚至牺牲自主权、出卖本国利益）只是为了帮助大公司多赚一些。对于这些协议的细节，跨国公司的确发挥了很大的影响。但是即便它们没有影响，讨价还价的本质也会让这样的交易在政治上易受攻击。

| 对我有什么好处？

整体说来，美国在这个新世界中会享有很不错的境遇。很多国家都羡慕它作为创新城市聚集地的幸运地位。大部分对TPP潜在影响的研究都得出了这样的结论：这一协议在今后15年对美国产出的拉动可能不到GDP的百分之一，这一增幅虽小但意义非凡。但新贸易协定仍面临着强大的阻碍。更慷慨的再分配——或许可通过扩大实施贸易调整援助来实现——可能会帮助中和一些反对意见。但是对TPP感到不安主要还是源于对精英阶层的不信任。如果没有证据表明这类协议对很多人有益而非仅对少数人有利，那么怀疑TPP价值的选民就不可能改变他们的固有观念。 ■



Game theory

Prison breakthrough

The fifth of our series on seminal economic ideas looks at the Nash equilibrium

JOHN NASH arrived at Princeton University in 1948 to start his PhD with a one-sentence recommendation: “He is a mathematical genius”. He did not disappoint. Aged 19 and with just one undergraduate economics course to his name, in his first 14 months as a graduate he produced the work that would end up, in 1994, winning him a Nobel prize in economics for his contribution to game theory.

On November 16th 1949, Nash sent a note barely longer than a page to the Proceedings of the National Academy of Sciences, in which he laid out the concept that has since become known as the “Nash equilibrium”. This concept describes a stable outcome that results from people or institutions making rational choices based on what they think others will do. In a Nash equilibrium, no one is able to improve their own situation by changing strategy: each person is doing as well as they possibly can, even if that does not mean the optimal outcome for society. With a flourish of elegant mathematics, Nash showed that every “game” with a finite number of players, each with a finite number of options to choose from, would have at least one such equilibrium.

His insights expanded the scope of economics. In perfectly competitive markets, where there are no barriers to entry and everyone’s products are identical, no individual buyer or seller can influence the market: none need pay close attention to what the others are up to. But most markets are not like this: the decisions of rivals and customers matter. From auctions to labour markets, the Nash equilibrium gave the dismal science a way to make real-world predictions based on information about each person’s incentives.

One example in particular has come to symbolise the equilibrium: the prisoner's dilemma. Nash used algebra and numbers to set out this situation in an expanded paper published in 1951, but the version familiar to economics students is altogether more gripping. (Nash's thesis adviser, Albert Tucker, came up with it for a talk he gave to a group of psychologists.)

It involves two mobsters sweating in separate prison cells, each contemplating the same deal offered by the district attorney. If they both confess to a bloody murder, they each face ten years in jail. If one stays quiet while the other snitches, then the snitch will get a reward, while the other will face a lifetime in jail. And if both hold their tongue, then they each face a minor charge, and only a year in the clink (see diagram).

There is only one Nash-equilibrium solution to the prisoner's dilemma: both confess. Each is a best response to the other's strategy; since the other might have spilled the beans, snitching avoids a lifetime in jail. The tragedy is that if only they could work out some way of co-ordinating, they could both make themselves better off.

The example illustrates that crowds can be foolish as well as wise; what is best for the individual can be disastrous for the group. This tragic outcome is all too common in the real world. Left freely to plunder the sea, individuals will fish more than is best for the group, depleting fish stocks. Employees competing to impress their boss by staying longest in the office will encourage workforce exhaustion. Banks have an incentive to lend more rather than sit things out when house prices shoot up.

| *Crowd trouble*

The Nash equilibrium helped economists to understand how self-improving individuals could lead to self-harming crowds. Better still, it helped them to tackle the problem: they just had to make sure that every

individual faced the best incentives possible. If things still went wrong—parents failing to vaccinate their children against measles, say—then it must be because people were not acting in their own self-interest. In such cases, the public-policy challenge would be one of information.

Nash's idea had antecedents. In 1838 August Cournot, a French economist, theorised that in a market with only two competing companies, each would see the disadvantages of pursuing market share by boosting output, in the form of lower prices and thinner profit margins. Unwittingly, Cournot had stumbled across an example of a Nash equilibrium. It made sense for each firm to set production levels based on the strategy of its competitor; consumers, however, would end up with less stuff and higher prices than if full-blooded competition had prevailed.

Another pioneer was John von Neumann, a Hungarian mathematician. In 1928, the year Nash was born, von Neumann outlined a first formal theory of games, showing that in two-person, zero-sum games, there would always be an equilibrium. When Nash shared his finding with von Neumann, by then an intellectual demigod, the latter dismissed the result as “trivial”, seeing it as little more than an extension of his own, earlier proof.

In fact, von Neumann's focus on two-person, zero-sum games left only a very narrow set of applications for his theory. Most of these settings were military in nature. One such was the idea of mutually assured destruction, in which equilibrium is reached by arming adversaries with nuclear weapons (some have suggested that the film character of Dr Strangelove was based on von Neumann). None of this was particularly useful for thinking about situations—including most types of market—in which one party's victory does not automatically imply the other's defeat.

Even so, the economics profession initially shared von Neumann's assessment, and largely overlooked Nash's discovery. He threw himself into other mathematical pursuits, but his huge promise was undermined when in 1959 he started suffering from delusions and paranoia. His wife had him hospitalised; upon his release, he became a familiar figure around the Princeton campus, talking to himself and scribbling on blackboards. As he struggled with ill health, however, his equilibrium became more and more central to the discipline. The share of economics papers citing the Nash equilibrium has risen sevenfold since 1980, and the concept has been used to solve a host of real-world policy problems.

One famous example was the American hospital system, which in the 1940s was in a bad Nash equilibrium. Each individual hospital wanted to snag the brightest medical students. With such students particularly scarce because of the war, hospitals were forced into a race whereby they sent out offers to promising candidates earlier and earlier. What was best for the individual hospital was terrible for the collective: hospitals had to hire before students had passed all of their exams. Students hated it, too, as they had no chance to consider competing offers.

Despite letters and resolutions from all manner of medical associations, as well as the students themselves, the problem was only properly solved after decades of tweaks, and ultimately a 1990s design by Elliott Peranson and Alvin Roth (who later won a Nobel economics prize of his own). Today, students submit their preferences and are assigned to hospitals based on an algorithm that ensures no student can change their stated preferences and be sent to a more desirable hospital that would also be happy to take them, and no hospital can go outside the system and nab a better employee. The system harnesses the Nash equilibrium to be self-reinforcing: everyone is doing the best they can based on what everyone else is doing.

Other policy applications include the British government's auction of 3G mobile-telecoms operating licences in 2000. It called in game theorists to help design the auction using some of the insights of the Nash equilibrium, and ended up raising a cool £22.5 billion (\$35.4 billion)—though some of the bidders' shareholders were less pleased with the outcome. Nash's insights also help to explain why adding a road to a transport network can make journey times longer on average. Self-interested drivers opting for the quickest route do not take into account their effect of lengthening others' journey times, and so can gum up a new shortcut. A study published in 2008 found seven road links in London and 12 in New York where closure could boost traffic flows.

| *Game on*

The Nash equilibrium would not have attained its current status without some refinements on the original idea. First, in plenty of situations, there is more than one possible Nash equilibrium. Drivers choose which side of the road to drive on as a best response to the behaviour of other drivers—with very different outcomes, depending on where they live; they stick to the left-hand side of the road in Britain, but to the right in America. Much to the disappointment of algebra-toting economists, understanding strategy requires knowledge of social norms and habits. Nash's theorem alone was not enough.

A second refinement involved accounting properly for non-credible threats. If a teenager threatens to run away from home if his mother separates him from his mobile phone, then there is a Nash equilibrium where she gives him the phone to retain peace of mind. But Reinhard Selten, a German economist who shared the 1994 Nobel prize with Nash and John Harsanyi, argued that this is not a plausible outcome. The mother should know that her child's threat is empty—no matter how tragic the loss of a phone would be, a night out on the streets would be worse. She should

just confiscate the phone, forcing her son to focus on his homework.

Mr Selten's work let economists whittle down the number of possible Nash equilibria. Harsanyi addressed the fact that in many real-life games, people are unsure of what their opponent wants. Economists would struggle to analyse the best strategies for two lovebirds trying to pick a mutually acceptable location for a date with no idea of what the other prefers. By embedding each person's beliefs into the game (for example that they correctly think the other likes pizza just as much as sushi), Harsanyi made the problem solvable. A different problem continued to lurk. The predictive power of the Nash equilibrium relies on rational behaviour. Yet humans often fall short of this ideal. In experiments replicating the set-up of the prisoner's dilemma, only around half of people chose to confess. For the economists who had been busy embedding rationality (and Nash) into their models, this was problematic. What is the use of setting up good incentives, if people do not follow their own best interests?

All was not lost. The experiments also showed that experience made players wiser; by the tenth round only around 10% of players were refusing to confess. That taught economists to be more cautious about applying Nash's equilibrium. With complicated games, or ones where they do not have a chance to learn from mistakes, his insights may not work as well.

The Nash equilibrium nonetheless boasts a central role in modern microeconomics.

Nash died in a car crash in 2015; by then his mental health had recovered, he had resumed teaching at Princeton and he had received that joint Nobel—in recognition that the interactions of the group contributed more than any individual. ■



博弈论

监狱突破

开创性经济学思想系列报道第五篇，纳什均衡

约翰·纳什（John Nash）于1948年来到美国普林斯顿大学读博士时，推荐信上只有一句话：“他是个数学天才。”纳什不负所望。年仅19岁、只修读过一门经济学本科课程的他在就读研究生的头14个月便做出建树——期间他对博弈论的贡献最终为其赢得了1994年的诺贝尔经济学奖。

1949年11月16日，纳什向《美国国家科学院院刊》（Proceedings of the National Academy of Sciences）投送了一篇不到一页纸的短文，在文中他阐述了日后被称为“纳什均衡”的概念。这一概念描述的是人们或机构在猜测他人行动的基础上做出理性选择时出现的一个稳定结果。在纳什均衡中，任一方都无法通过改变策略来改善自己的处境：每人都尽力做到最好，即使这并不意味着能为社会带来最优结果。纳什以一系列简洁优雅的数学演算显示，在参与者数量有限并且每人可做选择有限的每场“博弈”中，至少会有一个这样的均衡点。

他的见解拓展了经济学的疆界。在竞争充分、没有准入限制、各家产品完全相同的市场中，任何单个买家或卖家都不可能影响市场：谁也无需关注和打听别人在做什么。但大部分市场并非如此：对手及顾客的决定很重要。从拍卖市场到劳动力市场，纳什均衡理论为沉闷的经济学提供了一种可以根据人们的动机来预测现实情境结果的途径。

特别是其中一个例子——囚徒困境——已成为纳什均衡理论的象征。纳什在1951年的一篇扩展论文中以代数和数字阐述了这一情境，但经济学学生熟悉的另一版本更令人兴味盎然。那是纳什的论文导师阿尔伯特·塔克（Albert Tucker）给一群心理学家做讲座时提出的。

囚徒困境讲的是被分开囚禁的两名暴徒，两人汗流浹背地考虑着地方检察官提出的同样条件。如果他们都承认犯下血腥谋杀罪行，每人将获刑十

年。假如一人保持缄默而一人坦白，坦白者可获奖励，而另一人将被判终身监禁。假如两人都沉默，那么他们将面对轻微指控且只需入狱一年（见下图）。

囚徒困境只有唯一的纳什均衡解：两人都认罪。对每个人来说，这都是对另一方策略的最佳反应，因为对方可能已经认罪，毕竟坦白可避免终身监禁。悲剧的是，假如他们能想办法串通协作，两人的处境本来还可以更好。

这个例子表明，团体既可能是明智也可能是愚蠢的；对个人最有利的选择可能会给团体带来灾难性结果。在现实世界里，这样的悲剧结果屡见不鲜。若对海上捕鱼不加以限制，个人就会罔顾团体利益，涸泽而渔。为取悦上司，员工争相长时间呆在办公室，最后整个工作团队都精疲力竭。房价暴涨时，银行都想增加放贷而非按兵不动。

| 群体乱象

纳什均衡理论有助经济学家了解个人提高福祉的行动何以会损害群体利益。然而，更妙的是，该理论还有助于经济学家解决上述问题，他们只需确保创造最佳激励机制供每一个体选择。假如结果还是不对（比如，家长未能给孩子接种麻疹疫苗），那么肯定是由于人们没按自身利益行事。这些情况下，公共政策面临的挑战就成了知情度。

纳什的想法不乏与前人相契合之处。1838年，法国经济学家奥古斯丁·古诺（Augustin Cournot）的理论认为，在只有两家公司竞争的市场，两者都明白以提高产量为手段追逐市场份额的缺点，即价格下降，利润摊薄。古诺无意中举出了一个“纳什均衡”例子。每家公司视对手的策略制定自己的产量目标合情合理，然而，相比商家全面杀价竞争的情形，消费者最终会面对产品少而价格高的情境。

另一先驱是匈牙利数学家约翰·冯·诺伊曼（John von Neumann）。1928年，纳什出生的那年，冯·诺伊曼勾勒出第一套正式的“博弈”理论，该理论显示在两人参与的零和博弈中，总存在一个均衡点。当纳什向已成

为学术泰斗的冯·诺伊曼分享其发现时，后者不以为然，觉得那“不值一提”，仅把它看作自己早期理论的延展而已。

实际上，冯·诺伊曼着重的是两人参与的零和博弈，这使其理论的应用范围非常窄，大部分只适应于军事场景。其中一个“共同毁灭原则”，即武装敌对双方通过拥有核武而形成制衡（有人指出“奇爱博士”这一电影角色的原型就是冯·诺伊曼）。对于解释一方胜利并不自动意味着另一方失败的情形（包括大多数类型的交易市场），冯·诺伊曼的理论并无特别指导意义。

即便如此，经济学界一开始认同冯·诺伊曼的评价，大多轻视纳什的发现。之后纳什投入到数学研究的其他方面，但在1959年，他开始出现幻觉及被害妄想症状，无量前途因而受损。妻子送他入院治疗。出院后，他频频出没于普林斯顿大学各校区，经常自言自语及在黑板上乱写乱画。然而，在他与病魔搏斗期间，其均衡理论越发为经济学界看重。自1980年以来，引用纳什均衡理论的经济学论文数量是原来的七倍，而且这概念已被广泛应用于解决现实世界的许多政策问题。

一个著名例子是美国的医院体系，在上世纪40年代，该体系处于一种负面的纳什均衡状态。每家医院都想抢到最优秀的医科学生。由于战争的关系，优秀的医科生人数特别少，医院不得不争相越来越早地向在读医科生伸出橄榄枝。这对单个医院来说是上佳的策略，但对整个医院体系却是坏事：医院不得不在学生通过所有考试前就聘用他们。学生也不喜欢这样，因为他们根本没机会认真考虑人才争夺战中不同医院的聘用条件。

虽然各类医学协会和学生自己纷纷致函提出异议与建议，但还是经过几十年的调整以及借助90年代埃利奥特·帕兰森（Elliott Peranson）和阿尔文·罗斯（Alvin Roth，后来获得诺贝尔经济学奖）的模型，这个问题才最终得以解决。如今，学生会先提交自己的就职意向，随后通过一个算法被分配到医院。该算法能确保没有学生可改变其明述的意向继而被分到更优越且愿意接收他们的医院，而且也没有医院可以绕过系统去争抢更优秀的员工。系统运用了纳什均衡作为自增强机制：每人都基于其他所有人的行

为而做出最佳选择。

纳什均衡应用于政策制订的其他情形还包括英国政府在2000年拍卖3G移动通信运营牌照的案例。英国政府找来博弈理论专家协助，运用纳什均衡的部分原理设计拍卖规则，最终获得可观的225亿英镑（354亿美元）——尽管一些投标商的股东对结果不太满意。纳什的见解也有助于解释为何平均来说在交通网络中加建道路可能反而导致行车时间更长。自私自利的驾驶者总是选择最快的路线，全然不顾自己会导致他人行车缓慢，因此会堵塞一条新捷径。2008年发表的一项研究发现，封闭伦敦的7条连接道路和纽约的12条连接道路后，交通流量反而得以改善。

| 博弈开始

如果没有在原本理念上的一些改良，纳什均衡理论不会享有目前的地位。首先，许多情况存在不止一个纳什均衡点。作为对其他驾驶者行为的最佳反应，驾驶者选择靠左还是靠右行车（造成非常不同的结果）要看他们住在哪里；在英国，他们坚持靠左行驶，而美国则是靠右。让埋头代数计算的经济学者懊恼的是，分析策略需先了解社会规范及习惯。单凭纳什定理是不够的。

第二个改良是正确考虑非可信威胁因素。假如一个年轻人因被母亲没收手机而威胁离家出走，那就出现了一个纳什均衡点——母亲把手机还给儿子以求心安。但与纳什和约翰·海萨尼（John Harsanyi）在1994年共同获诺贝尔奖的德国经济学家赖因哈德·泽尔腾（Reinhard Selten）认为那并非合理结果。这位母亲应该知道儿子只是做空洞的威胁，他知道不管没有手机有多悲惨，夜宿街头只会更糟糕。她就是应该没收手机，迫使儿子专心做作业。

泽尔腾的研究让经济学者能够减少可能的纳什均衡点的数量。海萨尼提出，在许多现实博弈中，人们并不清楚对手的心思。假如一对恋人在不知对方偏好时要选择双方都可接受的约会地点，经济学者是难以为其分析出最佳策略的。通过在博弈中融入每人的想法（比如他们都猜中对方既喜欢寿司也喜欢披萨），海萨尼令问题得以解决。另一个问题仍然潜伏未解。

纳什均衡理论的预测能力要以理性行为为前提，但人们往往达不到这一理想状态。在再现囚徒困境的多次实验中，只有大约半数人选择认罪。对于沉溺于在分析模型中融入理性因素（及纳什均衡）的经济学者而言，这就很有问题。假如人们不按最利己的原则行事，建立有效激励机制又有什么用？

但这也非一概打倒。实验同时表明，经验会让参与者变得明智；到了第十轮，只有10%的“囚徒”拒绝认罪。经济学家们因而学会更谨慎地应用纳什均衡理论。对于复杂的博弈或者参与者无法从错误中学习的博弈，纳什的见解可能就不太管用了。

尽管如此，纳什均衡理论在现代微观经济学中依然占据核心地位。

纳什在2015年一场车祸中去世；在那之前，他已从精神疾病中康复，在普林斯顿大学恢复教职，并与他人共同获得诺贝尔奖——这彰显了团体互动比任何个人都能做出更大贡献。 ■



The Mundell-Fleming trilemma

Two out of three ain't bad

A fixed exchange rate, monetary autonomy and the free flow of capital are incompatible, according to the last in our series of big economic ideas

HILLEL THE ELDER, a first-century religious leader, was asked to summarise the Torah while standing on one leg. “That which is hateful to you, do not do to your fellow. That is the whole Torah; the rest is commentary,” he replied. Michael Klein, of Tufts University, has written that the insights of international macroeconomics (the study of trade, the balance-of-payments, exchange rates and so on) might be similarly distilled: “Governments face the policy trilemma; the rest is commentary.”

The policy trilemma, also known as the impossible or inconsistent trinity, says a country must choose between free capital mobility, exchange-rate management and monetary autonomy (the three corners of the triangle in the diagram). Only two of the three are possible. A country that wants to fix the value of its currency and have an interest-rate policy that is free from outside influence (side C of the triangle) cannot allow capital to flow freely across its borders. If the exchange rate is fixed but the country is open to cross-border capital flows, it cannot have an independent monetary policy (side A). And if a country chooses free capital mobility and wants monetary autonomy, it has to allow its currency to float (side B).

To understand the trilemma, imagine a country that fixes its exchange rate against the US dollar and is also open to foreign capital. If its central bank sets interest rates above those set by the Federal Reserve, foreign capital in search of higher returns would flood in. These inflows would raise demand for the local currency; eventually the peg with the dollar would break. If interest rates are kept below those in America, capital would leave the country and the currency would fall.

Where barriers to capital flow are undesirable or futile, the trilemma boils down to a choice: between a floating exchange rate and control of monetary policy; or a fixed exchange rate and monetary bondage. Rich countries have typically chosen the former, but the countries that have adopted the euro have embraced the latter. The sacrifice of monetary-policy autonomy that the single currency entailed was plain even before its launch in 1999.

In the run up, aspiring members pegged their currencies to the Deutschmark. Since capital moves freely within Europe, the trilemma obliged would-be members to follow the monetary policy of Germany, the regional power. The head of the Dutch central bank, Wim Duisenberg (who subsequently became the first president of the European Central Bank), earned the nickname “Mr Fifteen Minutes” because of how quickly he copied the interest-rate changes made by the Bundesbank.

This monetary serfdom is tolerable for the Netherlands because its commerce is closely tied to Germany and business conditions rise and fall in tandem in both countries. For economies less closely aligned to Germany’s business cycle, such as Spain and Greece, the cost of losing monetary independence has been much higher: interest rates that were too low during the boom, and no option to devalue their way out of trouble once crisis hit.

As with many big economic ideas, the trilemma has a complicated heritage. For a generation of economics students, it was an important outgrowth of the so-called Mundell-Fleming model, which incorporated the impact of capital flows into a more general treatment of interest rates, exchange-rate policy, trade and stability.

The model was named in recognition of research papers published in the early 1960s by Robert Mundell, a brilliant young Canadian trade theorist, and Marcus Fleming, a British economist at the IMF. Building on his earlier

research, Mr Mundell showed in a paper in 1963 that monetary policy becomes ineffective where there is full capital mobility and a fixed exchange rate. Fleming's paper had a similar result.

If the world of economics remained unshaken, it was because capital flows were small at the time. Rich-world currencies were pegged to the dollar under a system of fixed exchange rates agreed at Bretton Woods, New Hampshire, in 1944. It was only after this arrangement broke down in the 1970s that the trilemma gained great policy relevance.

Perhaps the first mention of the Mundell-Fleming model was in 1976 by Rudiger Dornbusch of the Massachusetts Institute of Technology. Dornbusch's "overshooting" model sought to explain why the newish regime of floating exchange rates had proved so volatile. It was Dornbusch who helped popularise the Mundell-Fleming model through his bestselling textbooks (written with Stanley Fischer, now vice-chairman of the Federal Reserve) and his influence on doctoral students, such as Paul Krugman and Maurice Obstfeld. The use of the term "policy trilemma", as applied to international macroeconomics, was coined in a paper published in 1997 by Mr Obstfeld, who is now chief economist of the IMF, and Alan Taylor, now of the University of California, Davis.

But to fully understand the providence—and the significance—of the trilemma, you need to go back further. In "A Treatise on Money", published in 1930, John Maynard Keynes pointed to an inevitable tension in a monetary order in which capital can move in search of the highest return:

This then is the dilemma of an international monetary system—to preserve the advantages of the stability of local currencies of the various members of the system in terms of the international standard, and to preserve at the same time an adequate local autonomy for each member over its domestic rate of interest and its volume of foreign lending.

This is the first distillation of the policy trilemma, even if the fact of capital mobility is taken as a given. Keynes was acutely aware of it when, in the early 1940s, he set down his thoughts on how global trade might be rebuilt after the war. Keynes believed a system of fixed exchange rates was beneficial for trade. The problem with the interwar gold standard, he argued, was that it was not self-regulating. If large trade imbalances built up, as they did in the late 1920s, deficit countries were forced to respond to the resulting outflow of gold. They did so by raising interest rates, to curb demand for imports, and by cutting wages to restore export competitiveness. This led only to unemployment, as wages did not fall obligingly when gold (and thus money) was in scarce supply. The system might adjust more readily if surplus countries stepped up their spending on imports. But they were not required to do so.

Instead he proposed an alternative scheme, which became the basis of Britain's negotiating position at Bretton Woods. An international clearing bank (ICB) would settle the balance of transactions that gave rise to trade surpluses or deficits. Each country in the scheme would have an overdraft facility at the ICB, proportionate to its trade. This would afford deficit countries a buffer against the painful adjustments required under the gold standard. There would be penalties for overly lax countries: overdrafts would incur interest on a rising scale, for instance. Keynes's scheme would also penalise countries for hoarding by taxing big surpluses. Keynes could not secure support for such "creditor adjustment". America opposed the idea for the same reason Germany resists it today: it was a country with a big surplus on its balance of trade. But his proposal for an international clearing bank with overdraft facilities did lay the ground for the IMF.

Fleming and Mundell wrote their papers while working at the IMF in the context of the post-war monetary order that Keynes had helped shape. Fleming had been in contact with Keynes in the 1940s while he worked in the British civil service. For his part, Mr Mundell drew his inspiration from

home.

In the decades after the second world war, an environment of rapid capital mobility was hard for economists to imagine. Cross-border capital flows were limited in part by regulation but also by the caution of investors. Canada was an exception. Capital moved freely across its border with America in part because damming such flows was impractical but also because US investors saw little danger in parking money next door. A consequence was that Canada could not peg its currency to the dollar without losing control of its monetary policy. So the Canadian dollar was allowed to float from 1950 until 1962.

A Canadian, such as Mr Mundell, was better placed to imagine the trade-offs other countries would face once capital began to move freely across borders and currencies were unfixed. When Mr Mundell won the Nobel prize in economics in 1999, Mr Krugman hailed it as a “Canadian Nobel”. There was more to this observation than mere drollery. It is striking how many academics working in this area have been Canadian. Apart from Mr Mundell, Ronald McKinnon, Harry Gordon Johnson and Jacob Viner have made big contributions.

But some of the most influential recent work on the trilemma has been done by a Frenchwoman. In a series of papers, H el ene Rey, of the London Business School, has argued that a country that is open to capital flows and that allows its currency to float does not necessarily enjoy full monetary autonomy.

Ms Rey’s analysis starts with the observation that the prices of risky assets, such as shares or high-yield bonds, tend to move in lockstep with the availability of bank credit and the weight of global capital flows. These co-movements, for Ms Rey, are a reflection of a “global financial cycle” driven by shifts in investors’ appetite for risk. That in turn is heavily influenced by

changes in the monetary policy of the Federal Reserve, which owes its power to the scale of borrowing in dollars by businesses and householders worldwide. When the Fed lowers its interest rate, it makes it cheap to borrow in dollars. That drives up global asset prices and thus boosts the value of collateral against which loans can be secured. Global credit conditions are relaxed.

Conversely, in a recent study Ms Rey finds that an unexpected decision by the Fed to raise its main interest rate soon leads to a rise in mortgage spreads not only in America, but also in Canada, Britain and New Zealand. In other words, the Fed's monetary policy shapes credit conditions in rich countries that have both flexible exchange rates and central banks that set their own monetary policy.

| *Rey of sunshine*

A crude reading of this result is that the policy trilemma is really a dilemma: a choice between staying open to cross-border capital or having control of local financial conditions. In fact, Ms Rey's conclusion is more subtle: floating currencies do not adjust to capital flows in a way that leaves domestic monetary conditions unsullied, as the trilemma implies. So if a country is to retain its monetary-policy autonomy, it must employ additional "macroprudential" tools, such as selective capital controls or additional bank-capital requirements to curb excessive credit growth.

What is clear from Ms Rey's work is that the power of global capital flows means the autonomy of a country with a floating currency is far more limited than the trilemma implies. That said, a flexible exchange rate is not anything like as limiting as a fixed exchange rate. In a crisis, everything is subordinated to maintaining a peg—until it breaks. A domestic interest-rate policy may be less powerful in the face of a global financial cycle that takes its cue from the Fed. But it is better than not having it at all, even if it is the economic-policy equivalent of standing on one leg. ■



蒙代尔-弗莱明三元悖论

三选二并不坏

伟大经济学思想系列最后一篇：固定汇率、独立的货币政策、资本自由流动之三元悖论

公元一世纪的宗教领袖希勒尔长老（Hillel the Elder）被要求单脚站立着概括犹太经典《妥拉》。他回答道，“己所怨恨，勿施于人。此乃《妥拉》全篇主旨；余者皆注释。”塔夫茨大学（Tufts University）的迈克尔·克莱恩（Michael Klein）曾写过，国际宏观经济学（对贸易、国际收支平衡、汇率等问题的研究）的种种洞见也可以套用类似的说法加以概括：“政府面对的是政策三难；余者皆注释。”

政策三难，也称不可能或不一致的三位一体，指的是一个国家必须在资本自由流动、汇率管理及货币政策独立（下图中三角形的三角）之间作出抉择，且只能三中选二。一个国家如果想固定汇率并制定不受外来影响的利率政策（三角的C边），就不能让资本自由跨境流动。假如汇率固定而资本可跨境流动，该国便无法推行独立的货币政策（A边）。假如一国选择资本自由流动及独立货币政策，则必须允许汇率浮动（B边）。

要了解这种三难状况，可想象一个货币兑美元汇率固定并对外资开放的国家。假如其央行设定的利率高于美联储所定标准，外资为寻求更高回报，将纷纷涌入。外资流入令本地货币需求上升，最终与美元的联系汇率将被打破。假如利率保持低于美国的水平，资本将流出该国，致使其货币贬值。

由于对资本流动设限是不受欢迎或徒劳的，所以三难困境可归结为如下两者间的抉择：浮动汇率加对货币政策的掌控，或者固定汇率加货币政策受制。富裕国家一般选择前者，而欧元区国家则选择的是后者。即使在1999年欧元推出前，人们就已清楚，采用单一货币意味着牺牲货币政策的独立性。

在筹备阶段，有志加入欧元区的成员国将本国货币与德国马克挂钩。由于在欧洲范围内资本可自由移动，三难选择迫使准成员国追随区内大国德国的货币政策。荷兰央行行长维姆·德伊森贝赫（Wim Duisenberg，后成为欧洲央行首任行长）由于迅速决定跟随德国央行调整利率而被冠以“十五分钟先生”的绰号。

荷兰能忍受这种货币奴役的原因是其贸易与德国紧密相连，两国的商业情势兴衰与共。而对于西班牙和希腊这些与德国经济周期不那么紧密同步的经济体，失去货币政策独立性的代价则要高得多：繁荣时期利率太低，而且一旦危机袭来也无法通过贬值货币来摆脱困境。

与许多伟大经济理念一样，三元悖论的传承脉络复杂。在一代经济学学生眼中，这是所谓“蒙代尔-弗莱明模型”的重要延伸。该模型把资本流动的影响纳入利率、汇率政策、贸易及稳定性的总体考虑中。

模型得名于上世纪60年代发表的多篇研究论文的两位作者——后生可畏的加拿大贸易理论家罗伯特·蒙代尔（Robert Mundell）及在国际货币基金组织任职的英国经济学家马库斯·弗莱明（Marcus Fleming）。基于他的早期研究，蒙代尔在1963年发表的一篇论文中提出，在资本完全自由流动及实施固定汇率的国家，货币政策将失效。弗莱明的论文也有类似结论。

如果说经济学界仍不为所动，那是因为当时的资本流动规模不大。富裕世界的货币都按1944年在新罕布什尔州布雷顿森林订立的固定汇率体系与美元挂钩。直到70年代该体系瓦解，三元悖论才被政策制定者看重。

蒙代尔-弗莱明模型也许是在1976年由麻省理工学院的吕迪格·多恩布什（Rudiger Dornbusch）首次提及。多恩布什的“超调”模型试图解释相对近期建立的浮动汇率体系为何实际上如此不稳定。蒙代尔-弗莱明模型渐为人知，正是归功于多恩布什的畅销教科书（与美联储现任副主席斯坦利·费希尔（Stanley Fischer）合著）及他对保罗·克鲁格曼（Paul Krugman）和莫里斯·奥伯斯法尔德（Maurice Obstfeld）等博士生的影响。国际宏观经济学中“政策三难”一词则是由奥伯斯法尔德和艾伦·泰勒

（Alan Taylor）首创，出自他们在1997年发表的一篇文章，前者现为国际货币基金组织首席经济学家，后者现执教于美国加州大学戴维斯分校。

但要充分了解三元悖论的理念源头和传世意义，还需要进一步回溯。在1930年出版《货币论》（A Treatise on Money）一书中，约翰·梅纳德·凯恩斯（John Maynard Keynes）指出，在资本能够流动以追逐最高回报的货币秩序中，难免会出现一种张力：

这就是国际货币体系的两难——一方面需要依国际标准保持体系内各成员国本国货币稳定性的优势，同时也要保持每一成员国在国内利率及对外贷款量的问题上拥有充分自主权。

这是对“政策三难”最早的概括，即便资本流动已被视为理所当然。凯恩斯在上世纪40年代初思考如何在战后重建全球贸易时已敏锐地意识到这一点。他相信建立汇率固定的体系有利于贸易发展。他认为，两次世界大战之间金本位制的问题在于体系无法进行自我调节。假如贸易失衡加重（上世纪20年代末便是如此），逆差国会因黄金流失而不得不采取措施回应。它们的做法是提高利率，抑制进口需求，削减工资以恢复出口竞争力。这只会导致失业，因为当黄金（连带货币）供应稀缺时，工资是不会乖乖下跌的。顺差国如果能加大进口支出，体系或许更容易重拾均衡。然而它们不是非得这样做。

相反，凯恩斯提出一个替代方案，布雷顿森林会议上英国的谈判立场正是以此为基础。他提议建立国际性清算银行（ICB）来清算导致贸易顺差或逆差的交易差额。参与该体系的各国在ICB享有与其贸易规模相当的透支额度。这为逆差国提供了缓冲的余地，以缓解金本位制度下所需要的痛苦调整。大手大脚的国家将受到惩罚：比如，透支须偿付的利息会累进提高。凯恩斯设想的体系会对顺差国征税以惩罚其囤积资金的行为。但这样的“债权调整”方式没有得到支持。美国当时反对此做法，和今天德国抗拒的原因相同：其自身是拥有巨额贸易顺差的国家。但凯恩斯提出成立国际性清算银行提供透支服务的建议为国际货币基金组织的成立奠定了基础。

弗莱明和蒙代尔在国际货币基金组织任职时完成了他们的论文，当时正值凯恩斯参与塑造战后货币秩序的时期。弗莱明曾于上世纪40年代在英国政府工作时接触过凯恩斯。而蒙代尔的灵感则来自其祖国。

在二战后几十年里，资本快速流动的环境是经济学者们难以想象的。跨境资本流动受限，既是由于政府管制，也在于投资者的谨慎态度。加拿大却是个例外。它与美国之间，资本可自由跨境流动，一方面是因为要阻止这样的流动不切实际，另一方面也因为美国投资者并不觉得资金放在邻国有什么危险。结果是，加拿大要挂钩美元的话必须牺牲自己的货币政策自主权。所以，从1950年至1962年，政府允许加元浮动。

加拿大人，比如蒙代尔，更能想象其他国家一旦允许资本跨境流动及汇率浮动将面临怎样的取舍。当蒙代尔在1999年获诺贝尔经济学奖时，克鲁格曼称赞之为“加拿大的诺贝尔奖”。这不单纯是俏皮话，还包含着更深层的意味。从事这方面研究的学者许多都是加拿大人，这点令人惊讶。除了蒙代尔，罗纳德·麦金农（Ronald McKinnon）、哈利·戈登·约翰逊（Harry Gordon Johnson）及雅各布·瓦伊纳（Jacob Viner）也都做出了巨大贡献。

但有关三元悖论最具影响力的近期研究来自一位法国女性。伦敦商学院的埃莱娜·雷伊（Hélène Rey）在一系列论文中指出，一个允许资本流动及汇率浮动的国家不一定完全享有货币自主权。

雷伊的分析首先发现，股票或高收益债券这类高风险资产的价格变动往往与银行信贷供应量和全球资金流动的影响步调一致。雷伊认为，这种联动反映了一种由投资者风险偏好变化推动的“全球金融周期”，而投资者的喜恶在很大程度上又是受到美联储货币政策变化的影响。美联储的影响力源于世界各地企业及家庭的美元借款规模。当美联储降息，人们可以廉价借得美元，从而推高全球资产价格及贷款抵押物的价值。全球信贷环境放宽。

反过来，在最近一项研究中，雷伊发现，美联储出人意料地提高其基准利

率后，抵押贷款随即息差加大，而且不止是在美国，加拿大、英国、新西兰也是如此。换言之，那些汇率浮动且央行可自行制订货币政策的富裕国家，其信贷环境实际还是会受美联储货币政策影响。

| “伊”道曙光

对这一结果的粗略解读是，政策三难实际上是两难：保持允许跨境资本流动或控制本地金融环境之间的选择。事实上，雷伊的结论更为隐晦：浮动汇率随资本流动而调整时，本地货币环境难免会受到影响，正如政策三难所示。所以，如果一个国家要维持其货币政策独立性，就必须运用额外的“宏观审慎”政策工具，如选择性的资本管制或对银行资本金实施附加要求，以遏制信贷的过快增长。

雷伊的研究确切表明，全球资本流动的力量意味着浮动汇率国家其货币政策的实际受限程度比政策三难所认为的大得多。但是，灵活汇率的限制性又远比固定汇率要小。在危机中，一切以保持联系汇率为依归，直至其瓦解。面对受美联储决策影响的全球金融周期，国内利率政策的威力也许会减弱。不过，即便是类似像单脚站立般的经济政策，也好过于全无控制。





Schumpeter

Look before you leap

The notion of leapfrogging poor infrastructure in Africa needs to come back down to earth

CAN entrepreneurs make up for a lack of roads? In Rwanda, where most of the population live in cut-off villages, the government wants to skip straight to drones. Encouraged by Paul Kagame, the president and a darling of the development industry (if not of human-rights activists), some of Silicon Valley's most prominent venture-capital firms, including Sequoia Capital and the investment arm of Google's parent company, Alphabet, have bet that tiny, unmanned aircraft carrying medical supplies can simply hop over the rolling green hills and the mud tracks that barely connect people now.

It is the latest example of what businesspeople working across Africa call "leapfrogging". Usually married to an almost evangelical belief in the power of startups, this is the notion that, having failed to adopt now-outdated technology, Africa can simply jump straight over it and go right to the latest thing. Just as drones can make up for poor roads, the theory goes, mobile phones can overcome a lack of well-functioning banks, portable solar panels can stand in for missing power stations and free learning apps can substitute for patchy education.

There is a compelling precedent. Fifteen years ago, only a tiny fraction of Africans had access to phones of any kind. Getting a landline installed meant waiting years. Then mobile telephony exploded. In some African countries, such as Uganda, the number of mobile phones came to surpass the total number of landlines in less time than the old state monopoly would take to install a single connection in your house (typically two years or more). When a telecoms mast goes up, other new businesses follow.

Young men start selling airtime; farmers find new markets.

Now the hope is that drones could take over from mobile phones as the way to transform Africa. The project under way in Rwanda is courtesy of a startup based in Silicon Valley called Zipline. Its idea is to use small, fixed-wing drones to drop off packets of blood with parachutes from Rwanda's five blood banks to hospitals and health-care centres, under a contract with the government. A lot of women die in childbirth because they cannot get blood quickly enough.

But the hype about machines saving African lives ought to elicit caution. No one can say how many people will benefit from Zipline, which has yet to begin operating, or whether there will be sufficient profits to continue over the long term. Another project is the world's very first "drone port", designed for Rwanda by Foster + Partners, a fancy British firm of architects that wants every small town in Africa to have its own drone port by 2030. Yet its Rwandan project won't be completed for another four years. A separate initiative, in Malawi, to transport blood samples for HIV tests, received money from UNICEF, a branch of the UN, and testing is under way. The project is pricey—at \$7,000 a drone. Paying drivers on motorbikes would be cheaper.

Such caveats hardly dampen the mood at business conferences in Africa, where you find hundreds of investors gushing about their plans to help the poor with new technology and make big profits while doing it. "Within the next few years you'll really see leapfrogging taking off," says Ashish Thakkar, a British-born, Ugandan businessman whose Mara Group, a business-services firm, is setting up tech businesses across the continent. Perhaps, but tech booms based on leapfrogging have been wrongly anticipated in the past. Americans who turn up in Nairobi and Dar es Salaam with millions of dollars hoping to buy startups that have risen as part of the so-called "Silicon Savannah", an east African cluster, for

example, frequently leave empty-handed because there isn't all that much to buy.

African tech types often think they can quickly copy rich-country products and sell them to the urban middle class. But then they discover that there is no getting around complex tax laws, a dearth of engineers and fragmented markets. The Western investors who back them have even less grasp of just how dysfunctional basic infrastructure can be, notes Ory Okolloh, a Kenyan investor and a political activist. All the evidence suggests that technology firms are no better at leapfrogging such hurdles than, say, a carmaker. The only part of the continent with a mature tech scene is South Africa: a country which also has good roads, reliable power and plenty of well-educated graduates.

Mr Kagame himself has admitted that leapfrogging has limits. Drones can transport blood, but they can't transport doctors, who need roads. Solar panels will help people light their homes without burning kerosene, but they will not replace the functioning grid that manufacturers need. Nor will clever technology firms do away with the need for well-drafted regulation and the rule of law.

| *Mind the gaps*

A few tech firms are pulling off impressive feats. M-Kopa, a Kenyan company backed by the Gates Foundation, has sold some 375,000 solar panels on credit, using mobile money to collect payments and to monitor the creditworthiness of borrowers. But it has had to build an entire network of old-fashioned marketers going from door to door. Jumia, a Nigerian e-commerce firm, built separate logistics systems in seven different countries. In other words, to make the most of digital opportunities these firms had to construct their own basic physical infrastructure.

Wander the streets of any big African city and it soon becomes clear that a

lack of enterprise is hardly the problem. In Nairobi's biggest slum, Kibera, the narrow dirt streets bustle with businesses charging phones from generators; running tiny cinemas showing Premier League football on satellite TVs; and selling solar panels. What you won't find are clean toilets, potable water or anyone earning much over a few dollars a day. The main leapfrogging that takes place is over the open sewers. That is not something you can fix with a mobile-phone app. ■



熊彼特

跨越前请三思

想直接越过非洲薄弱的基础设施？还是面对现实吧

有了众多创业者，就能弥补道路交通的不足吗？在卢旺达，大多数人口都居住在彼此相隔较远的村庄，针对这种情况，该国政府想跨越修路这一步，直接采用无人机。开发行业（人权活动家们可能就不是这样了）向来对其总统保罗·卡加梅（Paul Kagame）青眼有加。在他的感染之下，硅谷一些最为知名的风险投资公司如红杉资本（Sequoia Capital）及谷歌母公司Alphabet的投资部门也相信，这些用来运送医疗用品的迷你无人驾驶飞行器可轻松越过绵延的青翠山岭，以及勉强将人们连接起来的泥泞土路。

说到在非洲各地开创事业的商务人士们口中的“跨越式发展”，以上便是最新例证。这一理念常与几近狂热地相信创业公司的力量这一情形密不可分；其主要观点是，既然非洲之前没能采用的技术现已过时，那么干脆就越过它们，直接采用最新的技术。依此观点，就像状况不佳的道路可由无人机弥补一样，缺少运作良好的银行可仰仗移动电话，没有发电站可使用便携的太阳能电池板，不尽人意的教育也可为自主学习应用所替代。

在此之前已有一个颇具说服力的案例。十五年前，不管是哪种类型的电话，只有一小部分的非洲人能用得上。要安装一部固定电话需等上好几年，但随后便迎来了移动通讯突飞猛进的发展。在一些非洲国家如乌干达，移动电话的总数量已超过固话，这一过程用时还不到从前国有垄断企业为住户安装一台座机大致所需的时间（通常要两年或更久）。一旦电信行业发展起来，其他新的生意也会随之而来。年轻人们开始兜售电话卡，农民们也找到了新市场。

如今人们希望无人机可以继移动电话之后，成为又一改变非洲面貌的事物。硅谷一家创业公司Zipline正在为卢旺达开展一个项目。这家公司打算依照与当地政府的合同，利用小型固定翼无人机将装有血液的包裹从卢旺

达五家血库运送至各个医院及医疗保健中心，并用降落伞空投。很多女人因不能及时输血而在分娩过程中死亡。

这些能够帮助非洲挽救生命的机器得到了热火朝天的宣传，但我们对此应持谨慎态度。Zipline尚未开始运作，因而无从知晓多少人会因其而受益，或该项目能否获得足够的收益以支撑长期的运营。另一个项目是世界第一个“无人机机场”，由英国高端建筑公司福斯特建筑事务所（Foster + Partners）为卢旺达设计。该公司希望到2030年每个非洲小镇都能有自己的无人机机场，但它在卢旺达的项目还得再有四年才能完工。在马拉维，另一项用无人机运送血样以进行HIV检测的计划得到了联合国分支机构联合国儿童基金会（UNICEF）的资金支持，目前正在飞行测试。该项目花费不菲，仅一个无人机造价就要7000美元。雇佣摩托车手也许会便宜些。

然而非洲商务会议讨论的热烈气氛几乎并没因这些警示而有所冷却。在那里你会发现数百位投资者滔滔不绝地夸耀自己用新技术救助穷人、还能从中赚大钱的计划。“接下来的几年内，你将会真正见识到跨越式发展的成功。”艾希什·塔卡尔（Ashish Takkar）说道。这位英国出生的乌干达商人创办了商业服务公司玛拉集团（Mara Group），其科技业务现正在整个非洲铺开。塔卡尔所言也许会成真，但在过去人们曾对跨越式发展所造就的科技繁荣做出过错误的预判。例如，怀揣大把美元的美国人来到内罗毕（Nairobi）和达累斯萨拉姆（Dar es Salaam），希望能收购些崛起于非洲东部技术集群地、造就了所谓“大草原硅谷”（Silicon Savannah）的创业公司。但是他们常常会空手而归，因为并没有什么可买的。

非洲科技公司常会以为它们可以很快就复制出富裕国家的产品并将之出售给城市的中产阶级。但它们随后就发现无法绕开税法复杂、工程师严重紧缺、市场破碎等问题。肯尼亚投资人及政治活动家奥瑞·奥科罗（Ory Okolloh）指出，与这些公司相比，支持它们的西方投资者甚至更加不了解非洲最基本的基础设施究竟有多落后。这些证据表明，科技公司并不会比其他企业如汽车制造商更擅长跨越这种障碍。整个非洲只有南非科技领域的发展还算成熟：除此之外，该国还有优质的道路，可靠的电力供应及

大量受过良好教育的毕业生。

卡加梅本人也承认，跨越式发展也有其局限之处。无人机可运送血液，但却并不能运送医生，医生仍需要道路。太阳能电池板能让人不用煤油就能点亮自己的家，但它们并不能替代制造商所需要的运转顺畅的电网。即使有了高明的科技公司，也还需要完善的法规与法治。

| 小心跨越鸿沟

确有一些科技公司正在成就一番光辉业绩。由盖茨基金会（Gates Foundation）支持的肯尼亚公司M-Kopa通过允许赊购的方式售出了约37.5万个太阳能电池板，并通过移动支付收取费用及监控赊购人的信誉度。然而公司却不得不为此打造了一整套传统的上门推销员网络。尼日利亚电子商务公司Jumia也在七个不同的国家分别建立了物流体系。换言之，为了善加利用数字时代的机遇，这些科技公司只得自行建造最基本的实体基础设施。

到任何一个非洲大城市的街道随便转转就会明白，根本问题似乎并不是企业数量太少。在内罗毕最大的贫民窟基贝拉（Kibera），狭窄的土路上各种生意如火如荼地开展着：用发电机为手机充电，小型剧院通过卫星电视播放超级联赛，此外还有卖太阳能电池板的。但在那里你不会找到干净的厕所和饮用水，也不会看到一个一天能赚好几美元的人。所谓的跨越式发展大体只会在露天的阴沟之上发生——这可不是一个移动电话应用就能补救的问题。■



International data flows

Priceless

Trade in data seems very important, but there are no good, er, data on it

ALTHOUGH trade in goods and services is sluggish, international flows of data are exploding. According to the McKinsey Global Institute, a think-tank within a consultancy, data zipped across borders at a rate of 211 terabits per second in 2014. That is equivalent to 1.3 Libraries of Congress per second, and 45 times more than in 2005. McKinsey reckons that this torrent contributed more to global growth in 2014 than trade in goods.

The data deluge is changing trade in three main ways. First, it is spurring conventional trade in goods and services, through orders on internet platforms like Amazon and eBay. Second, a growing share of the products being traded is digital, from music files to insurance policies. And third, data are increasingly important lubricants for global supply chains. Companies ship vast datasets around the globe, using them to improve the efficiency of their operations.

Yet quantifying and valuing these flows is difficult. The McKinsey study yields impressive numbers, but relies on rough measures, which are valued using statistical correlations rather than precise measurements. Experts agree that data flows are growing at an amazing pace, but also that measuring them is dispiritingly difficult.

Statisticians face three big problems. First, current trade data does not usually record how services are provided. On May 25th America's Bureau of Economic Analysis published new estimates showing that around half of American exports of services could be delivered digitally, and that the fraction was increasing. But whether they actually are or not is unknown.

Second, there is no clear correlation between the volume of data and its value. Twitter feeds are not as valuable as digital design files. According to Cisco, a maker of networking gear, video accounted for 70% of global internet traffic in 2015, a share it thinks will increase to 82% by 2020. If growing data volumes reflect growing cat-video consumption, then “So what?” asks Robert Atkinson of the Information Technology and Innovation Foundation. On top of that, there may be lots of double-counting. Data flowing through America could be in transit from Canada to Mexico.

Finally, identifying where exactly data are adding value is nightmarish. International e-commerce, which accounts for as much as 12% of all trade in goods and services, according to McKinsey, is enabled by international data flows. But none of that value is attributed to the data involved.

More fundamentally, bytes shuttling across borders are mostly unpriced. Data are rarely valuable in themselves; they tend to generate value only indirectly. Google relies on global data flows to support e-mails and its search engine, but generates revenues from clicks on adverts. Companies like Caterpillar or Boeing use data transmitted by sensors in their products to improve efficiency, but the data is not priced as it flows. When cash is so disconnected from data, teasing out the latter’s value requires lots of head-scratching.

For now, policymakers have to rely on anecdotal evidence from companies claiming to use data to make savings and generate value. Another hint is the willingness of companies like Microsoft and Facebook to invest in new cables to carry data around the world. (Telegeography, a research firm, estimates that a transatlantic cable costs \$200m-300m to build).

Knowing what to measure and how to measure it both present huge headaches for statisticians. Governments and international agencies are increasingly focusing on this informational black hole: they are

considering options from simply asking firms how much their data are worth to demanding more detailed information on the nature of data flows from internet firms. It does not help that such flows are constantly evolving: at the moment, most data traffic is to people, but this may soon be superseded by inter-gadget traffic.

The volume and value of data are not just academic concerns. Governments around the world, keen to protect their citizens' privacy or bolster national security, are restricting flows in various ways with little sense of the economic consequences. China, India, Indonesia and Russia, among others, have imposed rules about where firms can store data about their local customers. A better sense of the costs of such moves might prompt a change of heart.

One thing is clear: there is a gulf between the experience of firms, which insist data flows are crucial, and policymakers, who have no sense of their macroeconomic importance, says Joshua Meltzer of the Brookings Institution, a think-tank. The present situation, in Mr Atkinson's view, is "like setting tariffs without knowing how much you're exporting". ■



国际数据流

无价之宝

数据贸易看起来非常重要，但.....目前还没有很好的数据来衡量它

虽然货物和服务贸易萎靡不振，数据的国际流动却呈爆炸性增长。咨询公司麦肯锡的智库麦肯锡全球研究院称，在2014年，数据以每秒211兆兆位的速度涌过国界。这相当于每秒1.3个国会图书馆，比2005年时增加了45倍。麦肯锡估计，这一洪流对2014年全球经济增长的贡献比货物贸易还要大。

海量数据对贸易的改变主要体现在三个方面。首先，通过亚马逊和eBay等互联网平台上的订单，它刺激了传统的货物和服务贸易。其次，从音乐文件到保单，贸易产品中数字产品的比重越来越大。第三，数据是全球供应链中日益重要的润滑剂。公司把庞大的数据集发往世界各地，用以提高运营效率。

然而，对这些流量进行量化和估值绝非易事。麦肯锡的研究得出了一些可观的数字，但所用手段却较为粗糙——它使用了统计相关性而非精确的测量值。专家们一致认为数据流增长速度令人称奇，然而测量的困难也让人泄气。

统计学家面临的三大问题。首先，目前的贸易数据通常不会记录服务如何提供。美国经济分析局在5月25日公布了新的测算，称美国出口的服务中约有一半可用数字方式交付，并且这一比重还在增长。但到底是不是这么回事还是个未知数。

第二，数据的体量与价值之间没有明显的相关性。Twitter的推文不如数字设计文件有价值。网络设备制造商思科称，视频占到了2015年全球互联网流量的70%，并认为这一份额将在2020年提高到82%。如果数据量的增长反映了有关猫的视频消费的增长，“那又怎么样呢？”信息技术与创新基金会的罗伯特·阿特金森（Robert Atkinson）问道。最重要的是，这里面还

可能存在大量的重复计算。流经美国的数据可能是从加拿大传输到墨西哥的。

最后，要找到数据到底在哪里创造了价值简直是一场噩梦。麦肯锡称，国际电子商务占货物和服务贸易总量的比例高达12%，而这正是通过国际数据流才实现的。但是，我们并没有把这部分价值归功于所涉及的数据。

更为根本的是，在国境间穿梭的字节大多是没有定价的。数据本身有价值的情况很罕见，它们往往只会间接产生价值。谷歌依赖全球数据流来支持其电子邮件和搜索引擎，但收入却是由广告点击产生的。卡特彼勒或波音等公司在产品上安装传感器，并使用其收集的数据来提高效率，但这些数据流动也并未定价。由于现金和数据隔得这么远，要梳理出后者有多少价值会令人大伤脑筋。

目前，政策制定者不得不依靠那些号称使用数据来节约成本并创造价值的公司给出的小道消息。还有一件事值得注意，就是微软和Facebook等公司愿意投资建设新的电缆以将数据传到全球。（研究公司Telegeography估计，建设一条跨大西洋电缆约需花费2亿至3亿美元）

对统计人员而言，要知道去测量什么以及如何测量都是非常让人头痛的事情。各国政府和国际机构越来越重视这一信息黑洞：它们考虑了各种方案，从简单地询问公司自身的数据值多少钱，到要求互联网公司提供数据流性质的更详尽信息。但由于数据流不断发展，这些做法的帮助都不大——目前大部分数据流都是流向人的，但这可能很快就会被设备间的流量所超越。

数据的体量和价值并不仅是出于学术上的考虑。世界各地的政府着重于保护其公民的隐私或加强国家安全，以各种方式限制数据流，却很少考虑这种做法的经济影响。中国、印度、印度尼西亚和俄罗斯以及其他一些国家都针对企业可以把本地客户的数据存储在什么地方制定了规则。要是它们更加了解这种做法的代价，说不准会改变主意。

有一点是明确的：公司和决策者之间有一道鸿沟——前者坚持数据流至关

重要，而后者则完全不了解其对宏观经济的重要意义，智库布鲁金斯学会的约书亚·梅尔策（Joshua Meltzer）说道。在阿特金森看来，现状就像是“不知道自己有多少出口额就来设定关税”一样。 ■



Vietnam's economy

The other Asian tiger

Vietnam's success merits a closer look

WHICH Asian country has roared ahead over the past quarter-century, with millions of its people escaping poverty? And which Asian economy, still mainly rural, will be the continent's next dynamo? Most would probably respond "China" to the first question and "India" to the second. But these answers would overlook a country that, in any other part of the world, would stand out for its past success and future promise.

Vietnam, with a population of more than 90m, has notched up the world's second-fastest growth rate per person since 1990, behind only China. If it can maintain a 7% pace over the next decade, it will follow the same trajectory as erstwhile Asian tigers such as South Korea and Taiwan. Quite an achievement for a country that in the 1980s was emerging from decades of war and was as poor as Ethiopia.

Unlike either China or India, Vietnam lacks the advantages of being a continent-sized economy, so the lessons of its rise are more applicable to other developing countries, especially those nearby. It is also a useful counter to techno-pessimism. The spread of automation in factories has fuelled concerns that poor countries will no longer be able to get a lift from labour-intensive manufacturing. Vietnam shows that tried-and-tested models of development can still work.

Most obviously, openness to the global economy pays off. Vietnam is lucky to be sitting on China's doorstep as companies hunt for low-cost alternatives. But others in South-East Asia, equally well positioned, have done less. Vietnam dramatically simplified its trade rules in the 1990s. Trade now accounts for roughly 150% of GDP, more than any other country

at its income level. The government barred officials from forcing foreigners to buy inputs domestically. Contrast that with local-content rules in Indonesia. Foreign firms have flocked to Vietnam and make about two-thirds of Vietnamese exports.

Allied to openness is flexibility. The government has encouraged competition among its 63 provinces. Ho Chi Minh City has forged ahead with industrial parks, Danang has gone high-tech and the north is scooping up manufacturers as they exit China. The result is a diversified economy able to withstand shocks, including a property bust in 2011.

At the same time Vietnam, like China, has been clear-minded about the direction it must take. Perhaps most important has been a focus on education. Vietnamese 15-year-olds do as well in maths and sciences as their German peers. Vietnam spends more on schools than most countries at a similar level of development, and focuses on the basics: boosting enrolment and training teachers. The investment is pivotal to making the most of trade opportunities. Factories may be more automated, but the machines still need operators. Workers must be literate, numerate and able to handle complex instructions. Vietnam is producing the right skills. Thailand, Indonesia and Malaysia lag behind, despite being wealthier.

| *Mekong, you follow*

Now a middle-income country, Vietnam faces a steep ascent to the high-income ranks. The Trans-Pacific Partnership, a 12-nation trade pact meant to be a boost, may well be blocked by America's inward turn. State-owned enterprises (SOEs) are bloated. Competing provinces, long a benefit, are a liability when they duplicate infrastructure. Vietnam has struggled to build a domestic supply chain. Moving up in value will be hard when China's grip on high-end output is tightening. The repressive, one-party system of government is brittle.

But Vietnam's past quarter-century means that it has a decent chance of prevailing. It is at last starting on SOE reform. It is negotiating trade deals in Asia and with Europe. And it is drafting plans to increase its domestic share of manufacturing without scaring off foreigners. Vietnam is a model for countries trying to get a foot on the development ladder. With luck, it will also become a model for those trying to climb up it. ■



越南经济

另一只亚洲小虎

越南的成功值得深究

在过去的二十五年里，哪个亚洲国家一路高歌猛进，带领数以百万计的人民摆脱贫困？哪个仍以农村为主的亚洲经济体将会成为这个大陆的下一部发电机？大多数人可能会对第一个问题回答“中国”，而对第二个回答“印度”。但这些答案可能忽略了一个国家，而在世界其他任何地区，这个国家都会因为其过去的成功和未来的潜力脱颖而出。

越南，人口超过9000万，自1990以来人均增长率居世界第二，仅次于中国。如果它能在未来十年保持7%的增长速度，它将会踏上昔日韩国、台湾等亚洲四小龙所走过的轨迹。对于一个20世纪80年代才摆脱数十年的战争，而且曾与埃塞俄比亚一样贫穷的国家而言，这是一个相当了不起的成就。

与中国或印度不同，越南并没有洲际经济体所具备的优势，因此它的崛起经验更适用于其他发展中国家，特别是其周边国家。越南的发展历程也是反驳技术悲观主义的一个有力实例。工业自动化的发展加剧了人们的担忧，他们认为贫穷国家再也不能从劳动密集型制造业中受益。越南的经验表明，这些历经验证的发展模式依然有效。

最为显而易见的是，越南对全球经济的开放政策收效明显。在各家公司寻找低成本替代国之时，越南恰好就在中国的家门口。但是，同样地理位置优越的其他东南亚国家却作为不多。20世纪90年代，越南大幅简化了贸易规则。目前，贸易相当于该国GDP的150%，高于同等收入水平的其他任何国家。政府还禁止官员强迫外国人在国内购买各类原材料，这与印尼的国产化要求形成鲜明对比。外国公司纷纷涌入越南，它们所生产的产品约占越南出口的三分之二。

与开放相伴而来的是灵活性。政府鼓励其63个省份相互竞争。胡志明市稳

步推进工业园区的发展，岘港已在发展高科技产业，北部地区则在制造商退出中国时将它们揽入怀中。这就形成了多元化的经济，足以抵御包括2011年房地产泡沫破灭在内的种种冲击。

同时，越南和中国一样，对自己必须走的方向思虑清晰。其中最重要的也许就是对教育的重视。越南15岁孩子的数学和科学成绩与同龄的德国孩子相当。越南对学校的投入也超过大多数与其发展水平相近的国家，并着重关注最基本的问题：提高入学率以及培训教师。若要充分利用贸易机会，这方面的投入至关重要。工厂可能会更加自动化，但机器仍然需要人去操作。工人必须能写会算，还要能处理复杂指令。越南正在培养具备相应技能的人才。尽管比越南富裕，泰国、印尼和马来西亚在这方面却落后了。

| 跟着湄公河走

越南现在是中等收入国家，它要跻身高收入国家行列仍面临着一个陡坡。有12个国家参加的跨太平洋伙伴关系协定（TPP）本来可以起到推动作用，但却很可能会因为美国保守的转向而搁浅。国有企业也颇为臃肿。省份间的竞争一直都是件好事，但这如果造成基础设施的重复建设，就会成为一种负累。此外，越南还始终难以建立起国内供应链。当中国对高端产出的控制收紧，越南向价值链的高端移动将十分困难。压迫性的一党制政府也很脆弱。

然而，越南过去25年的发展让它有了一个很好的获胜机会。它终于开始进行国企改革，并与亚洲其他国家以及欧洲进行贸易谈判。它还制定计划以提高制造业中的本土份额，同时又不会吓跑外国人。对那些想要在发展阶梯上获得立足之地的国家而言，越南是一个榜样。如果幸运的话，它还将成为那些试图在发展阶梯上稳步攀升的国家的榜样。■



Personal transportation

Uberworld

The world's most valuable startup is leading the race to transform the future of transport

“LET’S Uber.” Few companies offer something so popular that their name becomes a verb. But that is one of the many achievements of Uber, a company founded in 2009 which is now the world’s most valuable startup, worth around \$70 billion. Its app can summon a car in moments in more than 425 cities around the world, to the fury of taxi drivers everywhere. But Uber’s ambitions, and the expectations underpinning its valuation, extend much further: using self-driving vehicles, it wants to make ride-hailing so cheap and convenient that people forgo car ownership altogether. Not satisfied with shaking up the \$100-billion-a-year taxi business, it has its eye on the far bigger market for personal transport, worth as much as \$10 trillion a year globally.

Uber is not alone in this ambition. Companies big and small have recognised the transformative potential of electric, self-driving cars, summoned on demand. Technology firms including Apple, Google and Tesla are investing heavily in autonomous vehicles; from Ford to Volvo, incumbent carmakers are racing to catch up. An epic struggle looms. It will transform daily life as profoundly as cars did in the 20th century: reinventing transport and reshaping cities, while also dramatically reducing road deaths and pollution.

| *The wheels of change*

In the short term Uber is in pole position to lead the revolution because of its dominance of chauffeured ride-hailing, a part of the transport market that will see some of the fastest growth. Today ride-hailing accounts for less than 4% of all kilometres driven globally, but that will rise to more

than 25% by 2030, according to Morgan Stanley, a bank. The ability to summon a car using a smartphone does not just make it easy for individuals to book a cheaper taxi. Ride-sharing services like UberPool, which put travellers heading in the same direction into one vehicle, blur the boundaries between private and public transport. Helsinki and other cities have been experimenting with on-demand bus services and apps that enable customers to plan and book journeys combining trains and buses with walking and private ride-sharing services. Get it right, and public-transport networks will be extended to cover the “last mile” that takes people right to their doorsteps. This will extend the market for ride-hailing well beyond the wealthy urbanites who are its main users today.

But in the longer term autonomous vehicles will drive the reinvention of transport. The first examples have already hit the road. Google is testing autonomous cars on streets near its headquarters in Mountain View. A startup called nuTonomy recently launched a self-driving taxi service in Singapore. Tesla’s electric cars are packed full of driver-assistance technology. And within the next few weeks Uber itself will offer riders in Pittsburgh the chance to hail an autonomous car (though a human will be on hand to take back the wheel if needed).

Self-driving cars will reinforce trends unleashed by ride-hailing, making it cheaper and more accessible. The disabled, the old and the young will find it easier to go where they want. Many more people will opt out of car ownership altogether. An OECD study that modelled the use of self-driving cars in Lisbon found that shared autonomous vehicles could reduce the number of cars needed by 80-90%. As car ownership declines, the enormous amount of space devoted to parking—as much as a quarter of the area of some American cities—will be available for parks and housing instead.

It is not clear which companies will dominate this world or how profitable

it will be. Uber will not win in its current form: a ride-hailing business which depends on human drivers cannot compete on roads full of self-driving cars. But this existential threat is spurring the firm's innovation. With its strong brand and large customer base, Uber aims to establish itself as the leading provider of transport services in a self-driving world. It is also branching out into new areas, such as food delivery and long-distance cargo haulage using autonomous trucks. There is logic in this ambition. Carmakers lack Uber's experience as a service provider, or its deep knowledge of demand patterns and customer behaviour.

But firms that pioneer new technological trends do not always manage to stay on top. Think of Nokia and BlackBerry in smartphones, Kodak in digital cameras or MySpace in social networking. Much will depend on which firm best handles the regulators. Technology companies have a history of trying new things first and asking for permission later. Uber's success in ride-hailing owes much to this recipe, yet when it comes to autonomous vehicles, the combination of vague rules and imperfect technology can have deadly consequences.

Even for the winners, it is not clear how great the rewards will be. As more firms pile into ride-sharing, and autonomous vehicles become part of the mix, the business may prove to be less lucrative than expected. By matching riders with drivers, Uber can offer transport services without owning a single vehicle, and keep the lion's share of the profits. But if its service becomes an integral part of urban transport infrastructure, as it hopes, Uber could end up being regulated, more highly taxed, broken up or all of the above. In a self-driving world, Uber might also have to own and operate its own fleet, undermining its "asset-light" model. The would-be high-margin digital disrupter would then look more like a low-margin airline.

| *The great road race*

For now Uber is the firm to beat in the race to transform the future of personal transport. Unlike Apple or Google, it is singularly focused on transport; unlike incumbent carmakers, it does not have a legacy car-manufacturing business to protect. Its recent rapprochement with Didi, its main rival in China, has removed a major distraction, allowing it to devote its \$9 billion war chest to developing new technology. Its vision of the future is plausible and compelling. It could yet prove a Moses company, never reaching its promised land—it might end up like Hoover, lending its name to a new product category without actually dominating it. But whether Uber itself wins or loses, we are all on the road to Uberworld. ■



个人交通

优步世界

全球估值最高的创业公司正在引领未来交通的变革

“我们优步一下吧。”极少有公司提供的产品如此风行，连公司名都成了一个动词。而这只是优步的众多成就之一。成立于2009年的优步目前是全球市值最高的创业公司，估值约700亿美元。它的应用能在全世界超过425个城市即刻叫车，令各地的出租车司机狂怒不已。但是优步的目标，以及支撑其估值的期许，还不止于此：它想要利用自动驾驶汽车使打车便宜又方便，以此让人们彻底打消拥有汽车的念头。它不满足于撼动每年一千亿美元的出租车生意，而是已将目光投向更大的、全球总值约为每年十万亿美元的个人交通市场。

有此野心的不止优步一家。大大小小的公司都意识到随叫随到的电动自动驾驶汽车有引发变革的潜力。包括苹果、谷歌和特斯拉在内的科技公司都不惜重金开发自动驾驶汽车；从福特到沃尔沃，现有的汽车生产商竞相迎头赶上。一场史诗般宏大的战斗即将打响。这将改变人们的日常生活，其深刻程度不亚于汽车在20世纪所产生的影响：彻底改造交通、重塑城市，同时大幅减少交通事故死亡人数及污染。

| 变革的车轮

短期内优步将引领这场革命，这是由于它在专车服务市场上占据主导地位，而这部分交通市场的增长将最为迅猛。摩根士丹利银行的数据显示，目前叫车占全球行车里程还不到4%，但到2030年将增至超过25%。用智能手机就能叫车不只会让个人能打到更便宜的出租车。Uberpool这样的拼车服务将去往同一方向的乘客拼到一辆车上，模糊了私人交通和公共交通的界线。赫尔辛基和其他城市已经开始试验随叫随到的公共汽车服务，以及让乘客在计划并预定行程时可将火车、公共汽车和步行及私人拼车服务结合起来的应用。如果做得好，公共交通网络将延伸到能覆盖“最后一英里”，把人们直接送到家门口。这会将叫车市场远远扩展到富裕的城市居

民之外，而这些人是目前的主要用户。

不过长远看来，推动交通变革的将会是自动驾驶汽车。第一批试用车辆已经上路。谷歌正在其山景城（Mountain View）总部附近的街道上测试自动驾驶汽车。一家名叫nuTonomy的创业公司最近在新加坡推出了无人驾驶出租车服务。特斯拉的电动车装配了各种各样的司机辅助技术。接下来的几周内，优步自己也将向匹兹堡的乘客提供叫自动驾驶汽车服务的机会（尽管仍有人坐在驾驶座位上，必要时会接管方向盘）。

自动驾驶汽车将加强因打车服务而解放的市场趋势，让这一服务更便宜、更便利。残疾人、老人和孩子会发现到他们想去的地方变得更容易了。更多的人会选择不再拥有汽车。经合组织（OECD）的一项模拟自动驾驶汽车在里斯本使用状况的研究发现，可共享的自动驾驶汽车能将所需汽车数量减少80%至90%。随着汽车拥有量的下降，停车所需的大量空间（在美国有些城市占到全市面积的四分之一）可以用来建造公园和住房。

至于哪些公司会主导这个世界，又会有多赚钱，目前尚不明了。优步不能靠目前的模式取胜：依靠人类司机的叫车业务无法与满街的自动驾驶汽车抗衡。但是事关生存，这一威胁激发了公司的创新。凭借强大的品牌和庞大的客户基础，优步的目标是将自身打造成自动驾驶领域领先的交通服务供应商。它也在涉足新的领域，如送餐服务，以及用自动驾驶卡车长途运送货物。这一目标有其合理性。汽车制造商欠缺优步作为服务供应商的经验，也缺乏对需求类型和客户行为的深刻理解。

然而开创新技术浪潮的公司并不能始终保持领先。想想智能手机领域的诺基亚和黑莓、数码相机市场上的柯达，或社交网络领域的MySpace。成功在很大程度上取决于哪家公司能最好地应对监管部门。技术公司早就惯于先尝试新事物，再申请许可。优步在打车服务上的成功就多亏了这一套，但到了自动驾驶汽车领域，规则含混不清加上技术不完善会导致致命的后果。

即便是对赢家而言，获利能有多少也不甚清楚。越来越多的公司争相提供

打车服务，再加上自动驾驶汽车也加入这一行列，这门生意也许最终并没有预期的那么赚钱。优步将乘客与司机匹配，其自身不需拥有一辆汽车就能提供交通服务，因此拿到了利润的大头。但若如它所望——其服务成为城市交通基础设施的一部分，那么优步可能最终会受到监管、被征更高的税费、被拆解，或是经历上述全部处置。在自动驾驶的世界，优步可能必须得拥有并运营自己的车队，动摇其“轻资产”模式。本想成为高利润的数字化颠覆者的优步，到时候可能会更像一家低利润率的航空公司。

| 疯狂公路赛

直到目前优步仍是改造个人交通未来这场赛事的领跑者。与苹果或谷歌不同，它只关注交通；与在位的汽车制造商不同，它不需要保护遗留的的汽车制造业务。它最近同中国主要对手滴滴打车的和解消除了一个重要的干扰，使之能将90亿美元巨款全部投入到新技术的研发。它的未来愿景看似合理且引人注目。它可能会成为一家“摩西”公司，永远无法到达它的“应许之地”；也许最终它会像胡佛吸尘器公司一样，公司名称被用于命名一类新产品，但却未能真正主导该领域。但无论优步自身是输是赢，我们都身在通往优步世界的路上。 ■



The global economy

The low-rate world

Central banks have been doing their best to pep up demand. Now they need help

THEY do not naturally crave the limelight. But for the past decade the attention on central bankers has been unblinking—and increasingly hostile. During the financial crisis the Federal Reserve and other central banks were hailed for their actions: by slashing rates and printing money to buy bonds, they stopped a shock from becoming a depression. Now their signature policy, of keeping interest rates low or even negative, is at the centre of the biggest macroeconomic debate in a generation.

The central bankers say that ultra-loose monetary policy remains essential to prop up still-weak economies and hit their inflation targets. The Bank of Japan (BoJ) this week promised to keep ten-year government bond yields around zero. On September 21st the Federal Reserve put off a rate rise yet again. In the wake of the Brexit vote, the Bank of England has cut its main policy rate to 0.25%, the lowest in its 300-year history.

| *Come Yellen and high water*

But a growing chorus of critics frets about the effects of the low-rate world—a topsy-turvy place where savers are charged a fee, where the yields on a large fraction of rich-world government debt come with a minus sign, and where central banks matter more than markets in deciding how capital is allocated. Politicians have waded in. Donald Trump, the Republican presidential nominee, has accused Janet Yellen, the Fed's chairman, of keeping rates low for political reasons. Wolfgang Schäuble, Germany's finance minister, blames the European Central Bank for the rise of Alternative for Germany, a right-wing party.

This is a debate on which both sides get a lot wrong. It is too simple to say

that central bankers are causing the low-rate world; they are also reacting to it. Real long-term interest rates have been declining for decades, driven by fundamental factors such as ageing populations and the integration of savings-rich China into the world economy. Nor have they been reckless. In most of the rich world inflation is below the official target. Indeed, in some ways central banks have not been bold enough. Only now, for example, has the BoJ explicitly pledged to overshoot its 2% inflation target. The Fed still seems anxious to push up rates as soon as it can.

Yet the evidence is mounting that the distortions caused by the low-rate world are growing even as the gains are diminishing. The pension-plan deficits of companies and local governments have ballooned because it costs more to honour future pension promises when interest rates fall. Banks, which normally make money from the difference between short-term and long-term rates, struggle when rates are flat or negative. That impairs their ability to make loans even to the creditworthy. Unendingly low rates have skewed financial markets, ensuring a big sell-off if rates were suddenly to rise. The longer this goes on, the greater the perils that accumulate.

To live safely in a low-rate world, it is time to move beyond a reliance on central banks. Structural reforms to increase underlying growth rates have a vital role. But their effects materialise only slowly and economies need succour now. The most urgent priority is to enlist fiscal policy. The main tool for fighting recessions has to shift from central banks to governments.

To anyone who remembers the 1960s and 1970s, that idea will seem both familiar and worrying. Back then governments took it for granted that it was their responsibility to pep up demand. The problem was that politicians were good at cutting taxes and increasing spending to boost the economy, but hopeless at reversing course when such a boost was no longer needed. Fiscal stimulus became synonymous with an ever-bigger

state. The task today is to find a form of fiscal policy that can revive the economy in the bad times without entrenching government in the good.

That means going beyond the standard response to calls for more public spending: namely, infrastructure investment. To be clear, spending on productive infrastructure is a good thing. Much of the rich world could do with new toll roads, railways and airports, and it will never be cheaper to build them. To manage the risk of white-elephant projects, private-sector partners should be involved from the start. Pension and insurance funds are desperate for long-lasting assets that will generate the steady income they have promised to retirees. Specialist pension funds can advise on a project's merits, with one eye on eventually buying the assets in question.

But infrastructure spending is not the best way to prop up weak demand. Ambitious capital projects cannot be turned on and off to fine-tune the economy. They are a nightmare to plan, take ages to deliver and risk becoming bogged down in politics. To be effective as a countercyclical tool, fiscal policy must mimic the best features of modern-day monetary policy, whereby independent central banks can act immediately to loosen or tighten as circumstances require.

| *Small-government Keynesianism*

Politicians will not—and should not—hand over big budget decisions to technocrats. Yet there are ways to make fiscal policy less politicised and more responsive. Independent fiscal councils, like Britain's Office for Budget Responsibility, can help depoliticise public-spending decisions, but they do nothing to speed up fiscal action. For that, more automaticity is needed, binding some spending to changes in the economic cycle. The duration and generosity of unemployment benefits could be linked to the overall joblessness rate in the economy, for example. Sales taxes, income-tax deductions or tax-free allowances on saving could similarly vary in line with the state of the economy, using the unemployment rate as the

lodestar.

All this may seem unlikely to happen. Central banks have had to take on so much responsibility since the financial crisis because politicians have so far failed to shoulder theirs. But each new twist on ultra-loose monetary policy has less power and more drawbacks. When the next downturn comes, this kind of fiscal ammunition will be desperately needed. Only a small share of public spending needs to be affected for fiscal policy to be an effective recession-fighting weapon. Rather than blaming central bankers for the low-rate world, it is time for governments to help them. ■



全球经济

低利率世界

各国央行始终竭尽全力提振需求。如今它们需要帮助

他们并非一定渴求关注。但过去十年间人们对央行官员们的关注始终未曾转移，对他们的敌意也与日俱增。金融危机时期美联储和其他央行因它们的举措而获得盛赞：通过削减利率、印钱购买债券，它们使得这场休克没有演变成经济萧条。现在它们标志性的政策，即保持低利率甚至负利率，成为这一时代关于宏观经济最大规模辩论的核心问题。

央行官员们称，要提振仍旧疲软的经济并达到通胀目标，超宽松货币政策仍然十分必要。日本央行本周承诺将十年期国债收益率保持在零左右。9月21日美联储再一次推迟了加息。英国脱欧公投之后，英国央行紧接着将主要政策利率削减至0.25%，是其300年来的历史最低点。

| 来吧耶伦，来吧千难万险

但是越来越多的批评之声担心低利率环境所带来的影响——这是一个颠倒混乱的世界：银行要向储户收取费用，大部分富裕世界国家的国债收益率为负，而在决定资本如何配置方面，央行比市场更重要。政治家们已经开炮。共和党总统候选人特朗普指责美联储主席耶伦出于政治原因维持低利率。德国财政部长沃尔夫冈·朔伊布勒（Wolfgang Schäuble）将右翼政党“德国另类选择党”（Alternative for Germany）的兴起归咎于欧洲央行。

在这场辩论中双方的理解都有很大的谬误。把低利率环境归咎于央行官员实在太过简单；他们也在着手应对。受一些基本因素的驱动，如人口老龄化以及储蓄充裕的中国融入世界经济，实际长期利率数十年来一直在不断下降。央行官员们也并未鲁莽行事。大部分富裕国家的通胀水平低于官方目标。实际上，在某些方面央行甚至不够大胆。例如，直到现在日本央行才明确保证要超越其2%的通胀目标。美联储似乎仍急于尽快加息。

但是越来越多证据表明低利率环境造成的扭曲与日俱增，而益处正不断缩

减。公司和地方政府养老金计划的赤字已经激增，因为当利率降低时，要保证未来养老金的发放需要投入更多资金。银行一般通过短期利率和长期利率之间的利差赚钱，但利率过低甚至为负值时，银行也将举步维艰。这损伤了银行提供贷款的能力，甚至对信誉可靠的借款人也是如此。无止境的低利率扭曲了金融市场，如果突然加息，必然引发大规模抛售。如此一来时间越久，积累的风险就越大。

要在这个低利率世界安全存活，现在必须要超越对央行的依赖。提升基本增长率的结构性改革扮演着至关重要的角色。但是它们的影响要发挥实际作用会很缓慢，而经济目前亟需救援。谋取财政政策的帮助是当务之急。抵抗经济衰退最主要的工具必须从中央银行转至政府。

对记得上世纪60年代和70年代的人来说，这种想法看起来既熟悉又令人担忧。彼时的政府想当然地认为提振需求是它们的责任。问题是政治家们擅长通过减税和增加支出来刺激经济，但当经济不再需要这样的刺激时，指望他们改弦更张则遥遥无期。财政刺激成为了日益庞大的政府的同义词。目前的任务是要找到一种财政政策，能够在困难时期重振经济，并且在繁荣时期也不会强化政府的地位。

这意味着增加公共支出要超越惯常的应对方式，即投资基础设施。诚然，投资生产性基础设施是件好事。很多富裕国家需要新的收费公路、铁路和机场，而修建这些设施永远都不会便宜。为了避免产生大而无用的项目，私营部门合伙人应当从一开始就参与其中。养老金和保险基金渴望拥有能带来稳定收入的长期资产，实现对退休人士的承诺。专门的养老基金可以从最终投资者的视角，就某个项目的优点提出意见。

但是投资基础设施并不是提振疲软需求的最佳方式。大规模的资本性支出项目无法为了微调经济而随时启动或关闭。这些项目的规划如同噩梦，又需要多年的实施，还可能因政治因素而停滞。要成为有效的逆周期工具，财政政策必须模拟当今货币政策的最佳做法，即各国央行都能够按照形势的需要迅速放宽或紧缩政策。

| 小政府凯恩斯主义

政治家们不会也不应该将大型预算决策权交给技术官员。但是还有一些方式能让财政政策不那么政治化，且反应更为灵敏。独立的财政委员会，如英国的预算责任办公室（Office for Budget Responsibility），有助于去除公共支出决策的政治色彩，但是它们无法加速财政投资的决策。这一点上需要更多自动调整的机制，将部分支出与经济周期的变化相关联。例如失业津贴的发放时长和金额可以根据经济整体失业率而定。营业税、所得税减免或储蓄免税额同样可以依据经济状况调整，以失业率作为指导原则。

所有这些看来都不太可能发生。自金融危机以来，由于政治家们未能肩负起自己的责任，中央银行被迫承担了过多的责任。但是超宽松货币政策的每一次微调都收效更微且弊端更多。当下一次经济衰退来临时，将迫切需要上述的财政弹药。要让财政政策成为打击衰退的有力武器，只需要一小部分公共支出受影响。现在，政府不应将低利率世界归咎于央行官员们，而应该帮助他们。 ■



Anti-globalists

Why they're wrong

Globalisation's critics say it benefits only the elite. In fact, a less open world would hurt the poor most of all

IN SEPTEMBER 1843 the *Liverpool Mercury* reported on a large free-trade rally in the city. The Royal Amphitheatre was overflowing. John Bright, a newly elected MP, spoke eloquently on the merits of abolishing duties on imported food, echoing arguments made in *The Economist*, a fledgling newspaper. Mr Bright told his audience that when canvassing, he had explained "how stonemasons, shoemakers, carpenters and every kind of artisan suffered if the trade of the country was restricted." His speech in Liverpool was roundly cheered.

It is hard to imagine, 173 years later, a leading Western politician being lauded for a defence of free trade. Neither candidate in America's presidential election is a champion. Donald Trump, incoherent on so many fronts, is clear in this area: unfair competition from foreigners has destroyed jobs at home. He threatens to dismantle the North American Free Trade Agreement, withdraw from the Trans-Pacific Partnership (TPP) and start a trade war with China. To her discredit, Hillary Clinton now denounces the TPP, a pact she helped negotiate. In Germany, one of the world's biggest exporters, tens of thousands took to the streets earlier this month to march against a proposed trade deal between the European Union and the United States.

The backlash against trade is just one symptom of a pervasive anxiety about the effects of open economies. Britain's Brexit vote reflected concerns about the impact of unfettered migration on public services, jobs and culture. Big businesses are slammed for using foreign boltholes to dodge taxes. Such critiques contain some truth: more must be done to help those

who lose out from openness. But there is a world of difference between improving globalisation and reversing it. The idea that globalisation is a scam that benefits only corporations and the rich could scarcely be more wrong.

| *The real pro-poor policy*

Exhibit A is the vast improvement in global living standards in the decades after the second world war, which was underpinned by an explosion in world trade. Exports of goods rose from 8% of world GDP in 1950 to almost 20% a half-century later. Export-led growth and foreign investment have dragged hundreds of millions out of poverty in China, and transformed economies from Ireland to South Korea.

Plainly, Western voters are not much comforted by this extraordinary transformation in the fortunes of emerging markets. But at home, too, the overall benefits of free trade are unarguable. Exporting firms are more productive and pay higher wages than those that serve only the domestic market. Half of America's exports go to countries with which it has a free-trade deal, even though their economies account for less than a tenth of global GDP.

Protectionism, by contrast, hurts consumers and does little for workers. The worst-off benefit far more from trade than the rich. A study of 40 countries found that the richest consumers would lose 28% of their purchasing power if cross-border trade ended; but those in the bottom tenth would lose 63%. The annual cost to American consumers of switching to non-Chinese tyres after Barack Obama slapped on anti-dumping tariffs in 2009 was around \$1.1 billion, according to the Peterson Institute for International Economics. That amounts to over \$900,000 for each of the 1,200 jobs that were "saved".

Openness delivers other benefits. Migrants improve not just their own lives

but the economies of host countries: European immigrants who arrived in Britain since 2000 have been net contributors to the exchequer, adding more than £20 billion (\$34 billion) to the public finances between 2001 and 2011. Foreign direct investment delivers competition, technology, management know-how and jobs, which is why China's overly cautious moves to encourage FDI disappoint.

| *What have you done for me lately?*

None of this is to deny that globalisation has its flaws. Since the 1840s advocates of free trade have known that, though the great majority benefit, some lose out. Too little has been done to help these people. Perhaps a fifth of the 6m or so net job losses in American manufacturing between 1999 and 2011 stemmed from Chinese competition; many of those who lost jobs did not find new ones. With hindsight, politicians in Britain were too blithe about the pressures that migration from new EU member states in eastern Europe brought to bear on public services. And although there are no street protests about the speed and fickleness in the tides of short-term capital, its ebb and flow across borders have often proved damaging, not least in the euro zone's debt-ridden countries.

As our special report this week argues, more must be done to tackle these downsides. America spends a paltry 0.1% of its GDP, one-sixth of the rich-country average, on policies to retrain workers and help them find new jobs. In this context, it is lamentable that neither Mr Trump nor Mrs Clinton offers policies to help those whose jobs have been affected by trade or cheaper technology. On migration, it makes sense to follow the example of Denmark and link local-government revenues to the number of incomers, so that strains on schools, hospitals and housing can be eased. Many see the rules that bind signatories to trade pacts as an affront to democracy. But there are ways that shared rules can enhance national autonomy. Harmonising norms on how multinational firms are taxed

would give countries greater command over their public finances. A coordinated approach to curbing volatile capital flows would restore mastery over national monetary policy.

These are the sensible responses to the peddlers of protectionism and nativism. The worst answer would be for countries to turn their backs on globalisation. The case for openness remains much the same as it did when this newspaper was founded to support the repeal of the Corn Laws. There are more—and more varied—opportunities in open economies than in closed ones. And, in general, greater opportunity makes people better off. Since the 1840s, free-traders have believed that closed economies favour the powerful and hurt the labouring classes. They were right then. They are right now. ■



反全球化人士

为什么他们错了

全球化的批评者称它只对精英阶层有利。实际上不那么开放的世界对穷人伤害最大

1843年9月，《利物浦水星报》（Liverpool Mercury）报道了该市一次大规模的自由贸易集会。利物浦皇家剧场内人满为患。新当选下院议员的约翰·布莱特（John Bright）滔滔不绝地论述取消食品进口关税的好处，呼应了彼时新生的《经济学人》的观点。布莱特对听众说，在拉票时他已经解释了“如果英国的贸易受到限制，石匠、鞋匠、木匠和各行各业的手艺人会遭什么罪。”他在利物浦的演讲赢得了满堂彩。

而173年后，很难想象一位主要的西方政治家会因捍卫自由贸易而受到称颂。美国大选中的两位候选人都不是自由贸易的捍卫者。唐纳德·特朗普在很多方面都语无伦次，对这一点倒很明确：来自外国的不公平竞争已经消灭了许多国内的就业机会。他威胁会废除北美自由贸易协定，退出跨太平洋伙伴关系协定（TPP），并和中国展开贸易战。希拉里·克林顿现在也开始抨击她参与谈判的TPP，令她信誉尽失。在世界最大出口国之一的德国，成千上万人在本月初涌上街头，抗议欧盟和美国之间拟议的贸易协定。

对开放经济影响的焦虑无处不在，对贸易的强烈反对只是其中一个表象。英国脱欧公投显示了人们对移民自由在公共服务、就业和文化方面影响的担忧。大公司因利用国外避税天堂逃税而备受抨击。此类批评含有一些事实：必须采取更多措施来帮助那些经济开放过程中的输家。但改进全球化和逆反其方向完全不是一回事。认为全球化是一场骗局、只有公司和富人得利的想法是大错特错。

| 真正有益穷人的政策

首要证据是二战以后的数十年里全球生活水平的巨大改善，而这靠的是全球贸易的爆炸式发展。货物出口占全球GDP的比重在1950年为8%，在50年后则提高至近20%。出口带动的增长和外国投资让数亿中国人脱离贫困，

从爱尔兰到韩国，各个经济体也因此面目一新。

坦白地说，新兴市场国家命运的非凡转变让西方选民不太舒服。但在他们的国家，自由贸易的总体效益也无可置疑。相比只服务国内市场的公司，出口企业生产力更高，付的薪水也更多。美国一半的出口都流向了与它有自贸协定的国家，尽管这些国家的经济总量还不到全球GDP的十分之一。

相比之下，贸易保护主义会伤害消费者，对工人也无所助益。穷人从贸易中得到的好处远比富人为多。一项针对40个国家的研究表明，如果跨境贸易终结，最富裕的消费者会丧失28%的购买力，而收入最低的十分之一的人群则会丧失63%。据彼得森国际经济研究所（Peterson Institute for International Economics）的数据，在2009年奥巴马断然对中国轮胎征收反倾销税之后，美国消费者转购非中国产轮胎的成本是每年约11亿美元。这样平摊到因反倾销而“拯救”的1200个工作岗位上，相当于每个工作岗位的代价要超过90万美元。

开放还会带来其他好处。移民不仅能改善自己的生活，还能支持东道国的经济：自2000年以来，进入英国的欧洲大陆移民一直是国库的净贡献者，从2001到2011年，他们为英国公共财政贡献了超过200亿英镑（340亿美元）。外国直接投资带来了竞争、技术、管理方法和就业岗位，而这便是为什么中国吸引外国直接投资的过于谨慎的举措令人失望。

| 你近来为我做了什么？

以上种种并不是为了说明全球化毫无缺点。自19世纪40年代以来，自由贸易的拥护者一直知道，尽管绝大多数人都会受惠，但还是有一些人会成为输家。而对这些人的帮助一直都太少。从1999到2011年，美国的制造业就业岗位净减少了600万左右，其中可能有五分之一源自中国的竞争；这些失业人员有很多没能找到新工作。事后看来，对于欧盟东欧新成员国移民对公共服务的压力，英国政客也太过掉以轻心。尽管对短期资本快速且变化无常的流动还没有街头抗议，但资本的跨境涌入和流出确实经常造成损害，尤其是在欧元区里那些债台高筑的国家。

正如我们本周的专题报道所指出的，必须做更多工作来解决这些问题。美国在再培训工人并帮助他们再就业的政策上的支出少得可怜，仅为其GDP的0.1%，相当于富裕国家平均水平的六分之一。在这种情况下，无论是特朗普还是希拉里都没有提出政策帮助因贸易或便宜技术而失业的人，这实在可悲。在移民方面，仿效丹麦的做法，把移民数量和地方政府的收入挂钩，以此缓解对学校、医院和住房构成的压力，这很合情合理。许多人把将贸易协定绑定签署国的做法视为对民主的侵犯，但还是有办法让共享的规则强化国家主权。对如何向跨国公司征税建立协调一致的规范可以让各国政府对其公共财政有更大的控制权。协同控制短期资本的剧烈流动将能恢复政府对货币政策的掌控。

这些是对贸易保护主义和本土主义鼓吹者的明智回应。最糟糕的答案可能是各国转而反对全球化。保持开放的理由和本刊初创时支持废除《谷物法》（the Corn Laws）时的情形差不多。相比起封闭经济体，开放经济体中机会更多，也更加多样化，而且总的说来有更大的机会令人民富裕。自19世纪40年代以来，自由贸易主义者一直相信封闭经济体有利于权贵阶层而会伤害劳工阶层。他们那时是对的，现在也对。■



Schumpeter

Family values

Donald Trump is running his campaign like a family business

FAMILY businesses are different from other sorts—they are held together by strands of DNA as well as the logic of profit. They are rich in scarce resources, such as loyalty and flexibility, but also suffer from extreme challenges, such as family feuds and wayward patriarchs. At their best they are unbeatable. At their worst they are disasters.

Donald Trump's presidential campaign is as good an illustration of this point as any. He presents himself as a businessman who can offer America commonsense solutions backed up by professional management—"I'm going to get great people that know what they're doing, not a bunch of political hacks," he says. But in fact he is a very particular sort of manager: a second-generation family businessman who inherited a property company from his father, Fred, and relies on his three adult children, Donald, Ivanka and Eric, and his son-in-law, Jared Kushner, to run it.

The debate about the business skills of Mr Trump frequently misses this simple point. Critics lambast his chaotic methods: the Trump Organisation lists 515 businesses and has at various times branched out from property into TV, airlines, beauty pageants and gambling. They forget that family firms are often held together by nothing more than a name and a buccaneering spirit. Some argue that he would be richer if he had invested his inheritance in the stockmarket. But Mr Trump has lived the life of Riley while putting his name on towers in Manhattan, holiday resorts in Palm Beach and golf clubs in Scotland.

For all his braggadocio Mr Trump has avoided some of the most common failings of family businesses such as family rows and botched successions:

witness the repeated feuds between the Koch brothers or the battle to see who will succeed Sumner Redstone. The Family Firm Institute says that only 30% of family firms last into the second generation and only 12% into the third. Mr Trump has not only kept his business intact through two divorces and numerous spats. He has also successfully groomed his children (and son-in-law) to take over.

Mr Trump is applying the same family-business formula to his presidential campaign, making all the key decisions himself, but also relying on his three adult children plus Mr Kushner to act as campaign aides, surrogates and all-purpose fixers. Eric and Donald junior have been particular assets with the hunting crowd (who might have been suspicious of Manhattan socialites) thanks to their love of slaughtering African wildlife. Republican Party bigwigs have to go through the children if they want access to Trump senior.

Mr Trump's family-business style served him brilliantly when he was running for his party's nomination. Family outfits are good at spotting profit centres that corporate giants ignore. Sam Walton, Walmart's founder, recognised that Americans wanted "every day low prices" more than they wanted local stores. Mr Trump recognised that working-class conservatives were fed up with a political party that offered steak for the rich in the form of tax cuts but cheap labour and a bit of patriotic sizzle for the masses.

The same style is turning into a disaster now. Successful family businesses know when to consolidate their gains by adopting professional management methods. Mr Trump still thinks he is running in the primaries. Ivanka was potentially a huge asset to the campaign, her skills honed by years of appearances on her father's television show, "The Apprentice". But she has expended much of her energy cleaning up after his misogynistic comments rather than extending his brand.

Mr Trump's campaign now has all the classic signs of a failed family business—riven by faction fights, haunted by reminders of past business dealings with dodgy financiers and property developers, and humiliated by a properly run rival. On August 17th Mr Trump shook up his team for the third time—appointing Stephen Bannon, a conservative journalist, to a new role as campaign chief executive, and Kellyanne Conway, a veteran Republican pollster, as campaign manager. But he still has not mastered the basic arts of running a campaign, such as buying political advertising and establishing field offices.

| *Brace yourselves for the next show*

Before celebrating Mr Trump's likely defeat in November it is worth remembering that family businesses can surprise everybody by turning themselves around. Rupert Murdoch's News Corporation increased in value after the restructuring that was triggered by a phone-hacking scandal. Mr Trump's children, who are reportedly the only people capable of reining him in, may yet be able to save his campaign from humiliation. And even if he loses he may be able to parlay political defeat into business success in the form of a conservative television channel fuelled by the rage that he has exploited and starring Ivanka and Co.

And before dismissing the Trumps' dynastic campaign as a weird aberration it is worth remembering that America is no stranger to political families. The Donald may be the first candidate to run his campaign like a family business but the Adamses, Kennedys, Rockefellers, Bushes and, of course, the Clintons have all regarded politics as a family business. Hillary Clinton is as professional as Mr Trump is slapdash. Yet there are some similarities. Mrs Clinton relies heavily on family members—not just on her husband, Bill, but also on her daughter, Chelsea. (The similarities between Chelsea and Ivanka are uncanny: they are, among other things, both in their mid-30s, and both married to men whose fathers have done time in prison).

Mrs Clinton is also prey to conflicts of interest, particularly over the Clinton Foundation, which would be much more fiercely debated now if it weren't for Mr Trump's follies. Even if he loses the election America will not be rid of the problems that are created when families, businesses and politics collide. ■



熊彼特

家庭观念

唐纳德·特朗普像经营家族生意一样竞选总统

家族企业有别于其他企业，将其凝聚在一起的不只是利润逻辑，还有DNA。家族企业握有稀缺资源，如忠诚和灵活，但也要经受严峻挑战，如家族内讧和刚愎自用的家族元老。家族企业表现最佳时不可战胜，状况最差时则是一塌糊涂。

特朗普的总统竞选活动恰好能够印证这一点。他将自己展现为一个生意人，能以专业的管理为美国提出合乎常理的解决方案。他说：“我将任命知道自己在干什么的优秀人才，而不是请一帮只图钱财的政客。”但事实上他是一个很另类的经理人：他是家族企业的第二代接班人，从父亲弗雷德那里继承了地产公司，并且依赖他的三名成年子女小唐纳德、伊万卡和埃里克以及女婿贾瑞德·库斯纳（Jared Kushner）来经营。

各种针对特朗普经营技巧的辩论经常会错失这一简单事实。批评者严厉批评其混乱的管理方法：特朗普集团旗下有515个商业项目，而且在不同时期除地产之外还曾涉足电视、航空、选美和博彩业。他们忘了将家族企业凝聚在一起的往往就是家族姓氏和冒险精神。有人称如果特朗普把他继承的产业投入股票市场，他会比现在更富有。但特朗普一边过着舒适惬意的生活，一边还用自己的名字为曼哈顿的高楼、棕榈滩（Palm Beach）的度假圣地和苏格兰的高尔夫球俱乐部命名。

尽管特朗普满嘴跑火车，但他避免了例如家族争端和继任人纷争等家族企业常见的过失：看看科赫兄弟的持续争斗和萨默·雷石东（Sumner Redstone）的继承人大战就知道了。家族企业研究所（The Family Firm Institute）的研究显示只有30%的家族企业能延续到第二代，仅有12%能传到第三代。历经两次离婚和数段绯闻，特朗普不仅保住了家族生意，还成功培养了自己的孩子（和女婿）来接手。

特朗普正在把经营家族企业的那一套用来竞选总统，自己做所有重大决策，但也依赖其三个成年子女和女婿库斯纳作为其竞选助理、代理人和解决各种问题的中间人。埃里克和小唐纳德颇能帮助竞选团队争取打猎爱好者的选票（这一群体原本可能还对曼哈顿的社会精英抱有怀疑态度），这多亏了他们二人对猎杀非洲野生动物的热爱。共和党大佬要见老特朗普，还必须通过他的子女。

特朗普的家族企业风格在他竞选共和党提名时效果显著。家族机构善于发现商业巨头容易忽略的利益中心。沃尔玛创始人山姆·沃尔顿认识到相对于社区商店，美国人更想要“天天低价”。特朗普意识到工人阶层保守派受够了执政党为富有阶层奉上减税的牛排大餐，而只留给普罗大众低廉的劳动报酬和一点儿打着爱国主义旗号的油星儿。

然而同样的风格却正将情况变得一塌糊涂。成功的家族企业知道什么时候该通过采纳专业的管理方法来巩固成果，而特朗普以为自己还在进行初选呢。伊万卡本有潜力成为竞选中一颗极为重要的砝码，她在其父的电视节目《学徒》（The Apprentice）中出镜多年，能力备受磨砺。但她的大部分精力都花在为父亲歧视女性的言论收拾烂摊子上，无暇扩展他的个人品牌。

现在特朗普的竞选活动充满了家族企业出现败相的种种经典征兆——派系斗争分裂，与奸猾的金融家和地产商过往的交易让他备受困扰，对手竞选运作得当令他相形见绌。8月17日，特朗普第三次重组竞选团队，任命保守派新闻记者史蒂芬·巴农（Stephen Bannon）出任竞选团队首席执行官这一新职，共和党资深民调专家凯莉安娜·康韦（Kellyanne Conway）任竞选经理。但他仍未掌握运作竞选的基本技艺，如购买政治广告和在各地建立竞选办事处。

| 为下一轮好戏振作精神

在庆祝特朗普11月可能出现的失败之前，值得提醒的是家族企业有可能会扭转乾坤，让人大跌眼镜。鲁伯特·默多克（Rupert Murdoch）的新闻集团在电话窃听丑闻引发重组后，股价不跌反升。特朗普的孩子们（据说只

有他们有能力让他有所收敛)也许还能挽救他的选情,让他不至于落败蒙羞。即便真输了,他也可能因势利导,将政治上的失利转为商业上的成功,开设保守电视频道,主推伊万卡。在竞选中特朗普充分利用了选民的愤怒情绪,足以为频道助力。

在把特朗普王朝式的竞选简单地看做是一次怪诞的行为偏差之前,值得注意的是美国历史上政治家族并不鲜见。特朗普也许是第一个像经营家族生意那样运作竞选的总统候选人,但是亚当斯、肯尼迪、洛克菲勒、布什,当然还有克林顿,这些家庭都把政治视为家族生意。专业的希拉里和鲁莽的特朗普看似南辕北辙,但他们之间不乏相近之处。希拉里非常倚重家庭成员——不光是丈夫克林顿,还有女儿切尔西。(切尔西和伊万卡之间有着出奇的相似之处,比如两人都是三十五、六岁,她们的公公都曾坐过牢)。希拉里同样也受到利益冲突的困扰,尤其是在克林顿基金会这一问题上。要不是特朗普频繁的荒唐言论,该基金会还会更受争议。即使特朗普竞选失败,美国也无法摆脱家族、企业和政治冲突所产生的问题。■



Football

Winging it

China and the beautiful game

WILL the Reds go red? Everbright, a Chinese state-backed financial conglomerate, is reportedly keen to buy Liverpool Football Club, one of the sport's most celebrated names. If it were to happen, it would be the biggest in a series of recent investments made by mainland firms in European football (see chart). Some think such moves will redraw the sporting map. Arsène Wenger, manager of Arsenal, a London club, has said that China has the financial wherewithal to “move a whole league of Europe to China”.

The tally of Chinese investment in foreign football clubs since January of last year now stands at \$2 billion, according to Rhodium Group, a consulting firm. The sums keep growing. The biggest deal yet was the takeover of AC Milan for \$820m by a mainland consortium, announced on July 5th. Chinese money has also cascaded towards individual footballers, who often join the world's best paid. The latest jaw-dropping deal was Shanghai SIPG's signing of Givanildo Vieira de Sousa, a Brazilian star known as Hulk, in June for \$61m.

China's president, Xi Jinping, a lifelong football fan, approves. He wants to build a domestic sports industry worth \$850 billion by 2025. His other goals are for China to host the World Cup by 2030 and win it soon after. The bureaucracy has swung into action, issuing 50-point policy plans and offering tax breaks and other inducements to firms investing in the game.

Many have responded, with Chinese investors in football ranging from the business elite to the relatively unknown. Some businessmen may be mindful of the benefits of being seen to invest in the state's declared priorities during Mr Xi's feared anti-corruption campaign. The new owner

of Wolverhampton Wanderers, Guo Guangchang, the boss of Fosun Group, for instance, was briefly detained by police last December before being released with no charges a few days later. Foreign football clubs also offer investors a state-sanctioned way to move money out of China, and a hedge against the falling yuan.

Many of those buying clubs abroad are also spending big on football back home. The knowledge gleaned from inspecting the way in which European clubs develop talent should eventually boost skills on pitches in China, where playing standards have long been poor. The investment is not a case of blind adoration for European football, argues Simon Chadwick of Coventry University Business School, but is rather quite strategic.

Insiders who know Liverpool FC are playing down the likelihood of an imminent deal, but the club's owners may be swayed by events 50km away from Anfield, its home. Manchester City, of which 13% is owned by a consortium led by China Media Capital (CMC), a venture-capital firm with a strong presence in Chinese media, is well placed to lift its profile in a vast, untapped football market. Manchester City has recently agreed a deal to set up a satellite club in China.

Analysts based in China tend to think that the string of purchases represents a bubble. The nation is likely to have less success in spending its way to the top in football than it has had in the Olympics, says Mark Dreyer of China Sports Insider, an industry blog. Corruption now is not as bad as in the old days of "black ball" scandals, when many matches were fixed. Still, the Hong Kong Jockey Club, which hosts betting on a range of sports, remains suspicious and does not allow bets on Chinese football matches.

And the problem with state backing is that it could easily lead to the sort of industrial policies that have led to overinvestment and underperformance in several other Chinese industries. The chances of China becoming a

global chip-making superpower, for example, are slim, even though it plans to spend over \$100 billion buying semiconductor firms and technologies, said Bain & Company, a consultancy, in a recent study. A report drawing similar conclusions about China's ambitions in football could soon be on its way. ■



足球

肆意挥洒

中国与这项美好的运动

红魔是否会变得更红？据报道，中国国家支持的光大金融集团有意收购利物浦足球俱乐部——最著名体坛豪门之一。如果此事成真，这将是近期内内地企业在欧洲足坛所做的一系列投资中的最大手笔（见图表）。有些人认为这样的举措将改变体育的格局。位于伦敦的阿森纳俱乐部主教练阿尔塞纳·温格曾表示，中国有财力“将欧洲的一个联赛全盘搬到中国来”。

根据咨询公司荣鼎集团（Rhodium Group）的数据，自去年一月至今，中国在国外足球俱乐部上的投资累计已达20亿美元，而且这一金额还在持续增长。迄今最大的一笔交易7月5日公布，由大陆财团出价8.2亿美元收购AC米兰。中国的资金也会涌向个别球员，使其跻身世界收入最高运动员的行列。最近一宗令人瞠目结舌的交易是今年六月，上港集团以6100万美元的天价签下巴西球星“绿巨人”吉万尼尔多·维埃拉·德·索萨。

中国国家主席习近平一生热爱足球。他本人对此表示赞许，并希望到2025年，国内体育产业规模达到8500亿美元。他的另一目标是中国能举办2030年世界杯，还要在此后不久夺冠。中国官僚迅速采取行动，发布50条政策计划，并为投资体育的企业提供税收减免等优惠。

许多人纷纷响应——无论是商界精英还是相对无名之辈，许多中国投资者开始投资足球。在习近平令人胆寒的反腐运动期间，一些商人可能意识到，让别人看到自己投资于国家公布的重点项目有其好处。比如，伍尔弗汉普顿流浪者队的新主人郭广昌是复星集团的老板，去年十二月间曾被警方带走调查，几天后获释，并未受到指控。国外足球俱乐部还为投资者提供了一种国家批准的方式来将资金转移出中国，也可对冲人民币贬值的影响。

许多收购国外俱乐部的富豪在国内也对足球一掷千金。通过观察欧洲俱乐

部的人才培养模式，由此获取的知识最终应该会提高中国球场上的竞技水平——长期以来中国的足球水平一直不高。考文垂大学商学院的西蒙·查德威克（Simon Chadwick）认为，这些投资并不是对欧洲足球的盲目崇拜，相反其背后有着相当的战略考量。

了解利物浦俱乐部的内部人士正在努力降低立即交易的可能性，但距离其总部安菲尔德50公里处发生的事情可能会左右其老板的判断。在中国媒体中颇有影响的风险投资公司华人文化产业投资基金（CMC）拥有曼彻斯特城队13%的股份。曼城队已经万事俱备，要在这个尚未开发的巨大足球市场中提升自身的形象。它最近还达成协议，准备在中国建立卫星俱乐部。

中国本土分析师倾向于认为这一连串的收购是一个泡沫。行业博客“中国体育透视”（China Sports Insider）的马克·德雷尔（Mark Dreyer）说，中国靠砸下重金能取得奥运会的成功，然而由此成为足球强国的可能性不大。腐败现在已不像当年“假球”丑闻时那样猖獗——当时许多比赛的比分都早早定下。尽管如此，经营多种运动投注的香港赛马会对此仍心怀顾虑，不允许投注中国的足球比赛。

由国家做后盾的问题在于，它很容易导致曾在中国若干其他行业引发过度投资和业绩不良的那种产业政策。比如咨询公司贝恩在最近的一项研究中表示，中国成为全球芯片制造超级大国的机会十分渺茫，即便它计划花费超过1000亿美元来购买半导体公司和技术也无济于事。对中国的足球雄心下类似结论的报告可能很快就会出炉了。■



Geolocation

Addressing the world

How to find anywhere on the planet

LAST year, a brush fire threatened the home of Ganhuyag Chuluun Hutagt, who lives in Mongolia's capital, Ulaanbaatar. Instead of giving the fire brigade his address, though, Mr Ganhuyag had to guide them to the blaze by describing a series of landmarks along the way. That was because, like most buildings in Mongolia, his house does not have an address. Road names and building numbers are so sparse there that fewer than 1% of Mongolians do. But Mr Ganhuyag, who is on the board of the country's post office, Mongol Post, proposes to do something about it.

Thanks to his urging, Mongol Post is adopting an ingenious new system of addresses that can locate any place in the country—and, indeed, in the world. Instead of house number, street name, town, province and so on, or the unwieldy co-ordinates of latitude and longitude, this system, the brainchild of Chris Sheldrick, boss of What3Words, a firm based in London, divides the Earth's surface into nine-metre-square blocks. Each block is then given names consisting of trios of randomly selected, unrelated words. One patch of Siberia, for example, is called, in English, "mirroring.surrendered.epidemics". But it also has nine other names, in other languages, including Russian.

Divvying up Earth's surface into nine-metre-square blocks requires nearly 57 trillion addresses (to be precise, 56,764,364,951,858 of them). That sounds a lot, but Mr Sheldrick realised that 40,000 words would be enough to do the job—indeed, more than enough, since that number actually yields 64 trillion three-word combinations. Moreover, places that are at sea have only English addresses. The other languages, restricted to the land, thus require a mere 25,000 words each. When drawing up a list in a new language,

What3Words' linguists toss out homophones, and also any words that may create offence, such as "fondle", in English, or, in Arabic, words for alcoholic drinks. Otherwise, words are selected based on their familiarity and frequency of use.

| *A way with words*

Besides nailing down locations in Mongolia, Mr Sheldrick's system is also proving useful in the *favelas* of Rio de Janeiro. That city's government has, according to Sila Vieira da Silva, failed to generate addresses fast enough to keep up with the new shacks and alleyways appearing in these shanty towns, and does not bother to bring post into at least 11 of them anyway. Mr Vieira da Silva is one of the owners of Carteiro Amigo, a company that has delivered letters in Rio's *favelas* since 2000 by compiling directions to residents who pay for the service. Now, using software licensed from What3Words, Carteiro Amigo is converting to three-word addresses.

Rich countries, too, can benefit, says Peter Atalla, the boss of Navmii, a London firm that has folded What3Words' software into navigation apps for motorists. One search in ten that uses Navmii's app is for a What3Words address. Not only are they easy to memorise, type out and communicate by phone, Mr Atalla says people also like the precision of directing others to, say, a specific entrance rather than an entire building, or to a picnic spot instead of the whole park. Direct Today Couriers, another British outfit, reports that converting standard addresses into What3Words ones has reduced the number of missed deliveries by 83%. Watch.this.space. ■



地理定位

全球定址

如何找到地球上的任何地方

冈呼雅格·朝伦·呼图克图（Ganhuyag Chuluun Hutagt）住在蒙古首都乌兰巴托。去年，一场灌木丛火灾威胁到了他的家。不过，冈呼雅格并没有告诉消防队他的地址，而是不得不描述一系列沿途地标，以此引导对方前来救火。这是因为，和蒙古大多数建筑一样，他的房子没有地址。路名和门牌非常稀疏，蒙古人口中只有不到1%在使用它。但是作为蒙古邮政的董事会成员，冈呼雅格提出要做点什么。

在他的推动下，蒙古邮政正在实施一种非常巧妙的新地址系统，可以定位该国的任何地方——甚至全世界的任何地方。该系统是伦敦What3Words公司的老板克里斯·谢尔德里克（Chris Sheldrick）的心血之作。它没有门牌号码、街道名称、镇、省等标识或是麻烦的纬度和经度，而是把地球表面分成九米见方的小块，然后为每个小块分配一个由三个随机选择的不相关单词构成的名字。比如，西伯利亚的一个地块在英语中被称为“mirroring.surrendered.epidemics”（镜像.投降.传染病），但它还有另外九个名字，用俄语及其他语言写成。

将地球表面分成九米见方的小块需要近57万亿个地址（准确来说是56764364951858个）。这听起来很多，但谢尔德里克意识到，4万个单词就足以完成这项工作——实际上还绰绰有余，因为这么多单词实际上可产生64万亿个三单词组合。此外，海上的地点只有英文地址。其他语言仅限于陆地，因此每种语言只需要区区25000个单词。在为新的语言草拟列表时，What3Words的语言学家去掉了同音词以及任何可能让人感到不快的词，比如英语中的“爱抚”或是阿拉伯语中有关酒精饮料的词。其他的词就根据人们熟悉的程度和使用频率来选择。

| 单词之路

除了在蒙古定位地点之外，谢尔德里克的系统在里约热内卢的贫民区也十

分有用。根据西拉·维埃拉·达席尔瓦（Sila Vieira da Silva）的说法，市政府生成新地址的速度赶不上这些棚户区内新窝棚和小巷出现的速度，不过政府反正也不想为其中至少11个区通邮。维埃拉·达席尔瓦是“朋友邮递员”（Carteiro Amigo）公司的业主之一，该公司自2000年起通过整理付费居民的指路说明来为里约的贫民区送信。现在，利用What3Words授权的软件，“朋友邮递员”正在逐步改用三个单词的地址。

富裕国家也可以从中受益，伦敦公司Navmii的老板彼得·阿塔拉（Peter Atalla）说。该公司已将What3Words嵌入了面向驾驶员的导航软件。在Navmii的应用完成的搜索中，有十分之一使用了What3Words地址。它们不仅容易记忆、易于输入且方便电话交流，阿塔拉说人们还很欣赏它的定位精度，比如可告诉别人前往一个特定的入口而不是整栋建筑，或是一个野餐地点而非整座公园。另一家英国组织“当日直邮”（Direct Today Couriers）表示，将标准地址转换为What3Words地址让误投递减少了83%。注意.这个.领域。■



Free exchange

Believing is seeing

New technologies will make society richer by cultivating trust

IT IS easy to forget that even the most trivial commercial transactions rely on small acts of trust. Laws encourage good behaviour, but states lack the resources to force everyone to be good all the time. Trust keeps society running. Just ordering a pizza requires faith that the dough will be well made, that the pizzeria will not abuse the customer's credit-card information, and that the delivery man will not abscond with the cargo. More complex partnerships, of the sort that make long-run economic growth possible, require much higher degrees of trust. New technologies, from sharing-economy apps to the blockchain, offer routes around some of the trust deficits that stand in the way of growth. Yet whether such solutions to problems of mistrust build on or undermine social ties is no easy question to answer.

Trust in society is not just a nicety. It makes possible, as one paper on the subject has it, "the commitment of resources to an activity where the outcome depends upon the co-operative behaviour of others". Low-trust societies waste piles of time and money working out who can be counted on, defending vulnerable stores of wealth, and guarding against con men. Such places are infertile ground for long-run investment, the gains from which could be grabbed by rivals or stolen by government. Meanwhile trust is highest, and defences against chicanery lowest, within some of world's wealthiest countries. Studies of the relationship between measures of trust and economic growth find a close link between the two. That does not necessarily mean one causes the other. But research also suggests that trust boosts trade, participation in financial markets and investment, suggesting that greater trust spurs the activities that make a place richer.

Sadly, cultivating trust is hard. It is a sort of social capital which must be built through time and effort. Repeated positive interactions and demonstrations of trustworthiness create a foundation of mutual confidence. Within close communities, emotional cues like praise and shame effectively discourage antisocial activity. In environments rich in social capital, the return for co-operative behaviour is high; you can make more money playing by the rules and building a business, for instance, than by reneging on a contract at the first opportunity. In the same way, trustworthiness is rarely rewarded in low-trust societies; both high-trust and low-trust states of the world are sticky.

Inventive humans are good at finding ways around trust bottlenecks. Reliance on families or tribes—groups whose members' interests are more closely aligned, presumably, than those of the population as a whole—is a common strategy. Yet by their nature, such workarounds are limited in scope, and leave many members of society isolated. New technologies offer a more promising approach. A company's ability to use the internet to monitor production in a factory half a world away means that firms need not establish deep relationships with foreign suppliers before opening a distant plant. Network connections between retailers and banks can help verify a customer's ability to pay; the blockchain, a shared, public and trusted digital ledger of transactions, eliminates the need for a central counterparty altogether.

These advances clear the way for new investments and purchases. Yet whether they are a long-run boon is harder to assess. In a world of big data, people might come to trust only what can be verified electronically. In a recent blog post, Branko Milanovic of The City University of New York lamented the “commodification” of labour made possible by market-making apps. Enabling strangers to quickly do business frees people of the need to be nice, he argues; their trust-building skills could atrophy. Similarly, Tyler Cowen of George Mason University recently mused that as

people grow more accustomed to interacting with intelligent machines (like Apple's Siri), which require no social niceties, they might find it harder to build relationships with humans. Technologies can perpetuate discrimination: algorithms used to make lending decisions or process human speech occasionally "learn" to become racist by analysing the data fed to them.

| *Computer says yes*

Historically, however, technology has done more to open up society than to segregate it. New technologies make it easier to trust unfamiliar groups. Public ratings, for instance, can undercut discrimination. Taxi drivers who might normally speed past members of a different race may feel more comfortable picking up a diverse set of riders given good ratings on Uber. A survey conducted by BlaBlaCar, a popular ridesharing service, found that 88% of its members reported a high level of trust in fellow users—higher than that reported for colleagues or neighbours. In a study in America, Alberto Alesina, of Harvard University, and Eliana La Ferrara, of Bocconi University in Milan, found that places with higher levels of racial and income diversity have lower levels of trust. By arranging interactions across such boundaries, technology may widen the circle of trust.

Apps often encourage good behaviour as well. Public ratings, like the ones that Uber presents for its drivers or that Yelp collects for businesses, mean that good customer service is increasingly important in capturing new business. Firms and customers that behave badly risk a permanent stain on their reputation.

Reliance on a social panopticon to enforce good behaviour may not seem much like the sort of trust that underpins economic growth. It is one thing to use Airbnb to rent a spare room from someone of a different background, and quite another to build the deep social bonds needed to support long-run investments. For big commitments, people will not suddenly let down

their guard, however impressive technology becomes. Yet trust is a habit. New technologies that encourage co-operation in some spheres of life contribute to social capital rather than weaken it. ■



自由交流

所信即所见

新科技通过培育信任令社会更富足

即使最微不足道的商业往来也要依赖点滴信任之举，人们很容易就忘记这一点。法律会鼓励端正的行为，但政府并不具备足够的资源能令所有人都始终乖乖听话。社会的运转有赖于信任的存在，连叫一个匹萨也都是如此——你得相信面团会揉制得很好，相信店家不会滥用顾客的信用卡信息，送餐员也不会携匹萨潜逃。至于那种更复杂且可使经济长期增长的伙伴关系，所需要的信任程度则要高得多。从共享经济应用到区块链，一些新技术提供了可绕开部分阻碍经济增长的“信任赤字”的途径。然而，这些用以解决信任匮乏问题的方法是会以社会关系为基础，还是逐渐削弱这些关系？这并不是个容易回答的问题。

在社会中，信任并不仅仅关乎礼貌。正如一篇主题为信任的论文所说的那样，对于那些“结果如何将取决于他人的合作行为的活动”，信任会使其获得“资源的投入”。为了甄别可信赖的人、维护易遭受损害的财富积累以及提防骗子，处在低信任度社会的人们要浪费大量的时间和金钱。这种地方不会是适宜进行长期投资的沃土，因为收益可能不是被对手攫取，就是被政府窃走。而另一方面，在世界上最富裕的一些国家里信任度最高，对欺诈的防备程度也最低。一些关于信任度与经济增长之间关系的研究发现，二者之间存在着密切的联系。虽然并不能说二者互为因果，但有研究发现信任可以促进贸易发展、提高金融市场上的参与度，以及增加投资。这表明更高层次的信任将促进能使一个地区变得更加富足的活动。

可惜培育信任并非易事。信任是一种社会资本，须加以时间并为之付出努力才能积累起来。不断发生的良性互动，以及能展现可信度的行为可为互相信任奠定基础。在联系紧密的群体中，赞扬及羞耻感这样的情绪线索可有效地阻止反社会行为的发生。在社会资本充足的环境中，合作行为能换来可观的回报。例如，和一旦有机会就违反合同规定相比，按规则行事开创事业能让人赚到更多的钱。同样，在低信任度的社会，诚信却很少能得

到相应的报偿。无论是在高信任度还是低信任度的国家，都存在着棘手的问题。

富于创造力的人类很善于寻找绕过信任瓶颈的方法。依靠家人或部落是最常见的一个策略——大体来说，相较于全体人口的共同利益，这些群体成员的利益更为密切相关。但就其本质而言，这种办法的作用范围有限，会使许多社会成员陷入孤立。一些新的技术提供了更具前景的解决方案。如果公司能够通过互联网监控位于世界另一边工厂的生产状况，那么各家企业就无需在远方建厂前先与外国供应商们建立深层纽带。零售商与银行间的网络连接则可帮助检验客户的支付能力。有了区块链——一种共享且可信的、用以记录交易的公共总账，便可完全不再需要集中的对手方来促成交易。

这些进步为新的投资和采购扫清了道路，但要评估它们会不会一直都能带来好处却很难。身处一个拥有大数据的世界，人们最终也许只会相信能够以电子手段证实的东西。纽约市立大学（The City University of New York）的布兰科·米拉诺维奇（Branko Milanovic）近期在一篇博文中哀叹做市应用使得劳动力“大宗商品化”。他认为，陌生人之间进行交易变得很快捷，这使人们无需保持友善，他们建立信任的技能因此也许会退化。无独有偶，乔治梅森大学（George Mason University）的泰勒·柯文（Tyler Cowen）近期也深入思考了这个问题。他指出，与机器智能（如苹果的Siri）互动无需社交礼节，随着人们愈发习惯于这种互动，他们也许会发觉与人类建立关系会变得更难。科技也会延续歧视这一状况：一些用以做出借贷决定或处理人类话语的算法分析了向其输入的数据后，有时竟“学会”了种族主义。

| 电脑说“是的”

然而，从过往经历来看，科技使社会变得更开放的情形要多于其造成的隔离状态。有了新技术，去相信不熟悉的群体就会变得更为简单。例如，公众评价机制可以减少歧视的现象。有些司机看到其他种族的人往常可能会疾驰而过，现在他们也许会很愿意接送多种多样的乘客，只要这些人在优步上有良好的评价。广受欢迎的拼车服务商BlaBlaCar的一项调查显示，其

88%的会员都表示他们对其他BlaBlaCar用户的信任程度更高——这一比例要高于表示自己高度信任同事或邻居的人。在美国，哈佛大学的阿尔贝托·阿莱斯纳（Alberto Alesina）及米兰博科尼大学（Bocconi University）的艾莲娜·费拉拉（Eliana La Ferrara）在一项研究中发现，种族更多样、收入更多元的地方信任度会更低。科技能促使人们跨越这些界线进行互动，这样也许可以扩大信任的范围。

应用也经常会鼓励良好的行为。公众评价（例如优步向其司机提供的那种，或Yelp为商家搜集的那些）意味着若要捕捉新商机，优质的客户服务变得愈加重要。行为不端的公司或顾客将会遭遇名誉永久受损的风险。

依赖社会的全面监控来加强人们的端正举止似乎与可巩固经济发展的那种信任并不可等量齐观。通过Airbnb向来自不同背景的人出租一个房间是一回事，为了支持长期投资而建立深层的社会纽带则完全是另一回事。不管科技会变得多么令人赞叹，在需要重大投入的事情上，人们仍不会突然卸下防备。然而信任是一种习惯。那些在生活某些方面可促进协作的新科技会帮助积累社会资本，而非削弱它。■



Self-driving cars

Motoring with the Sims

Testing autonomous vehicles virtually will make them safer on real roads

AMERICA'S National Highway Traffic Safety Administration (NHTSA) is investigating the fatal crash in May of a Tesla Model S electric car. Normally such an accident, tragic though it is for the friends and family of the victim, would not warrant a high-level inquiry of this sort. In the case in question, though, the car was operating on Autopilot. That is the name Tesla, an electric-vehicle-maker based in California, has chosen for its "autonomous-driving mode", in which the vehicle itself, via sensors and computers, lifts from the person behind the wheel much of the burden of controlling the car. According to Tesla, neither the Model S's driver nor the car's own sensors noticed a large articulated lorry crossing the road ahead. The car therefore failed to brake, and it ended up careering under the lorry's trailer. That ripped off its roof, killing the driver.

In the accident, which happened in Florida, the lorry, which was painted white, was set against a brightly lit sky, Tesla noted. One possibility is that the vehicle's cameras, working in combination with its forward-facing radar, wrongly concluded that the lorry was an overhead sign with space beneath it. Some reports have suggested the driver might have been watching a video at the time. But whatever the NHTSA determines to be the cause, the accident makes plain that self-driving cars still have a long way to go before they are ready for routine use.

Tesla acknowledges this by describing Autopilot as an "assist" feature designed to relieve some of the workload of driving. When engaged, the system advises drivers: "Always keep your hands on the wheel. Be prepared to take over at any time." Autopilot periodically checks pressure on the steering wheel to ensure that it is being held, and will slow the car if no

pressure is detected. Yet plenty of videos have been posted on social media of drivers not touching the steering wheel and relying totally on their vehicle's autonomous features. One of these was filmed by a driver from the back seat.

| *The virtues of driving virtually*

For Tesla and other firms developing autonomous vehicles (from information-technology companies such as Google and Uber to established carmakers), the systems now available are more akin to intelligent cruise control than robot chauffeurs. But the features they provide, such as lane-keeping, automatic braking, maintaining a safe distance from the vehicle in front and overtaking, are necessary steps towards fully self-driving cars that, backers say, will operate more safely than those driven by people. Most accidents are, after all, caused by human error.

To get to that happy state of affairs, though, much practical development work must take place. Doing this on the open road provides the most realistic data, but as the accident in Florida shows, this can be a risky business. A new facility, at the University of Warwick, in Britain, offers an alternative approach. It is a driving simulator specifically designed to test “intelligent” vehicles. It can thus interact with the sensors of an autonomous car and put that car through its paces without its needing to go on the road.

The car to be tested sits in the middle of the simulator, which projects a 360° high-definition image of the vehicle's virtual surroundings, constructed from digital maps of 48km (30 miles) of roads in and around the nearby city of Coventry, together with adjacent buildings and scenery. The simulator comes complete with virtual traffic, cyclists, pedestrians and even dogs scampering into the road—all of which its operators can control. It also features surround-sound and actuators that move the vehicle as it would when accelerating, braking or cornering. Even the thump of a virtual

pothole can be created.

Some car sensors will interact directly with the projected image. Camera-based systems on many vehicles typically use a form of artificial intelligence, called machine vision, to analyse the shapes of objects. But this can go wrong, says Paul Jennings, head of experimental engineering at Warwick, such as when cameras succumb to a condition known as “washout” caused by the glare of bright sunrises and sunsets. Unlike the real world, hundreds of sunrises and sunsets can be created in the simulator every day. This will speed up the development of antiglare systems. Other visible hazards that might be hard for self-driving cars to manage—streets crowded with pedestrians, cars jumping red lights, joggers suddenly running into the road—can also be created endlessly in a simulator without endangering anyone.

Cameras are not, though, the only sensors fitted to autonomous vehicles. They also have devices that can detect how far away objects are. These may use ultrasound, radar or lidar (a system like radar but which substitutes laser light for radio waves). The researchers at Warwick can bypass these sensors and feed in simulated signals from the computer model. But they are also working on ways to test the sensors directly. One possibility is to generate radar or ultrasonic signals and send them to the test vehicle as if they had been reflected from cars and other objects in the projected scene.

Besides testing a car’s hardware and software, Dr Jennings’s simulator will also test its “wetware”—ie, the humans who are being transported—for he plans to invite members of the public to become drivers and passengers. His idea is to use gaze-monitoring and cameras inside the vehicles to find out how they respond to certain situations. In particular, he and his colleagues hope to see how quickly they realise that something might be going wrong and understand that they should therefore take back control of the car. This is important, for there is ample evidence that some people put

too much trust in machines. For example, drivers have been known to follow instructions from satellite-navigation devices slavishly, even when the result is that they end up hundreds of kilometres from their intended destinations.

| *Hacked to death?*

Autonomous vehicles also rely on navigation signals from satellites, though, and on other wireless transmissions as well. In the future, such connectivity will increase. Autonomous vehicles will probably communicate both with each other and with bits of transport infrastructure, such as traffic lights. The integrity of the signals involved will be paramount. So for safety's sake, Dr Jennings's machine can simulate what happens when contact is degraded or shut off—for example, when a vehicle enters a tunnel or a city canyon of tall buildings. A giant Faraday cage, formed from a mesh of materials that block electrical signals, surrounds the simulator. This both insulates it from outside interference and enables the signals that are required inside it to be created and controlled accurately, and terminated at will.

On top of this testing of accidental interference with a car's wireless traffic, the team will also try to hack deliberately into vehicles—something that it would be illegal as well as irresponsible to attempt on public roads. Such tests, nevertheless, need to be done. Carsten Maple, a cyber-security expert at Warwick, reckons criminals are only about five years away from being able to disable a car's ignition remotely, holding it to ransom until the owner has made a payment. Indeed, in 2015 Fiat Chrysler recalled 1.4m vehicles in America after security researchers showed it was possible to take control of a Jeep Cherokee via its internet-connected entertainment system.

Despite the potential problems, though, Dr Jennings and his team are convinced that genuinely driverless vehicles have a big future. At first this

future could be in controlled and specially designated areas, such as city centres. One vehicle that will be tested in the simulator has been designed with just such a purpose in mind. It is an electrically powered passenger-carrying pod produced by RDM, a firm in Coventry. The pods are already being tested in pedestrianised areas of Milton Keynes, a modernist British city. RDM says they are also intended for use in places such as airports, shopping centres, university campuses and theme parks.

On the open road, however, it may take longer before steering wheels become obsolete. Even after extensive testing in simulators, the performance of autonomous systems will still need to be verified in the real world. And no self-driving system will ever be completely foolproof. As the Florida crash showed, accidents will still happen—although, mercifully, there may be fewer of them. ■



自动驾驶汽车

在虚拟世界行车

对自动驾驶汽车进行模拟测试会让它们在真正上路时更安全

美国国家高速公路安全管理局（NHTSA）正在调查特斯拉Model S电动汽车于五月发生的一起致命交通事故。这类事故对死者的亲朋好友来说固然是个惨剧，但通常情况下并不会引起如此高层次的质询。然而上述事故中的涉事汽车当时正处于“自动驾驶”模式——加州的电动汽车制造商特斯拉将其命名为Autopilot。在这种模式下，通过传感器和计算机，汽车可以为驾驶者分担大部分驾车工作。特斯拉称，无论是Model S的驾驶员还是车辆自身的传感器都没有发现前方正在横穿公路的集装箱货车。汽车因而没有刹车，猛冲进了拖车底部。车顶被掀掉，致使驾驶员丧生。

特斯拉指出，在这起发生于佛罗里达的车祸中，涂刷成白色的卡车映衬在明亮的天空中。因而有一种可能是，与前向雷达协同工作的车载摄像头误认为拖车是高架标志，其下方有空间可以通过。还有一些报道表示驾车者当时可能正在观看视频。但无论NHTSA认定原因为何，这起车祸说清楚了一件事，那就是自动驾驶汽车要投入日常使用还有很长的路要走。

特斯拉也承认这一点。它称Autopilot只是一项“辅助”功能，目的是为了分担一部分驾驶工作。在工作时，这一系统会提示驾驶者：“双手始终握住方向盘。随时准备重新操控汽车。”Autopilot会定期检查方向盘上的压力，以确认驾车者没有放手。如果未能检测到压力，系统会降低车速。然而在社交媒体上发布的大量视频里，驾驶人并没有接触方向盘，而是完全依赖车辆的自动驾驶功能行进。其中一段视频甚至是驾驶人在汽车后座上拍摄的。

| 虚拟驾驶的优点

对于特斯拉和其他开发自动驾驶汽车的公司（从谷歌和优步这样信息技术公司到传统汽车企业）而言，现在投入使用的这些系统更像是智能巡航控制而非机器人司机。但它们所提供的功能，如车道保持、自动刹车、与前

车保持安全距离和超车，都是实现完全自动驾驶的必要步骤。自动驾驶汽车的支持者认为它们会比人类操纵的汽车更安全，毕竟大多数交通事故都是由人为失误造成的。

然而要达到那样的完满状态，还需要进行很多实际的开发工作。在开放道路上进行这些工作可获得最真实的数据，但正如发生在佛罗里达的事故所示，这也会是一件危险的事情。英国华威大学（University of Warwick）的一台新设备提供了另一种解决方法。这是一台驾驶模拟器，专为测试“智能”汽车而设计。它可以与自动驾驶汽车的传感器互动以检验其性能，而车辆本身无需上路。

待测试汽车停在模拟器中央，模拟器根据附近考文垂市内及周边48公里（30英里）道路的数字地图构建出汽车所处的虚拟环境，连同毗邻的建筑和景观一起形成360°的高清影像并投射出来。模拟器还能建立虚拟车流、自行车、行人，甚至还有蹦跳着跑到路上的小狗，操作人员可以控制所有这些元素。它还有环绕立体声和致动器，后者可让汽车像实际加速、刹车或转弯时那样运动。模拟器甚至还能造出路面上的坑洼。

一些汽车传感器能直接和投射影像互动。很多车辆上基于摄像头的识别系统通常使用一种名为“机器视觉”的人工智能来分析所见物体的形状。但华威大学实验工程负责人保罗·詹宁斯（Paul Jennings）说，这种方法有可能出错，例如在日出和日落时耀眼的阳光会形成“眩目”的情况，致使摄像头失效。模拟器和真实世界不同，它每天都可创造出数百次日出和日落。这会加速防眩光系统的开发。模拟器还可以不停地产生自动驾驶汽车可能难以处理的其他可见危险，比如满是行人的街道、闯红灯的汽车、突然进入道路中央的慢跑者，而这一切不会危及任何人。

然而摄像头并不是自动驾驶汽车所配备的唯一一种传感器。它们还装有探测物体远近的装置。这些装置可能利用超声波、雷达或激光雷达（类似雷达，但用激光替代雷达波）。华威大学的研究人员可以绕开这些传感器、直接向车辆输入计算机模型产生的模拟信号。但他们也在开发直接测试这些传感器的方法。一种可能的方法是产生雷达或者超声波信号并对测试车

辆发射，就好像是由投射场景中的车辆和其他物体反射的信号一样。

詹宁斯博士的模拟器不仅会测试车辆的硬件和软件，还将测试它的“湿件”（wetware），即车中的乘员——他计划邀请公众作为驾驶员和乘客。他的想法是利用视线监控和车内摄像头来探明人们对特定情况的反应如何。他和同事们特别希望能知道人们能多快意识到情况不对并知道自己应该重新操控汽车。这点很重要，因为有充分证据表明一些人太过于信任机器了。一个人们熟知的例子是驾驶员会盲从卫星导航设备的指示，即使最终被导航到预定目的地数百公里之外时也依然如此。

| 被黑致死？

然而自动驾驶汽车也依赖卫星导航信号以及其他无线传输，未来这样的连接还将更多。无人驾驶汽车可能会相互通讯，还会和一些像交通灯这样的交通基础设施通讯。这些信号的完整性将至关重要。为安全起见，詹宁斯的设备会模拟通讯状况不佳或中断时的情况，例如车辆驶入隧道或两侧高楼林立的城市街道。由能够阻断电信号的材料制成的网格构成了一个巨大的法拉第笼，包围住模拟器。这让模拟器免于外界干扰，同时还可精确地产生和控制其中需要的信号，并随时中止。

除测试对车辆无线传输的意外干扰之外，研究团队还试图有意入侵这些汽车——在公共道路上这样做既不合法也不负责任。然而这些测试总归是要进行的。华威大学的网络安全专家卡斯滕·梅普尔（Carsten Maple）估计，大概只需五年，犯罪分子就能远程让汽车点火装置失效，以此劫持汽车直至车主付出赎金。实际上在2015年，菲亚特克莱斯勒就在美国召回了140万辆汽车，因为之前安全研究人员表示有可能通过车载联网娱乐系统控制一辆Jeep切诺基。

尽管存在种种潜在问题，詹宁斯和他的团队仍然确信真正的自动驾驶汽车有着光明的前景。未来其应用也许会先出现在受控和指定的区域，如市中心。一辆将在模拟器中进行测试的汽车就是专为这一目的而设计的。这是一辆由考文垂的RDM公司生产的电动载人豆荚车。这种车辆已经在英国的现代主义城市米尔顿凯恩斯（Milton Keynes）的步行区测试。RDM表示

豆荚车还可用于机场、购物中心、大学校园和主题公园等场所。

然而要在开放道路上让方向盘变得过时，也许还有更长的路要走。即使在模拟器中进行了大量测试，自动驾驶系统的性能还是需要在现实世界里验证。没有什么自动驾驶系统能永远不出丝毫纰漏。正如佛罗里达的车祸所示，事故仍可能会发生，但值得庆幸的是，也许会发生得少些。■



Australia's economy

Good on you

Australia has weathered the China slowdown and commodities slump well. What has it done right?

THE last time Australia was in recession, Mikhail Gorbachev led the Soviet Union and Donald Trump had filed for Chapter 11 only once. Barring unforeseen catastrophe, late next year Australia will pass the Netherlands' modern record of 26 years of consecutive growth—despite the slowdown of its biggest trading partner, China. Unlike most of the rich world, it sailed through the global financial crisis, and unlike most commodity exporters, it has weathered the raw-materials price slump. Its GDP growth rate of 3.1% dwarfs that of America and the euro zone.

Australia is often called “the lucky country”, and luck, particularly in geology and geography, has played a part in its success. But it has deftly played both sides of the China boom: the surging demand for raw-material imports while that lasted; more recently, the desire of the Chinese middle-class to eat well, travel and educate their children in English. Yet every silver lining has a cloud. Not only does Australia have one of the most expensive housing markets in the world, it remains overexposed to the fortunes of China.

The story of Australia's success starts with what its government did not do: spend beyond its means. Tight budgets in the late 1990s and early 2000s, combined with improving terms of trade, meant that when the financial crisis hit, the government was running budget surpluses (though the country as a whole has a long-running current-account deficit). It could thus afford stimulus packages in late 2008 and early 2009 worth more than A\$56.6 billion (\$42.8 billion). Only China provided greater stimulus as a share of GDP.

Australia was then in the middle of the biggest mining boom in its history, stemming from increased demand in China. In the decade to 2012, the value of its mined exports tripled; mining investment rose from 2% of GDP to 8%. From January 2003 to February 2011 the price of iron ore, which these days comprises 17% of Australia's exports by value, rose from \$13.8 to \$187.2 a tonne. Australian thermal coal, which accounts for 12% of its exports, rose from \$26.7 to \$141.9 (down from a peak in 2008 of \$192.9).

The Reserve Bank of Australia (RBA) estimates that, during that period, mining raised real disposable household income by 13% and wages by 6%, boosting domestic purchasing power. Saul Eslake, an independent economist, argues that "except for the Chinese people, no country derived more benefit from the growth and industrialisation of China" than Australia. The value of the Australian dollar also rose, which dented non-mining exports. But since demand from Asia kept prices high for Australia's agricultural commodities (such as beef and wheat), and because it exports relatively few manufactured goods, the damage was contained.

As China rebalanced and commodity prices tumbled, other exporters such as Russia, South Africa and Brazil fell into recession. In Australia, although business investment has fallen sharply, GDP growth remains near its 25-year average of 3% (and as a side benefit, the commodity-price fall quelled rising inflation).

For that, thank two factors. First, the rise in mining investment during the fat years led to increased production. Commodity exports have continued to grow (albeit modestly and less profitably). Though prices of iron ore and coal are well below the past decade's peaks, they remain above pre-boom levels.

More important, Australia let the dollar depreciate, which made its exports more appealing. Today Australia benefits from a growing number of

Chinese consumers, who buy Australian food products that are widely seen as safer than their home-grown equivalents.

Middle-class Asian students have been flocking for English-language education to Australian universities, which are closer and cheaper than their American and British counterparts. Between June 2015 and June 2016 the number of international students enrolled in Australian colleges and universities rose by 11%, and the number of international visitors rose by 13.7%. Today education and tourism together account for 14% of Australia's export value. Graduates are eligible to work for up to four years, and some stay longer, giving Australia a relatively young, well-educated, multicultural workforce.

Those workers will need places to live, which has helped increase house construction. According to Paul Bloxham, the chief Australia and New Zealand economist at HSBC, Australian builders completed almost 200,000 new dwellings last year, and will probably do the same this year and next. Construction has absorbed some of the employment losses as mining investment has waned (building a mine requires more people than running one).

Yet that has failed to stop an alarming rise in house prices, particularly on Australia's east coast. In 2015 the median house price in Sydney was 12.2 times the median income, up from 9.8 in 2014. Melbourne's multiple rose from 8.7 to 9.7 in that period. Some argue that house prices have peaked, and that as residential construction continues prices will moderate (except perhaps in central Sydney). But if prices collapse, that could not just harm Australia's otherwise healthy banks, but also dampen domestic consumption for years.

Some argue that government debt, which has hit a record 36.8% of GDP, up from a low of 9.7% in 2007, is another worry, because it provides less policy

room to deal with the next crisis. It remains lower than in most developed countries. But given the risks of a housing bust or deeper slowdown in China, such worries reflect a healthy lack of complacency. After all, one day the luck will run out. ■



澳大利亚经济

看好你

澳大利亚安然度过了中国经济放缓和大宗商品暴跌。它是如何做到的？

上一次澳大利亚经济衰退时，戈尔巴乔夫还在苏联执政，特朗普还只申请过一次破产保护。除非遇到不可预料的灾难，明年年底澳大利亚将打破荷兰经济26年持续增长的现代记录，尽管其最大的贸易伙伴中国经济发展趋缓。与大部分富裕国家不同，澳大利亚安然度过了全球金融危机。也与大部分大宗商品出口国不同，它经受住了原材料价格下跌的考验。它的GDP增长率为3.1%，令美国和欧元区相形见绌。

澳大利亚常被称作“幸运之国”。运气，尤其是地质和地理方面的运气，在其成功的道路上起到了一定的作用。不过它的确在中国的蓬勃发展中左右逢源：一方面是中国经济快速发展时对原材料进口需求的飙升；另一方面是近来中国中产阶级对更好的食品、出国观光以及让子女接受英语教育的渴望。然而光明背后总有乌云。澳大利亚不但拥有世界上最贵的住宅市场之一，也一直过于受到中国财富的影响。

澳大利亚的成功始于其政府的有所不为：不会寅吃卯粮。20世纪90年代末到21世纪初的预算紧缩，加上贸易条件的不断改善，意味着当金融危机来袭时，政府还有预算盈余（尽管整个国家长期存在经常账户赤字）。因此澳大利亚能够负担得起2008年末至2009年初总额超过566亿澳元（428亿美元）的经济刺激计划。如果按刺激计划占GDP比例来算，只有中国给出了更大幅度的刺激。

之后因为中国需求的增加，澳大利亚的矿业进入其历史上最繁荣的时期。在截至2012年的十年间，它的矿产品出口额增至原来的三倍：矿业投资从GDP的2%增至8%。从2003年1月到2011年2月，铁矿石的价格从每吨13.8美元涨至187.2美元，目前占澳大利亚出口额的17%。占澳大利亚出口额12%的热煤，价格则从26.7美元增至141.9美元（比2008年的峰值192.9美元有所下降）。

澳大利亚储备银行（RBA）估算，这一时期矿业将家庭实际可支配收入提高了13%，工资提高了6%，从而提升了国内购买力。独立经济学家索罗·埃斯雷克（Saul Eslake）认为，“除了中国人民，没有哪个国家（比澳大利亚）从中国的发展和工业化中获利更多。”澳元也升值了，这削弱了非矿产品的出口。但是因为亚洲的高需求令澳大利亚农产品（如牛肉和小麦）的价格始终高企，加上澳大利亚出口的制成品相对很少，所以损害有限。

随着中国经济再平衡、大宗商品价格暴跌，俄罗斯、南非和巴西等出口国陷入衰退。在澳大利亚，尽管商业投资大幅下降，GDP增长仍保持在近3%，即其25年来的平均水平（而且有附带的好处：大宗商品价格下跌抵消了通货膨胀的上扬）。

这多亏了两个因素。第一，繁荣时期在矿业投资上的增长带来了产量增加。大宗商品出口持续增长（尽管幅度不大且利润更低）。虽然铁矿石和煤的价格均远低于过去十年里的峰值，但仍高于繁荣期之前的水平。

更重要的是，澳大利亚让澳元贬值，这让它的出口更具吸引力。今天的澳大利亚正从越来越多的中国消费者处获益，他们普遍认为澳大利亚的食品比本国出产的同类产品更安全，因而纷纷购买。

亚洲中产阶级家庭的学生大批涌向澳大利亚的大学接受英语教育，它们比美国和英国的大学更近，费用也更低。2015年6月到2016年6月期间，澳大利亚高等院校招收的国际学生数量增长了11%，国际游客的数量增长了13.7%。现在教育业和旅游业共占澳大利亚出口额的14%。澳大利亚允许外国毕业生最多留澳工作四年，有些人则会待得更久。这为该国带来了相对年轻、受过良好教育且文化多元的劳动力。

这些劳动力对住房的需求帮助促进了住宅的建设。汇丰银行澳新首席经济学家保罗·布洛克斯汉姆（Paul Bloxham）称澳大利亚建筑商去年建造了近20万套新住房，今年和明年可能也有相同的业绩。建筑业还吸收了部分因矿业投资衰退而失业的工人（建设一个矿山比运营一个矿山所需的人员更多）。

但这却未能阻挡房价以惊人的速度增长，尤其是在澳大利亚东海岸。2015年悉尼的房价中位数是收入中位数的12.2倍，而在2014年还是9.8倍。同一时期在墨尔本则由8.7倍增至9.7倍。有些人认为房价已经到达峰值，随着住宅建设不断增多，价格将逐渐和缓（悉尼中央区可能除外）。但如果房价暴跌，不仅可能会损害澳大利亚原本健康的银行，还会长年抑制国内消费。

另一个引人担忧的问题是政府债务，因为它会缩小应对下一次危机时的政策空间。2007年政府债务占GDP的比例低至9.7%，现已升至创纪录的36.8%。这一债务水平仍低于大部分发达国家，但是考虑到房地产市场崩盘或中国经济进一步减速的风险，有这样的担忧表明澳大利亚并未自鸣得意。毕竟好运气总有一天会用完的。■



Bad loans to shipping

That sinking feeling

Banks continue to count the cost of shipping's troubles

TOO many ships, too little trade. On August 31st Hanjin Shipping, South Korea's biggest container carrier and the seventh-largest in the world, filed for receivership, after five years of losses and another deficit in the first half of 2016. Hanjin was holed by shipping's prolonged global slump, the product of vast overcapacity and slow trade growth. Its creditors, led by state-owned Korea Development Bank (KDB), have had enough.

Shipping's malaise is both broad and deep. An earnings index compiled by Clarksons, a research firm, covering the main types of vessel—bulk carriers, container ships, tankers and gas transporters—reached a 25-year low in mid-August. The average for the first half of 2016 was 30% down, year on year, and 80% below the peak of December 2007. Stephen Gordon of Clarksons adds that new orders at shipyards are the lowest in 30 years.

As KDB's loss of patience shows, the industry's troubles hurt lenders as well as shippers. According to Petrofin, another research group, Asian banks have expanded their shipping loans in recent years. With China's economy slowing and world trade in the doldrums, they may soon regret that. For their part, European banks have already been tossed this way and that since the financial crisis of 2007-08. Some, notably *Landesbanken*—public-sector, regional wholesale banks—in northern Germany, are still counting the cost.

German banks, traditionally strong in shipping, were eager lenders before the crisis, happily putting up 70% of a vessel's cost—and even the rest, before borrowers raised the equity. Then the storm broke: Petrofin calculates that between 2010 and 2015 leading German lenders slashed

their shipping books from \$154 billion to \$91 billion. In 2012 Commerzbank, the country's second-largest lender, decided to quit altogether. Its portfolio has since dwindled from €19 billion (\$24 billion) to €8 billion.

On August 31st Bremer Landesbank, from the city-state of Bremen, announced loan-loss provisions, mainly for shipping, of €449m—over one-fifth of its equity at the end of 2015—and reported a first-half loss of €384m. At €6.5 billion, its shipping portfolio is around 30% of its loan book. Bremer LB will not be allowed to sink. NORD/LB, its neighbour, which already owns 54.8%, is taking it over fully. The deal values the state government's 41.2% stake at €262m—far below its worth when Bremen boosted its holding in 2012.

NORD/LB itself is far from shipshape. It recently reported a first-half loss of €406m, thanks to further loss provisions on marine loans. It plans to cut its shipping book, €19 billion at the end of 2015, to €12 billion-14 billion. Last month it agreed to sell \$1.5 billion of loans to KKR, a private-equity firm, and an unnamed sovereign-wealth fund. A third lender, HSH Nordbank, is seaworthy largely thanks to guarantees, covering €10 billion of loans, from the states of Hamburg and Schleswig-Holstein. The guarantees were cut to €7 billion in 2011, but increased in 2013 when that proved premature. In May the European Commission approved the reinstated aid, provided that the bank's core operations were sold. This is due by 2018.

Some are confident of steering through choppy waters. Besides KKR, Berenberg, a Hamburg bank, is talking to institutional investors about buying (well-performing) loans. Not everyone is seasick. ■



航运业的不良贷款

濒临沉没的感觉

银行继续因航运业萧条而亏损

船只太多，贸易太少。8月31日，经过五年的亏损，加之2016年上半年再现赤字，韩国最大、世界第七大集装箱航运公司韩进海运（Hanjin Shipping）申请破产保护。韩进深陷全球航运长期萧条的泥沼，造成这种不景气的原因是运力严重过剩而贸易增长缓慢。以国有的韩国产业银行（KDB）为首的韩进债权人已经忍无可忍。

航运业的弊病根深面广。研究公司克拉克森（Clarksons）编制的收入指数涵盖散装货船、集装箱船、油轮和燃气运输船在内的所有主要船型，该指数在今年八月中已经创下25年的新低。2016年上半年平均水平同比下降30%，比2007年12月的峰值暴跌了80%。克拉克森的史蒂夫·戈登（Stephen Gordon）补充道，船厂新订单量目前也处于30年来的最低水平。

韩国产业银行对韩进失去耐心表明，航运业的困境让银行同航运公司一样深受其害。另一家研究公司Petrofin的研究显示，亚洲各银行近年来加大了对航运业的贷款力度。但中国经济的放缓和全球贸易的萧条可能很快就会让那些银行悔不当初。而欧洲各银行自2007至2008年金融危机之后就已经处于风雨飘摇之中。一些银行，特别是德国北部的州立银行（国有区域性批发银行），仍在亏损。

德国银行的航运业贷款业务历来强劲。在金融危机之前，它们积极为航运业提供贷款，在借款人提高股权融资比例之前，非常乐于为建造一艘货轮所需成本的70%、甚至全部提供贷款。然后，暴风雨袭来：Petrofin的计算结果显示在2010至2015年间，大型德国银行的航运业贷款从1540亿美元大幅缩减至910亿美元。2012年，德国第二大银行德国商业银行（Commerzbank）决定完全退出航运业贷款业务。自此，该银行的航运业贷款组合已从190亿欧元（240亿美元）减少至80亿欧元。

8月31日，德国不莱梅州的不莱梅州立银行（Bremer Landesbank）宣布提取4.49亿欧元的贷款损失准备金，占其2015年年末总资本的五分之一，主要针对航运业贷款；同时还宣布该行上半年亏损高达3.84亿欧元。该行航运业贷款组合达65亿欧元，占其贷款总额的30%左右。不莱梅州立银行不会就此轰然倒下。邻州的北德意志州立银行（NORD/LB）在已经拥有其54.8%的股份后，将要全面接管不莱梅州立银行。这一交易将州政府所持41.2%的股份估值为2.62亿欧元，远远低于2012年不莱梅州提高持股比例时的价值。

北德意志州立银行自身也绝非顺风顺水。该银行最近公布，由于需要对航运贷款进一步提取贷款损失准备金，其上半年亏损4.06亿欧元。该银行计划减少航运贷款，从2015年底的190亿欧元减少到120至140亿欧元。上个月该银行同意将其15亿美元的贷款出售给私募股权公司KKR和一家未提及名字的主权财富基金。另一银行德国北方银行（HSH Nordbank）经受住了航运风暴的考验，这主要是得益于汉堡州和石勒苏益格-荷尔斯泰因州（Schleswig-Holstein）对其100亿欧元贷款所提供的担保。这一担保额在2011年削减至70亿欧元，但2013年由于认为削减时机不成熟又予以增加。今年五月，欧盟委员会批准对其恢复援助，前提条件是北方银行售出其核心业务，并于2018年之前完成。

有些机构则有信心能冲过眼前的惊涛骇浪。除了KKR之外，汉堡的贝伦贝格银行（Berenberg）正在与机构投资者商谈收购（优良）贷款。看来并非人人都在晕船。 ■



Self-driving lorries

A long haul

A revolution in the trucking industry is a distance down the road

“DUEL”, one of Steven Spielberg’s early films, features a lorry apparently controlled by demonic forces rather than a driver. The sensors, cameras and software already steering the wheels of some of the world’s lorries, in place of drivers, are regarded as a similarly malign power by truckers fearing replacement by technology. But they have little reason to worry about the arrival of self-driving lorries, and the benefits of safer roads and cheaper shipping should be felt more widely than any pain from job losses for years to come.

It has so far been carmakers and tech firms that have hogged the headlines in the race to develop autonomous vehicles. Ford announced on August 16th that it intends to have a car devoid of pedals and steering wheel on the road by 2021. But several firms have been working on driverless lorries. Rio Tinto, a commodities giant, has put them to work at one of its iron-ore mines in Australia, and Volvo will soon begin testing a self-driving truck at a mine in Sweden. Mercedes-Benz, Iveco and most other lorrymakers have plans for autonomous vehicles, and a big beast of tech is also set to make a move on the kings of the road. As *The Economist* went to press, Uber, a ride-hailing firm, was expected to announce it had acquired Otto, an American startup that is developing self-driving kit to retrofit to any lorry.

Lorries have kept pace with cars in the race to commercialise self-driving vehicles for two reasons. As Lior Ron, a co-founder of Otto, points out, lorries offer businesses a clear return on investment through cost savings from greater efficiency. Self-driving cars, robotaxis aside, on the other hand, will be a discretionary purchase by consumers, aimed at making journeys more pleasurable.

But hauliers interested in autonomous systems will need to factor in that the existing technology does still require a driver (as, often, do regulations). Most autonomous systems are being designed for motorways, for manoeuvres such as accelerating and braking. A human will drive the lorry on smaller roads leading to and from main road arteries and would need to take the wheel in an emergency. There will still be benefits. Self-driving lorries may attract new drivers to a hard job. Vehicles could be driven for longer hours, and with optimised software should consume less fuel than they do under the sole guidance of leaden-footed truckers. Safety could also improve.

It is also easier to devise autonomous systems for lorries than for cars that have to negotiate all types of road. Driving on motorways is much easier to automate than city travel, as everyone is going in the same direction at high but regular speeds. There's no need to worry about pedestrians, and blind spots that come with a city's sharp corners.

The main roadblock is likely to be that trucking in rich countries is an old-fashioned business, dominated by small firms. Persuading these hauliers to adopt and pay for new technology will be tough. Otto reckons its kit, which still needs a human in the cab, should be available by around 2020 at a cost of \$30,000. As Stephan Keese of Roland Berger, a consulting firm, points out, the big cost savings will come only when higher levels of automation allow hauliers to get rid of drivers completely. That is still a long way off. Most observers reckon the technology for fully autonomous cars or lorries will not be ready before 2030, and will then take years to become commonplace. Unlike the truck in "Duel", driverless lorries are unlikely to run the conventional business models of hauliers off the road for some time. ■



无人驾驶卡车 路途漫长

一场运输业的革命尚需时日

史蒂芬·斯皮尔伯格（Steven Spielberg）早期电影《决斗》的主角是一辆卡车，控制它的显然不是司机而是一股邪恶力量。如今，传感器、摄像头和软件已经代替司机控制了全球一部分卡车的方向盘，担心被技术取代的卡车司机因而将它们视为类似的邪恶力量。但是，司机们无需为无人驾驶货车的到来而担忧。在未来的几年里，人们会愈加广泛地感受到更安全的道路和更便宜的运输所带来的益处，而不是失业所造成的痛苦。

到目前为止，在开发自动驾驶汽车的角逐中，霸占头条的一直是汽车制造商和科技公司。8月16日，福特汽车宣布将在2021年前推出一款没有踏板和方向盘的小汽车。但是，有几家企业一直致力于无人驾驶卡车的开发。大宗商品巨头力拓（Rio Tinto）已在其澳大利亚的一个铁矿场中使用无人驾驶卡车，沃尔沃也即将在瑞典的一个矿场测试一款无人驾驶卡车。奔驰、依维柯以及大多数其他卡车制造商都有开发自动驾驶车辆的计划，一家大型科技公司也将对卡车这一公路之王有所行动。本刊付梓之时，召车公司优步（Uber）预计会宣布已经收购美国创业公司奥托（Otto），后者正在开发能够改装货车的成套自动驾驶技术。

在无人驾驶技术商业化方面，卡车始终与乘用车保持步调一致有两个原因。奥托的联合创始人利奥尔·罗恩（Lior Ron）指出，通过提高效率来节省成本，卡车通常能为企业带来明确的投资回报。另一方面，除了机器人出租车，无人驾驶乘用车由消费者自主购买，目的是让旅途更愉快。

但是，对自动驾驶系统感兴趣的运输公司需考虑到，现有技术仍然需要有司机（正如法规也往往有这样的要求）。大多数自动驾驶系统都是为在高速公路上行驶而设计，控制加速和刹车等操控动作。如要通过小路来进出主干道，以及在紧急情况下控制方向盘，仍需要司机来驾驶卡车。即便如此，无人驾驶还是会有益处。无人驾驶卡车可能会吸引新司机加入这一辛

苦行当。无人驾驶车辆可以行驶更长时间，而且，相比只受行动笨拙的卡车司机控制，有了经过优化的软件，车辆油耗会更少，安全性也能提升。

与必须穿越各类道路的乘用车相比，为卡车设计自动驾驶系统也更为容易。在高速公路上要远比在城市内行驶更容易实现自动化，因为大家都以较高却也很均匀的速度同向行驶，而不必担心行人以及沿城市街角急转弯时所形成的盲点。

主要的障碍可能在于发达国家的卡车运输业由小企业主导，传统守旧。要说服这些运输公司花钱采用新技术很困难。奥托认为自己这套技术和应用（仍需要有人坐在驾驶室）应该会在2020年左右研制出来，成本为3万美元。咨询公司罗兰贝格（Roland Berger）的斯蒂芬·吉斯（Stephan Keese）指出，只有在自动化达到更高水平、能让运输公司完全不需要司机之时，大量成本节省才会实现。但这仍然很遥远。大多数观察者认为，完全自动驾驶乘用车或卡车的技术在2030年之前不会成熟，而普及还需要再多几年。与《决斗》中的卡车不同，一段时间内，无人驾驶卡车不大可能会挤占运输公司的传统商业模式。 ■



An update on AIDS

HIV's slow retrenchment

The battle against the human immunodeficiency virus continues

THE latest dispatch from the war on HIV, the “Global AIDS Update 2016”, just published by UNAIDS, the UN agency responsible for combating the virus, brings qualified good news. Last year, it estimates, there were 1.1m AIDS-related deaths, down from a peak of 2m in 2005 and a figure of 1.2m in 2014. Last year also saw 2.1m new infections, down from a peak of 3.4m in 1998 but up from 2014’s estimate of 2.0m.

By the end of 2015 some 17m people were taking anti-retroviral (ARV) drugs—2m more than the target number for that year, set by the UN in 2011. This accounts for the falling death rate. Some hoped the drug roll-out might also lead to an increased fall-off in the rate of new infections. That hope was based on the idea, experimentally demonstrated at small scale among cohabiting couples, that taking ARVs makes an infected individual less likely to pass the virus on. There is, though, no sign of such an acceleration in the downward trend of new infections. This year’s uptick aside, it has remained fairly steady since the turn of the century, despite the fraction of infected people on ARVs having risen from 3% in 2000 to 46% in 2015.

The next UN target is that, by 2020, 90% of those infected should have been diagnosed and know their status, 90% of those so diagnosed should be on ARVs, and 90% of those on ARVs should have suppressed viral loads. That is ambitious, but history suggests those in the field will rise to the challenge. ■



艾滋病防治新进展

HIV：“威力”缓慢减弱

对抗人类免疫缺陷病毒的战斗仍在继续

联合国艾滋病规划署（UNAIDS）——联合国负责对抗艾滋病的机构，近期发布了《全球艾滋病状况报告》。这份最新的战报带来了些好消息，但也很有限。报告估计，去年艾滋病相关死亡有110万例，低于2005年200万的峰值，也少于2014年的120万例。去年新增感染人数为210万人，少于1998年高峰期的340万，但多于2014年200万的估计数字。

到2015年底，约有1700万人使用抗逆转录病毒（ARV）药物，比联合国在2011年为该年设定的目标多出200万人。这解释了死亡率的下降。一些人曾希望随着这种药物的推广，新增感染者的出现速度会进一步下降。他们的愿望是基于一个猜测，即服用ARV药物可减少感染者将病毒传染给他人的可能。这个猜测已在同居伴侣间的小范围实验中得以证实，但并没有迹象表明新增感染者的数量有加速下降的趋势。抛开今年的上升数字不谈，自新世纪以来，新增感染者的速度一直较为稳定，尽管感染者中服用ARV药物的比例已从2000年的3%上升到2015年的46%。

联合国的下一个目标是，到2020年，让90%的感染者能够被确诊并知晓自己的状况，其中90%的确诊患者能接受ARV治疗，而90%接受ARV治疗者的病毒载量能得到控制。这个目标很宏伟，但历史表明，在这一领域奋战的人们会迎接这个挑战。 ■



The state of the world

Better and better

Human life has improved in many ways, both recently, according to a Swedish economic historian, and in the 19th century

HUMANS are a gloomy species. Some 71% of Britons think the world is getting worse; only 5% think it is improving. Asked whether global poverty had fallen by half, doubled or remained the same in the past 20 years, only 5% of Americans answered correctly that it had fallen by half. This is not simple ignorance, observes Johan Norberg, a Swedish economic historian and the author of a new book called “Progress”. By guessing randomly, a chimpanzee would pick the right answer (out of three choices) far more often.

People are predisposed to think that things are worse than they are, and they overestimate the likelihood of calamity. This is because they rely not on data, but on how easy it is to recall an example. And bad things are more memorable. The media amplify this distortion. Famines, earthquakes and beheadings all make gripping headlines; “40m Planes Landed Safely Last Year” does not.

Pessimism has political consequences. Voters who think things were better in the past are more likely to demand that governments turn back the clock. A whopping 81% of Donald Trump’s supporters think life has grown worse in the past 50 years. Among Britons who voted to leave the European Union, 61% believe that most children will be worse off than their parents. Those who voted against Brexit tend to believe the opposite.

Mr Norberg unleashes a tornado of evidence that life is, in fact, getting better. He describes how his great-great-great-great grandfather survived the Swedish famines of 150 years ago. Sweden in those days was poorer

than Sub-Saharan Africa is today. “Why are some people poor?” is the wrong question, argues Mr Norberg. Poverty is the starting point for all societies. What is astonishing is how fast it has receded. In 1820, 94% of humanity subsisted on less than \$2 a day in modern money. That fell to 37% in 1990 and less than 10% in 2015.

Not only have people grown much more prosperous; they also enjoy better health than even rich folk did in the past. This is due partly to galloping progress in medical science. When the swine flu pandemic threatened to become catastrophic in 2009, scientists sequenced the genome of the virus within a day and were producing a vaccine in less than six months.

The spread of basic technology, allowing for clean water and indoor plumbing, may have helped even more. Louis XIV’s palace was the pinnacle of 18th-century grandeur. Nonetheless, without flush toilets, it stank. “The passageways, corridors and courtyards are filled with urine and faecal matter,” wrote a contemporary observer. Now 68% of the world’s population have modern sanitation—a luxury denied to the Sun King—up from 24% in 1980.

People are growing smarter too. Americans scored, on average, 100 points on IQ tests just after the second world war. By 2002, using the same test, this had risen to 118, with the biggest improvements in answers to the most abstract problems. This “Flynn Effect”, as it is known, is observed in all countries that have modernised. The most likely reasons are better nutrition and the spread of education—brains that are well-fed and well-stimulated tend to work better—and environmental improvements such as the removal of lead from petrol.

Mr Norberg agrees with Steven Pinker, a psychologist, that humankind is also experiencing a “moral Flynn Effect”. As people grow more adept at abstract thought, they find it easier to imagine themselves in other people’s

shoes. And there is plenty of evidence that society has grown more tolerant. As recently as 1964, even the American Civil Liberties Union agreed that homosexuals should be barred from government jobs. In 1987 only 48% of Americans approved of interracial dating; in 2012 that figure was 86% (and 95% of 18- to 29-year-olds). The caste system in India has eroded as individualistic values have spread: the proportion of upper-caste weddings with segregated seating fell from 75% to 13% between 1990 and 2008.

Despite the bloody headlines, the world is far safer than it used to be. The homicide rate in hunter-gatherer societies was about 500 times what it is in Europe today. Globally, wars are smaller and less frequent than they were a generation ago. The only type of violence that is growing more common is terrorism, and people wildly overestimate how much of it there is. The average European is ten times more likely to die by falling down stairs than to be killed by a terrorist. Evidence that the past was more brutal than the present can be gleaned not only from data but also from cultural clues. For example, children's nursery rhymes are 11 times more violent than television programmes aired before 9pm in Britain, one study found.

That life is improving for most people does not mean it is improving for everyone. Male blue-collar workers in rich countries have seen their earnings stagnate. Even if the statistics fail properly to capture the benefits they enjoy as consumers of new technology, the slippage in their status is real and painfully felt.

Global warming is a worry, too, but Mr Norberg hopes that human ingenuity will tame it. He writes with enthusiasm about all kinds of green innovation. For example, thanks to more efficient farming technology, the world may have reached "peak farmland". By the end of the century, an area twice the size of France will have been returned to nature, by one estimate.

This book is a blast of good sense. The main reason why things tend to get

better is that knowledge is cumulative and easily shared. As Mr Norberg puts it, “The most important resource is the human brain...which is pleasantly reproducible.” ■



世界状况

日趋向好

据一位瑞典经济历史学家所说，人类生活在多方面都获得改善，不论是在近年，还是在19世纪

人类是个悲观的物种。约71%的英国人认为世界正变得越来越糟，只有5%的人认为情况在改善。在回答过去20年里全球贫困人口是减少了一半、增加了一倍还是维持不变这个问题时，只有5%的美国人给出了减少了一半的正确答案。瑞典经济历史学家、新书《人类的进程》（Progress）的作者约翰·诺伯格（Johan Norberg）认为，不能简单将这看做是无知。即使一只黑猩猩全靠猜，从三个选择中选出正确答案的几率也要高得多。

人类倾向于把事情想得比实际情况更糟，并且会夸大发生灾难的可能性。这是因为他们做出判断时依靠的不是数据，而是很容易就能想到的一个例子。坏事更能令人印象深刻，而媒体也放大了这种扭曲的认识。饥荒、地震和斩首事件总是能成为引人眼球的头条新闻；而“去年全球有4000万架次飞机安全降落”这样的新闻并不会占据头条。

悲观主义会产生政治影响。认为过去更好的选民更有可能要求政府回归过去。唐纳德·特朗普的支持者中有高达81%的人认为在过去50年间生活变得更糟了。投票支持脱欧的英国人中，61%的人认为大多数孩子的境遇都会不如他们的父母，而投票反对脱欧的人则意见相反。

诺伯格给出了极为有力的证据，说明我们的生活确实是越来越好。他描述了他的曾曾曾曾祖父是如何在150年前瑞典的数次饥荒中存活下来的。那时的瑞典比现在的撒哈拉以南的非洲地区还要贫穷。诺伯格认为，“为什么有人会陷于贫困”是一个错误的问题。所有社会发展之初都存在贫困。令人惊讶的是脱贫的速度。1820年，以现代货币计算，94%的人每日维持生活的费用还不足两美元。这一比例在1990年下降至37%，到2015年则降至不到10%。

人们的生活不仅更加富足，健康状况也有明显改善，甚至好于过去的富人。原因之一是医学的飞速进步。2009年猪流感的流行眼看就要导致灾难，但科学家一天之内就完成了对这种病毒基因组的测序，并在不到六个月的时间内生产出了疫苗。

基础技术的传播让人们有了清洁的饮用水和室内管道系统，这些可能更进一步改善了人们的生活。路易十四的宫殿是18世纪辉煌建筑的顶峰之作，然而由于没有抽水马桶，难免臭气熏天。一位当时的观察家写道：“通道、走廊和庭院里到处都是尿尿。”现在，全球68%的人口都能享受到现代卫生设施，这可是“太阳王”路易十四无福消受的，而这一比例在1980年时只有24%。

人们也变得越来越聪明了。二战刚结束时，美国人平均智商为100分。到了2002年，同样的测试方法得出的分值上升到了118，提升最大的方面是对抽象问题的解答。这种被称为“弗林效应”（译注：Flynn Effect，指智商测试的结果逐年增加的现象）的现象在所有实现了现代化的国家都可以观察到。最可能的原因就是营养的改善和教育的普及——获得了良好的营养，受到了良好的刺激，大脑就有可能会更聪敏——以及环境的改善，比如石油除铅。

诺伯格认同心理学家史蒂文·平克（Steven Pinker）的观点，即人类同时也在经历着“道德弗林效应”。由于人们更加擅长抽象思维，他们更容易站在他人的角度思考问题。有充分的证据显示人类社会已变得越来越包容。就在1964年，连美国公民自由联盟（the American Civil Liberties Union）都认为应禁止同性恋者在政府工作。在1987年，只有48%的美国人赞同跨种族约会；到2012年这个数字则是86%（在18到29岁人群中为95%）。印度的种姓制度也随个人价值的传播而削弱：上层种姓婚礼上按种姓分座位的情况已经从1990的75%降至2008年的13%。

尽管各种血腥头条充斥媒体，我们的世界远比过去安全。在原始采猎社会，凶杀率大概是现在欧洲的500倍。全球范围内，较之上一代人所处的世界，战争的规模变小，频率也降低了。唯一变得更为频繁的暴力行为是

恐怖主义，而人们普遍过分夸大了恐怖主义蔓延的程度。平均来说，欧洲人从楼梯跌落致死的几率是遭受恐怖主义分子袭击致死的十倍。若要说明过去的生活比现在更野蛮，不仅可从数据中获得佐证，还能在文化上寻到蛛丝马迹。例如，一项研究显示，过去童谣的暴力程度是现在英国晚9点以前黄金时段电视节目的11倍。

大部分人的生活得到了改善不代表所有人的生活都更好了。富裕国家男性蓝领工人的收入一直裹足不前。他们作为消费者享受了新技术发展带来的福利，即使统计数据不能充分体现这一点，其社会地位的下降却是实实在在的，而且有切肤之痛。

全球变暖也引人担忧，但诺伯格希望人类的聪明才智遏制这一趋势。他充满激情地论及各种绿色创新。例如，更加高效的农耕技术让世界可能已经达到了“农田面积高峰”（译注：peak farmland，农田面积足以满足需求，不会再增加）。据估计，到本世纪末两倍于法国国土面积的农田将退耕，恢复自然状态。

这本书充满着理性判断。人类生活改善的主要原因在于知识可以累积，且容易分享。正像诺伯格所说，“人类的大脑才是最重要的资源.....好在大脑学到的知识是可以不断传承的。”■



Zalando

Fashion forward

One of Europe's most interesting technology companies sells shoes and threads

PAST the rolling hills, grazing ponies and sleepy villages of North Rhine-Westphalia, in west Germany, a convoy of trucks converges on Mönchengladbach. Here a hangar the size of 13 football fields encloses the logistics centre of Zalando, Europe's biggest online vendor of clothing and footwear. Inside, people pack boxes with shoes, jeans and handbags; and thousands of parcels progress at fairground speed up and down a 14km conveyor belt where they are weighed, labelled, scanned and sorted before tumbling down slides into trucks bound for 15 countries. Last year Zalando shipped 55m orders, over 100 per minute, from three such warehouses.

The firm's founders, David Schneider and Robert Gentz, started by selling flip-flops online from their Berlin flat in 2008. They found that Europe's market for shoes and clothing was fragmented, inefficient and offline. Soon, they were backed by Germany's Samwer brothers, whose habit of imitating American online businesses earned them a reputation as the copycat kings of Europe. They noted that whereas Zappos, a firm later bought by Amazon, an American online retailer, was selling shoes online in the United States, nobody was doing so in Europe.

Backed by the Samwers' firm, Rocket Internet, Zalando has grown into a giant. Spending on fashion in bricks-and-mortar outlets is stagnant in Europe, but online sales are increasing by around 15% a year in the countries where Zalando operates. Its sales—of €3 billion (\$3.3 billion) in 2015—are rising by around 30% a year (even after taking into account returns of items to the firm). When a series of Dutch shoe stores went bankrupt last year, many pointed to “the Zalando effect”, echoing the impact that Amazon has had on bookshops.

Selling fashion in lots of markets is not easy. Half of what Zalando sells (by value) comes back to it in the form of returns, because of problems with fit or style. It tolerates all manner of customer whims. They can order as much as they like and are allowed 100 days to send back items at no cost. In places where people aren't used to buying fashion online, such as Italy and Poland, they can pay the postman in cash. In towns and cities, the company is experimenting with collecting returns directly from customers' homes and offices. All this has yielded 18m shoppers a year (who buy at least one item). Workers may not be as well treated: two years ago conditions for employees in one of its warehouses came in for criticism, as they have at Amazon. Zalando claims to have improved them.

Early on it was difficult to get meetings with fashion brands. Christoph Lange, the company's chief product officer, had to lie and say that Zalando had a physical store just to get in the door. Makers of clothing thought internet selling was evil, he says. Representatives of Topshop, a British mid-market brand, walked out of the two firms' first meeting. Now it gives Zalando exclusive rights to sell its ranges in Europe. Zalando has relationships with 1,500 brands that supply 150,000 articles. It sells mostly well-known labels. Another online fashion retailer, ASOS, sells only 850 brands of clothing and shoes and relies heavily on its own label. A lure for retailers and brands is that Zalando saves them from having to invest in e-commerce themselves.

It also saves them from having to get to grips with an unfamiliar office culture. Zalando has a Silicon Valley-inspired work environment, holding "fuck-up nights" to celebrate failure and "hack weeks" to cook up new ideas. It encourages its employees to abandon hierarchy and structure for what it calls "radical agility". It has a 1,350-strong, and rapidly growing, technology team. Among its other assets are its software, which it built itself, and its user-friendly apps (two-thirds of all traffic goes through mobile phones). Other, older German companies, such as Otto and Lidl, are

trying to mimic Zalando's startup feel, notes Thomas Slide of Mintel, a market-research firm.

| *Big data, in style*

Zalando pays close attention to data. It gleans a wealth of numbers from the more-than-5m daily visits to its site, and some brands and retailers of the bricks-and-mortar sort give it access to their stock counts. Both sets of figures help improve the firm's forecasting of fickle fashion trends, its use of targeted ads and the speed of its responses to shifts in weather patterns or fashion tastes. Through data-mining it can spot the trendsetters among its customers and stock up on what they buy. In future it wants to sell its insights to the rest of the industry. "We want to keep tabs on every fashion item in the world," says Rubin Ritter, Zalando's chief financial officer.

Its success has not gone unnoticed, however. Investors in Zalando have done well recently—its shares have risen by 19% over the past three months, compared with 8% for the DAX, Germany's main share index—but the main worry is that Zalando could be overrun by Amazon, which plans to expand in fashion, or by Alibaba, a Chinese e-commerce juggernaut that is expanding in Europe. Mr Ritter's argument that Amazon and Zalando can comfortably co-exist rests chiefly on the fact that Amazon is pursuing the more price-conscious shopper, whereas Zalando is after a higher-value, more brand-conscious segment. The company believes that for such customers, shopping for clothes, shoes and accessories is an emotional activity; shopping on Amazon is just a transaction. "Amazon lists prices, we give advice," sums up Mr Lange.

Not everyone is convinced by that, but many agree that Zalando has a head start. Amazon can copy it, but it would be hard to outperform the German company to the point where people start switching enmasse, says Max Erich of ING, a bank. Eventually, though, Amazon will build a strong offering, and consumers will be called upon to decide: do they want a one-

stop-shop for everything, from electric toothbrushes to Jimmy Choo shoes? Zalando's hope is that there is still something special about shopping for fashion, even if it's done while waiting for the bus. ■



Zalando

引领时尚

欧洲最为有趣的科技公司之一卖的是鞋和衣服

德国西部的北莱茵-威斯特法伦州（North Rhine-Westphalia），一队卡车驶过绵延起伏的山丘，经过吃草的小马和寂静的村庄，汇集到门兴格拉德巴赫市（Mönchengladbach）。那里有一个飞机库，足有13个足球场那么大，里面是欧洲最大的服装与鞋类在线销售商Zalando的物流中心。在里面，人们将鞋、牛仔裤以及手袋装箱；14公里长的传送带上上下下地传递着几千个包裹，就像在露天市场一样迅速。包裹在传送带上被称重、贴上标签、扫描和分类，随后顺着滑道滚落至卡车中，再被运往15个国家。去年Zalando从三个这样的仓库发出了5500万个订单，每分钟超过100个。

2008年，该公司创始人大卫·施耐德（David Schneider）和罗伯特·根茨（Robert Gentz）在柏林的宿舍里通过网络售卖人字拖，事业由此起步。他们发现欧洲的鞋类及服装市场破碎且低效，还不提供在线服务。他们很快就得到了德国桑威尔兄弟的支持——他们惯于模仿美国的互联网公司，还由此获得了“欧洲山寨之王”的名号。桑威尔兄弟注意到，美国在线零售商Zappos（后被亚马逊收购）通过互联网在美国境内卖鞋，在欧洲却没有这样的公司。

在桑威尔兄弟的互联网创业孵化器Rocket Internet的支持下，Zalando已发展为一个巨头。在欧洲，实体店铺的时尚销售停滞不前，而在那些Zalando开展业务的国家里，在线销售每年却有大约15%的增长。Zalando的销售额平均每年增长约30%（即使剔除退货后），2015年达到了30亿欧元（33亿美元）。去年，一连串荷兰鞋店破产，很多人表示这是因为“Zalando效应”的作用，就像当初“亚马逊效应”对实体书店产生的影响那样。

在众多市场中售卖时尚商品并不容易。Zalando售出的商品有一半（按价值来算）都因尺寸或风格的原因被退货。它会容忍顾客各种各样的怪念头

——他们想下多少单就下多少单，还可以100天内免费退货。在人们并不习惯在网上购买时尚商品的地方，如意大利和波兰，顾客可向邮递员支付现金。而在城镇，Zalando则试验直接从顾客家中或办公室里收取退货商品。以上这些措施每年能为公司带来1800万名顾客（他们至少都会买一件商品）。然而公司员工的待遇可能就没那么好了：两年前，公司一间仓库的员工工作条件遭到批评，亚马逊也曾遭致类似批评。但Zalando称工作条件已有所改善。

起初，与各时尚品牌碰面并不容易。为了得到与之会谈的机会，首席产品官克里斯托弗·朗（Christoph Lange）不得不谎称公司拥有一个实体店铺。他说，服装制造商曾认为在线销售是邪恶的事物。英国中端市场品牌Topshop的代表在两家公司首次会谈时曾中途离席，现在却给予Zalando在欧洲出售其各系列商品的专属权利。如今有已1500个品牌与Zalando建立了合作关系，向其供应的商品多达15万件。Zalando出售的产品多为知名品牌。另一家在线时尚零售商ASOS只出售850个品牌的服装与鞋类，且严重依赖自家品牌。Zalando使零售商和品牌无需亲自投资于电子商务，这正是其吸引力所在。

Zalando还使它们不用勉力去应对自己并不熟悉的办公室文化。Zalando的工作环境有着硅谷的影子，会为庆祝失败而举行“操蛋之夜”，还会为激发新点子举办“黑客周”。它鼓励员工抛却层级架构，以实现其所谓的“彻彻底底的灵活”。它还拥有一支强大且正迅速成长的技术团队，目前人数多达1350人。Zalando的其他有利条件还包括自行开发的软件，以及对用户非常友好的应用（三分之二的流量都来自手机）。市场研究公司英敏特（Mintel）的托马斯·斯莱德（Thomas Slide）指出，其他成立更早的德国公司如奥托（Otto）和Lidl都在试着模仿Zalando的创业公司特色。

| 时髦的大数据

Zalando还密切关注数据。通过其网站每日超500万次的访问量，Zalando搜集了大量的数字，一些品牌及实体零售商还准其获知自己的货物盘点。这两组数字能帮助Zalando更好地预测多变的时尚潮流、更精准地投放定向广告，以及更快地应对天气模式及时尚品味的变化。通过数据挖掘技

术，Zalando还可从顾客中识别出引领潮流的人，并囤积这些人所购买的商品。未来它还想将这些洞见出售给行业内的其他从业者。该公司首席财务官鲁宾·利特（Rubin Ritter）说，“世界上的每一件时尚商品我们都要密切留意。”

然而人们并没有无视Zalando的成功。它的投资者们近来收成不错——其股票在过去的三个月里涨了19%，德国主要股票指数DAX指数则涨了8%。但人们最主要的担忧是Zalando有可能会遭到亚马逊或中国电子商务巨头阿里巴巴的碾压。亚马逊计划拓展时尚业务，阿里巴巴也正在欧洲扩张。对此，利特称亚马逊和Zalando是可以安然共存的，主要是因为亚马逊吸引的是对价格更为敏感的顾客，而Zalando的目标则是身价更高、更具品牌意识的顾客。Zalando相信，对于这类顾客来说，购买服装、鞋子和饰品是为了满足情感诉求；而在亚马逊上购物就只是买东西而已。朗总结道，“亚马逊只会列出价格，我们却能给出建议。”

这并不能令所有人信服。不过很多人都并不否认Zalando已占据先机。ING银行的麦克斯·埃里希（Max Erich）说，亚马逊倒是可以效仿Zalando，但想全面胜过这家公司并使所有人都转投自己的怀抱也许会很难。然而，亚马逊最终会打造出非常强大的服务，消费者们也将面临选择：他们想不想要从电动牙刷到Jimmy Choo鞋子的一站式购物？Zalando希望，购买时尚商品仍会是件有特殊意义的事，即便是在等公车的时候为之。■



Fashion retailing

Passé

The fashion industry grapples with bad timing

NEW YORK CITY has just begun its sacred rites of retail. For its fashion week, which started on September 7th, tents go up, guests emerge from black cars, models sulk down catwalks and the wealthy and celebrated clap in unison. The point of all this is for designers to declare what will be “in” next spring. But for much of fashion retail, it is increasingly clear that something is out of place.

For a sense of the problem, consider what happens when the week-long schedule of shows ends. Designers start making the clothes that retailers have ordered, with delivery scheduled four to six months later. But consumers see collections online instantly. “Fast fashion” shops such as Zara, which is part of Spain’s Inditex, rapidly produce clothes “inspired” by what appeared on the runway. When the originals arrive in stores, they feel tired.

This has produced clear winners and losers. The world’s two biggest clothes retailers are now Inditex and TJX, according to Euromonitor, a research firm. TJX buys excess inventory of brand-name clothes and resells them at low prices. Traditional department stores, meanwhile, are struggling, partly because outdated frocks and coats languish on racks and then have to be sold at a discount.

The challenge is widely understood. Now the industry is finally starting to deal with it. In March the Council of Fashion Designers of America (CFDA) and the Boston Consulting Group suggested alternatives to the current, slow retail cycle, some of which have been championed by fashionistas. A small band of designers are testing new business models this month in

New York, or plan to at fashion week in London later in the month. The idea is to show clothes and sell them at the same time. It may seem obvious, but the shift is not easy for designers, suppliers, fashion magazines and retailers that have worked for so long around the old calendar. Most designers are sticking to it, with minor adjustments. During February's fashion week in New York, for example, Michael Kors and Tory Burch showed only a very few looks that were available immediately.

Others are going further. On September 7th Tom Ford staged not a "spring" runway show, as is customary, but a party streamed live online, featuring clothes from his autumn 2016 collection that are available for sale now. Rebecca Minkoff, another designer, will present her collection on the street outside her Manhattan store, with guests invited to shop for the runway looks immediately. Because retailers have already decided which of its clothes to stock, the fashion show can promote specific items to boost their sales. It becomes a more closely co-ordinated activity, says Uri Minkoff, the company's chief executive.

British designers are adapting, too. Burberry's show in September will for the first time present only clothes that are available immediately. The company has pulled its entire fashion-design process forward by about six months, with clothes conceived, samples produced and presentations to editors and retailers all concluded much earlier. The catwalk event will not be a business event for the garment trade but a marketing event for consumers.

But old habits die hard. The CFDA is exploring whether retailers might stock more clothes when people like wearing them. But many stores and designers still expect them to buy fur coats in July. And some in the industry are sceptical. Pascal Morand, who oversees Paris's fashion week, approves of selling clothes that consumers can wear now. But he also worries about designers listening too much to what people want.

“Consumers favour incremental innovation,” he says, whereas the most exciting designs defy the norm and are often adopted by consumers only gradually. ■



时装零售 过时了

时装业努力解决时机不当的展售模式

纽约市刚刚开始了它神圣的零售仪式。纽约时装周于9月7日开幕，期间一个个帐篷被支起，嘉宾步下黑色轿车，模特面色冷峻地走上T台，富豪与名流齐声鼓掌。所有这一切都是为了让设计师宣布明年春季的流行趋势。但对于大部分时装零售业来说，人们越来越清楚地认识到有些东西已经不合时宜。

要理解这一问题，可以试想一下，为期一周的走秀安排结束后会发生什么。设计师开始制作零售商订购的服装，预计四至六个月后交货。但是，消费者能立刻在网上看到这些时装。Zara（隶属于西班牙的Inditex集团）等“快时尚”品牌会迅速生产出“灵感”来自T台走秀的衣服。待到原创时装上市之时，消费者已经看腻了。

赢家和输家已经一目了然。根据研究公司欧睿国际（Euromonitor）的数据，目前世界上最大的两家服装零售商是Inditex和TJX。TJX购买名牌服装过剩的库存并以低价出售。与此同时，传统的百货公司举步维艰，部分原因是过时的女裙和外套长期滞销，于是只得打折出售。

这种挑战广为人知，现在，时装业终于开始应对。三月，美国时装设计师协会（Council of Fashion Designers of America）和波士顿咨询公司建议替代目前缓慢的零售周期，其中一些方案已受到时尚达人的追捧。一小群设计师已在本月的纽约时装周上（或计划在本月稍晚时候举行的伦敦时装周上）试水新的商业模式。他们的想法是让服装的展示与销售能够同步。这似乎了无新意，但对于长期沿用老黄历的设计师、供应商、时尚杂志和零售商而言，适应这个转变并不容易。大多数设计师仍然坚持老一套，只做轻微调整。例如，在今年二月的纽约时装周上，Michael Kors和Tory Burch只展示了少数几套能够立即出售的款式。

其他品牌则更进一步。9月7日，汤姆·福特（Tom Ford）举办的并不是一场司空见惯的“春季”时装秀，而是一个网上直播的派对，重点推介其品牌目前可供出售的2016年秋装系列。另一位设计师瑞贝卡·明可弗（Rebecca Minkoff）将在她曼哈顿商店外的大街上展示其系列服装，并邀请嘉宾即刻购买T台服装。由于零售商已经决定好哪些服饰要备货，所以可借时装秀推广特定款式以提高销售。该公司的首席执行官尤里·明可弗（Uri Minkoff）表示，时装秀变成了更为密切协调的活动。

英国的设计师也在做调整。博柏利（Burberry）九月的时装秀将首次只展示可供立即出售的款式。该公司已将时装设计的整个过程提前了大约六个月，服装构思、样品制作以及向编辑和零售商展示都更早地完成了。T台展示将不是一个为服装交易举办的商业活动，而是一场为消费者举行的营销活动。

但是，积习难除。美国时装设计师协会正在探讨零售商是否可以在服装当季增加它们的存货。然而，许多商店和设计师仍然指望零售商在七月订购毛皮大衣。一些业内人士对此表示怀疑。负责巴黎时装周的帕斯卡尔·莫兰德（Pascal Morand）赞成出售消费者当季能穿的服装。不过，他也担心设计师会过多地听从人们的愿望。他说“消费者喜欢渐进式创新”，但最令人兴奋的设计藐视常规，往往逐渐才会被消费者接受。■



Investing in commodities

Of mice and markets

A surge in speculation is making commodity markets more volatile

A GAME of cat and mouse appears to be taking place in the oil market. The felines are big producers who want prices to go higher, the rodents speculators betting that they will fall. Twice this year, in the first quarter and the third, hedge funds and others have taken out record short positions on futures of West Texas Intermediate (WTI), an American crude-oil benchmark, only to be mauled by (so far empty) talk among members of the OPEC oil cartel and Russia of a production freeze. The resulting scramble by funds to unwind their short positions has fanned a rally in spot oil prices (see left-hand chart).

This reminds Ole Hansen, head of commodities research at Denmark's Saxo Bank, of currency intervention by central banks. It often works best, he says, when speculators are positioned heavily in the opposite direction. He mischievously pictures Saudi Arabia's deputy crown prince, Muhammad bin Salman, watching a screen on his desk each week when America's Commodity Futures Trading Commission (CFTC) reports speculative positions, poised to pounce.

Not long ago there were fewer mice to catch: in 2012-14 volumes in commodity futures and options markets as a whole were relatively muted, as China's economy slowed and prices of materials from copper to coal tumbled. Now volumes have bounced back. The Chicago-based CME says the volume of energy futures and options traded on its exchanges has risen by 21%, year on year, in 2016. Those of metals are also up strongly. Barclays, a bank, says that inflows into commodity-based exchange-traded products (ETPs), index funds and other investments have surged too. Led by gold and oil, this year they are at their highest for seven years (see right-hand chart).

The last time investment flowed heavily into commodities was at the tail end of the China-led supercycle, in 2009-12. But back then, says Erik Norland of the CME, the pattern was different. Commodity markets were dominated by investors making one-way bets that prices would rally. Moreover, producers saw no need to hedge their exposures because prices (and hence their profits) were rising.

Lately, however, markets have become harder to read. In oil, for instance, the heightened volatility appears to have attracted hedge funds, which for the first time have been the most active investors in futures markets all year, according to CFTC data. Kevin Norrish, head of commodities research at Barclays, describes today's investors as more tactical than strategic. They are not investing out of confidence in the asset class as a whole. One example is their enthusiasm for gold, considered a safe-haven asset amid concerns about Brexit and America's presidential election.

Saxo's Mr Hansen reckons the low yields offered elsewhere in financial markets are also piquing interest in commodities. The cost of buying a tonne of copper and storing it for sale, for example, is less daunting when interest rates are negative.

The low-yield world may also be driving brave, or foolhardy, retail investors into commodity ETPs. The biggest beneficiaries this year have been gold funds. In America almost \$12 billion has poured into one exchange-traded fund, State Street Global Advisors' SPDR Gold Shares; the total invested in all such oil funds is just \$1 billion. Yet oil has also attracted some devil-may-care day traders prepared to risk everything for a quick buck. Mr Hansen points out that a particularly hair-raising ETP, the family of so-called 3X, or triple-leverage, notes linked to WTI prices, has surged in popularity this year, even though the fund is designed to multiply losses as well as gains. Investors in that are probably chasing volatility, rather than thinking about the boring details of supply and demand.

Such bets may be adding to the choppiness of markets. During the commodities boom, speculators were often wrongly blamed for pushing food and energy prices to stratospheric heights, when the true cause was China's thirst for scarce raw materials. Since then, the new mines, oil wells and fields of grain carpeting the planet to meet that demand have started to produce goods just when the appetite for them has dulled, pushing down prices. But speculators are jumping on anything that may suggest large changes in supply, which may cause exaggerated price swings. For instance, they have placed big wagers on rising coffee prices this year, because of weather-related crop damage in Vietnam, Indonesia and Brazil. Prices of robusta and arabica coffee are near 18-month highs.

Some believe inflows into commodities have already peaked. The pattern in recent years has been to divest in the autumn. But with the presidential election looming and uncertainty about American interest rates high, further volatility may be in store. Moreover, Saudi and Russian officials are again talking about stabilising oil markets as they prepare for a meeting later this month, which could make waves. The choppier markets are, the more speculative money they may attract. ■



投资大宗商品 老鼠与市场

投机激增让大宗商品市场更加波动无常

石油市场上似乎正在上演一场猫鼠游戏。猫儿们是那些大产油国，想让油价一路走高；鼠儿们是投机商，赌的是油价将要下跌。今年第一季度和第三季度，对冲基金和其他投资公司两次破纪录地重仓卖空WTI原油（美国原油基准价格）期货，却受到欧佩克成员国及俄罗斯限产论调（目前都是空谈）的重创。各家基金公司因此争先恐后地平仓，推高了石油现货价格（见左图）。

这让丹麦盛宝银行（Saxo Bank）大宗商品策略主管奥尔·汉森（Ole Hansen）联想到各大央行的货币干预手段，他认为这种方法在投机者重仓持有反向仓位时效果最佳。他以玩笑的方式描绘出了一幅场景：每周美国商品期货交易委员会（CFTC）发布投机头寸的时候，沙特副王储穆罕默德·本·萨勒曼（Muhammad bin Salman）紧盯着桌上的显示器，蓄势待发。

不久之前，可抓的老鼠还不多：2012至2014年间，中国经济放缓，从铜到煤等原材料价格暴跌，大宗商品期货和期权市场交易总体相对疲弱。如今交易量有所回升。芝加哥商业交易所（CME）公布的数据显示，2016年CME的能源期货和期权交易量同比上升了21%。金属交易也有强势上升。巴克莱银行的数据也显示，流向以大宗商品为基础的交易所交易产品（ETP）、指数基金和其他投资的资金都快速上涨。今年，流向以黄金和石油为首的大宗商品的投资额为过去七年最高（见右图）。

上一次投资大量流入大宗商品是在2009至2012年中国带动的超级周期的尾声。CME的埃里克·诺兰德（Erik Norland）认为那时的模式有所不同。当时主导大宗商品市场的是一边倒地押注价格会上升的投资者。此外，大宗商品生产国也认为无需对冲其风险敞口，因为价格（相应还有它们的利润）一直在上升。

然而，近期市场越来越难看透。以石油为例，过度的波动似乎已引起了对对冲基金的兴趣——CFTC的数据显示对冲基金首次成为期货市场上全年最活跃的投资人。巴克莱银行大宗商品研究主管凯文·诺里什（Kevin Norrish）认为当今的投资者重策略更甚于战略。他们的投资并非出于对整类资产的信心。其对黄金的热衷就是一个例子，出于对英国脱欧和美国总统选举的担忧，黄金被视为很好的避险资产。

盛宝银行的汉森认为金融市场上其他领域的低回报也在刺激着对大宗商品的兴趣。举例来说，在利率为负时，购买一吨铜储存待售的成本就没那么令人却步了。

普遍的低回报可能也推动了勇敢、或者说是莽撞的个人投资者进入大宗商品ETP。今年最大的受益者是黄金基金。在美国，将近120亿美元流向了一只交易所交易基金——道富环球投资管理（State Street Global Advisors）推出的SPDR黄金股票（SPDR Gold Shares）；投入到此类石油基金的总金额不过才10亿美元。然而石油也吸引了一些不管不顾的日间交易者，他们准备搏上一切赚笔快钱。汉森指出，一个风险尤为大的ETP，就是与WTI油价挂钩的所谓3X或三重杠杆（triple leverage）系列产品，今年受欢迎程度大增，尽管这种基金在倍增收益的同时也会倍增损失。此类投资者很可能是在追逐波动性，而并不考虑供需那些无聊的细节。

如此赌博式的投资可能会加大市场的不确定性。在大宗商品价格高企的时候，人们经常错误地认为是投机者将食品和能源价格推到了顶峰，而真正的原因其实是中国对稀缺原材料的渴求。自那时起，为满足中国的需求，全球各地兴建的新矿山、油井和农田开始投产，却又适逢需求下降，压低了价格。但投机者不会放过任何一个有可能导致供应大幅变化的机会，因为这有可能带来过度的价格波动。比如，投机者下了重注，认为由于今年越南、印尼和巴西因天气原因导致农作物减产，咖啡价格会上涨。目前罗布斯塔和阿拉比卡咖啡的价格接近18个月来的最高位。

有些人认为流向大宗商品的资金已达到顶峰。近年的模式是在秋季撤资。但由于美国总统大选临近以及美国利率水平充满不确定性，可能还会有更

大的波动。此外，沙特和俄罗斯官员再次发出了关于稳定石油市场的言论，他们正在为本月底可能会引发震荡的会议做准备。市场局势越是不明朗，吸引的投机资金就越多。■



Autonomous cars

Pitt stop

Uber launches its first self-driving cars

SITTING in the back seat of the self-driving Uber as it navigates narrow streets in Pittsburgh's old industrial heart, the Strip District, is surreal. The global ride-sharing firm chose the area as the spot to develop and test driverless cars, and picked up its first customers on September 14th. Your correspondent got a ride the day before. The vehicle moves smoothly down busy Penn Avenue, stopping at four-way stop signs and traffic lights, slowing to allow other cars to parallel park. It navigates around double-parked delivery vans. It even stops to allow jaywalking pedestrians to cross.

The cars are not truly driverless yet. During the trial an Uber employee sits behind the wheel, ready to take over should something go wrong. A second employee, a sort of co-pilot, sits in the front passenger seat, monitoring a screen, alerting the pilot to what the car "sees", including other cars, upcoming traffic, potential obstacles and elevation—Pittsburgh is very hilly. Another monitor in the back seat allows passengers to see what the car is seeing.

By the end of the year, 100 Volvos will be on the road, but in the meantime a fleet of Ford Fusions are picking up passengers. A large rotating laser (that strongly echoes the flux-capacitor from the film "Back to the Future") is mounted on the roof. The car is also fitted with 20 external cameras, measurement devices for acceleration and orientation, 360-degree radar sensors and separate antennae for GPS positioning and wireless data.

Pittsburgh is ideal for the tests. It has the talent, because Uber poached Carnegie Mellon University's robotics department last year. Raffi Krikorian, who heads up the company's research centre in Pittsburgh, calls the city the

“double-black diamond of driving”. It has a winding road system, extreme weather conditions and lots of traffic. Drivers there are used to odd quirks like the “Pittsburgh left”, as it is known, where oncoming traffic yields to cars making left-hand turns. If Uber can master autonomous driving in Pittsburgh, Mr Krikorian says, it can make it almost anywhere.

Having City Hall’s support for the urban lab helps. Even before Uber came to Pittsburgh, Bill Peduto, the mayor, was fighting state lawmakers to allow ride-sharing. Local government must take risks and behave like a startup, he says. “Regulation will never be ahead of innovation. If you sit and wait, the innovation will happen, but somewhere else.” The city is small enough that it can get things done, but large enough that the world should notice.

Put in the actual driver’s seat, for a short spell, your correspondent did need to intervene when midway through a turn, the traffic light turned red and the car suddenly stopped. But *The Economist* felt very safe. Not all Pittsburghers are convinced. “I’d want to know that it’s 100% foolproof before I’d get in,” says Shelby Rocco, a student. Mike Taylor, a banker, who uses Uber all the time, has no reservations. He feels bad for the drivers, who he suspects may lose their jobs, but “it’ll be nice not to have to keep up any more awkward conversations.” ■



自动驾驶汽车

匹兹堡行车记

优步推出首批自动驾驶汽车

坐在优步自动驾驶汽车的后座上，任其在匹兹堡老工业中心横排区（Strip District）狭窄的街道上行驶，感觉很不真实。这家全球拼车服务公司选择在这片区域研发和测试无人驾驶汽车，并在9月14日接待了第一批顾客。本刊记者在此前一天便体验了一次。所乘车辆沿交通繁忙的潘恩大道（Penn Avenue）平稳地行进，能依照四岔路口的停车标志及交通灯的指示停车，还会减速，以便让其他车辆侧方停车。这辆车能绕过并排停靠的厢式货车，甚至还会停下来避让乱穿马路的行人。

这些车还不能算真正意义上的无人驾驶。试验过程中一名优步员工会坐在驾驶位，若发生问题会随时接管汽车。另一名算是副驾驶员的员工坐在前排副驾驶位上，通过一个屏幕监控车辆状况，并提醒驾驶员车辆“看到了”什么，例如其他车辆、前方交通情况、潜在障碍以及地面的高低起伏（匹兹堡多山）。后排座位也配有一个监视器，能让乘客了解车辆所看到的情况。

到今年年底将有100辆沃尔沃上路，不过与此同时一个由福特混合动力蒙迪欧组成的车队已开始接送乘客。这些车的车顶安装了一台大型激光扫平仪（与电影《回到未来》中的通量电容器高度相似），此外还配有20个外部摄像头、加速及定向所需的测量装置、360°雷达传感器，以及用于GPS定位及无线数据传输的独立天线。

匹兹堡是进行测试的理想之地。它拥有合适的人才，优步去年就砸重金从卡内基梅隆大学机器人中心“挖角”。该公司匹兹堡研究中心的负责人拉菲·克里科里安（Raffi Krikorian）称这座城市相当于“驾车领域的双黑钻级别”。这里有曲折的道路系统、极端的天气状况以及繁忙的交通。当地的司机们还习惯于不同寻常的转弯方式，例如人们熟知的“匹兹堡式左转”——在这种情况下迎面而来的车流会为向左转的车辆让路。克里科里安

说，优步如果能在匹兹堡成功实现自动驾驶，便几乎能在任何地方推广该技术。

拥有市政府对实验室的支持也颇有裨益。早在优步来到匹兹堡之前，市长比尔·佩杜托（Bill Peduto）就一直在与州议员斗争，以使拼车获得准许。他说，地方政府应勇于冒险、像创业公司那样行事。“法规永远都不会领先于创新。如果你只是坐着干等，创新倒也会出现，但却会是在别的地方发生。”匹兹堡这座城市小到足以切实解决问题，但又足够大，能让世界注意到它的动向。

本刊记者坐在驾驶座上，有那么一阵确实需要短暂地接管汽车——正在转弯时红灯亮起，车突然停住。《经济学人》觉得自动驾驶汽车还是很安全的，但这并不能说服所有的匹兹堡人。一位名叫谢尔比·洛科（Shelby Rocco）的学生说，“我得确定无人驾驶汽车百分之百没问题之后才会乘坐。”长期使用优步的银行职员麦克·泰勒（Mike Taylor）则对自动驾驶汽车毫无疑虑。他担心的是司机们也许会失业，因而为他们感到难过。不过“再也不用别别扭扭地与人交谈了，这点还是很好的。”■



Chinese investment

A sponge wrung dry

China's private investors keep their hands in their pockets

ORDERS from on high can shape the Chinese economy. In 2013 Xi Jinping, the president, said cities should be more like sponges, sopping up rainwater for reuse when parched. China is now working on some 30 “sponge cities”. Then in 2014 Mr Xi said the government should encourage businesses to invest in state projects. Since then China has announced plans for thousands of “public-private partnerships” (PPP), including sponge cities. But investors do not seem interested. Sponge cities are struggling to soak up private capital.

This month Guyuan, a city in Ningxia, a north-western region that is dry most of the year, launched China's first sponge-city PPP. However, as is the case with others that are in the works, the “private” side of the partnership was not all it was cracked up to be. The investor, Beijing Capital, is in fact a government-owned firm. And to make the deal viable, the government pitched in a subsidy worth nearly one-fifth of the 5 billion yuan (\$750m) total cost.

This points to a bigger problem: a sharp slowdown in private investment in China. New data on September 13th underlined the trend. Over the first eight months of 2016, private-sector investment rose by just 2.1% from the same period a year earlier, virtually the lowest rise since records began in 2005. Meanwhile state-backed investment has soared (see chart). It might seem unsurprising that the government is driving China's economy. But it marks a big shift: the private sector was responsible for roughly two-thirds of investment over the past decade. And since investment accounts for nearly half of GDP, private caution clouds the growth outlook.

The simplest explanation for the slowdown is that the state has crowded out the private sector. Government-backed entities have long had better access to banks. In the past private companies have compensated by using their own earnings and tapping shadow lenders. Both routes are harder this year. Profits are not growing at the heady double-digit rates of not long ago. At the same time regulators have curbed shadow banks, leery of the risks brewing inside them. A side-effect has been to deprive some private firms of financing.

Yet that is only part of the problem. Many companies have money but are not spending it, says Zhu Haibin of JPMorgan Chase. They are keenly aware of the overcapacity in industries from coal mining to solar-panel making. Returns on capital have fallen by a third since 2011 to about 7%, according to Société Générale. With average bank lending rates just a touch lower at 5.25%, many are holding back, hoping profitability will improve. State firms can afford to pay less attention to the bottom line. Despite weaker returns than their private peers, they have kept investing.

The politics of big infrastructure projects are also a stumbling block. Local governments are reluctant to cede their most promising projects to private investors. Many officials are suspicious of private firms. Beijing municipality recently signed a PPP agreement for a new highway, and picked China Railway Construction Corp, a mammoth state-owned enterprise, as its partner. The official in charge suggested that private companies had neither the ability nor the capital necessary. And with ventures such as the sponge cities, it is not clear to private investors how they will make returns. Unlike toll roads or power stations—normal fodder for PPP deals—better drains and reservoirs are not easily converted into profits.

This being China, there are, as ever, questions about the quality of the data on investment. Some economists believe the public-private gap is

exaggerated because of the government's stockmarket rescue last summer, when the state acquired bigger stakes in companies. As these ownership changes filter into the data, they may be adding to the apparent increase in state investment. Separately, catastrophic numbers from Liaoning, a north-eastern province, have wreaked havoc with national statistics this year. Investment there is down by nearly 60%, but this may largely reflect a clean-up of previously embellished figures, not an economic disaster.

The government itself, however, is certainly behaving as if the problem is more than a statistical accident. This summer it dispatched teams of inspectors to 18 of China's 31 provinces to see why private companies were not investing. Earlier this month the cabinet unveiled measures to encourage them to spend more. It promised to treat private firms the same as public ones when investing in sectors such as health and education. It called on banks to lend more to them. And it said it would roll out more PPP projects, enticing private investors with larger state subsidies.

These pledges may well show some results in the coming months, especially now that the government is talking so openly about the need to spur private investment. But many economists say that bigger changes are needed. To begin with, China could make it easier for private businesses to invest in state-controlled sectors such as finance and transportation. The government could also break up some of the state-owned enterprises that currently dominate these sectors. For the time being, though, it is moving in the opposite direction, merging state firms to create even bigger national champions.

The silver lining in all this is in what it says about the acumen of China's private investors. Their caution reveals how big a role market forces, as opposed to top-down orders, now play. The government would love to see companies open their wallets. Instead, they are behaving like sensible businesses anywhere. They are conserving their cash and waiting for better

opportunities than sponge cities to emerge. ■



中国投资

拧干的海绵

中国私人投资者紧捂口袋

高层命令可以主导中国经济的发展。2013年国家主席习近平说，城市应该更像海绵，可以吸收雨水到干旱时再释放利用。中国如今正打造约30个“海绵城市”。之后的2014年，习近平表示政府应鼓励企业投资政府项目。自此，中国已公布数以千计的“公私合作”（PPP）项目，包括海绵城市建设计划。但投资者似乎并不感兴趣。海绵城市难以吸引到私人资本。

宁夏固原市位于常年干旱的中国西北地区，本月那里开启了中国首个海绵城市PPP计划。但与其他在议的PPP计划一样，其“私人”伙伴与之前的吹捧有所不符。项目的投资者北京首创其实是一家国企。而且为使交易可行，政府投入的补贴就接近50亿元（7.5亿美元）总成本的五分之一。

这指向一个更大的问题：中国私人投资的急剧放缓。9月13日的最新数据突显了这一趋势。在2016年的前八个月，私营部门投资仅比去年同期上升2.1%，几乎是2005年有记录以来最低的升幅。同时，政府支持的投资飙升（见图表）。由政府主导带动中国经济，似乎不足为奇。但这标志着一大转向：在过去十年，私营部门投资曾约占总额的三分之二。而由于投资占GDP比重接近50%，私人投资的谨慎为经济增长的前景蒙上了一层阴云。

对于投资的放缓，最简单的解释是政府将私营部门排挤在外。由政府支持的企业一向更容易获得银行贷款。过去，私企以自身的盈利收入及利用影子贷款作为资金补充。今年，这两条路都更为难走。利润增长已不复不久之前两位数的迅猛势头。同时，监管机构因担心影子银行酝酿的风险，已出台措施打压。其副作用之一就是令部分私企融资无门。

然而，这还只是问题的一部分。摩根大通的朱海斌表示，许多企业是有钱不愿花。它们深知从煤炭开采到太阳能面板制造等各个行业均出现了产能过剩的问题。据法国兴业银行（Société Générale）的数据，自2011年以

来，资本回报率已下跌三分之一，目前约为7%。而银行平均贷款利率仅略低于此，为5.25%，许多企业正减少投资，希望提升利润率。国企可以不用那么紧张盈亏，所以尽管收益弱于私企同行，它们还是可以不停投资扩展。

大型基建项目中的政治因素也是个绊脚石。地方政府不愿把最有前景的项目批给私人投资者。许多官员对私企持怀疑态度。北京市最近就建设一条新高速公路签署了PPP协议，挑选的合作伙伴是大型国企中国铁建。主管的官员表示，私企不具备所需的能力和资本。而对于海绵城市这类项目，私企并不清楚它们能否带来回报。不同于收费公路或电站这类常规PPP项目，投资建造更好的排水渠和水库并不容易转化为利润。

在中国，投资方面的数据质量从来都存在疑问。一些经济学家认为，由于去年夏天政府的救市行动，政府持有的企业股份加大，公私部门之间的差距实际被夸大了。这些所有权变化被纳入数据，也许更突显了政府投资的显著增加。个别来看，东北省份辽宁的灾难性数字已经严重拖累了今年的全国统计数字。那里的投资下降了近60%，但这可能主要是之前的虚假数字被清理修正的结果，并非真正的经济灾难。

但政府本身肯定是摆出一副“问题不止是统计有误”的姿态。今年夏天，政府派出巡视组深入全国31个省份中的18个探查私企不愿投资的原因。本月初，国务院推出措施鼓励私企增加投资，承诺在医疗及教育等行业的投资上，政府将对私企国企一视同仁，并呼吁银行多向私企贷款。政府还表示将推出更多的PPP项目，并以更高额的政府补贴吸引私人投资者。

这些承诺很可能会在未来几个月取得一定成效，尤其是在政府如此公开表态需要刺激私人投资的情况下。但许多经济学家表示还需要有更大的改变。首先，中国可以提供便利措施，让私营企业更容易地投资金融和交通等由国家控制的行业。政府也可以拆分目前雄霸这些行业的国企。但就目前来看，政府却是朝着相反方向在发展——通过合并国企创造更大型的国有领军企业。

尚存的一线希望是中国私人投资者的精明头脑。他们的谨慎举动显示了如今发挥重要作用的是市场力量而非自上而下的命令。政府希望私企解囊投资。但像任何地方的精明企业一样，中国私企的行事也很理智。它们保留资金，静待更胜海绵城市的投资机遇浮现。 ■



A.P. Moller-Maersk

Profits overboard

The shipping business is in crisis. The industry leader is not exempt

THE collapse of Hanjin Shipping, a South Korean container line, on August 31st brought home the extent of the storm in shipping. The firm's bankruptcy filing left 66 ships, carrying goods worth \$14.5 billion, stranded at sea. Harbours around the world, including the Port of Tokyo, refused entry for fear of going unpaid. With their stock beyond reach, American and British retailers voiced concerns about the run-up to the Christmas shopping period.

Hanjin is not alone. Of the biggest 12 shipping companies that have published results for the past quarter, 11 have announced huge losses. Several weaker outfits are teetering on the edge of bankruptcy. In Japan three firms, Mitsui OSK Lines, NYK Line and Kawasaki Kisen Kaisha, look vulnerable. Activist investors are now pressing for them to merge to avoid the same fate as the South Korean line.

Even the strongest are suffering. France's CMA CGM, the world's third-largest carrier, announced a big first-half loss on September 2nd. Maersk Line, the industry leader, and the largest firm within A.P. Moller-Maersk, a family-controlled Danish conglomerate, will be in the red this year, having lost \$107m in the six months to June. The industry could lose as much as \$10 billion this year on revenues of \$170 billion, reckons Drewry, a consultancy.

Two powerful forces have rocked the industry. The first is the ebbing of world trade since the financial crisis. Two-thirds of global seaborne trade by value is carried in containers, but in 2015, for the first time since they were invented in the 1950s, (apart from the 2009 recession), global GDP

grew faster than worldwide box traffic. Insipid economic growth and moribund trade liberalisation play their part; so too do shifts in manufacturing. Multinational firms are increasingly building factories in local markets; General Electric, for example, now makes engine parts where they are needed rather than shipping them from America.

The second factor is a surge in the size of the global container fleet following a ship-ordering binge that began around 2011. Overcapacity has crushed freight rates. Sending a container from Shanghai to Europe now costs half what it did in 2014, according to figures from the Chinese city's shipping exchange.

Shipping has been through many crises but few as severe as this one. The industry may still resist doing what many recommend, which is to tackle overcapacity directly by scrapping vessels. But the depth and length of the downturn mean that firms will start doing things differently.

Eyes are trained on changes at Maersk Group in particular, which has long set the course for the industry. The Danish line has probably lost only \$11 per container moved this year, less than the \$100 figure for companies like Hanjin, but that is still unacceptable to its bosses and to the family that owns it. They are considering splitting up the conglomerate, and are due to announce details this month.

Maersk Group has invested in all sorts of assets since the 1960s: supermarkets, airlines and recently oil drilling, as well as shipping. The idea was to construct a hedge against falling freight rates and spikes in oil prices. When fuel is dear, squeezing container profits, drilling for oil and gas would keep it afloat, or so the thinking went. But since 2014 oil prices and freight rates have fallen together, throwing both the shipping and energy units into a sea of red ink (see chart).

In June Maersk Group's chairman, Michael Pram Rasmussen, fired Nils Smedegaard Andersen, its CEO, and replaced him with Soren Skou, the head of the container line. Mr Andersen, a former boss of Carlsberg, a Danish brewer, and the first CEO to be brought in from outside the company, was keen on retaining some diversification. Mr Skou, who has worked in shipping since he joined the group in 1983, is believed to be more sceptical.

| *Breakers ahead*

The main part of his review of the group's operations will seek to determine whether it should break itself into two: a separate, publicly listed shipping business, encompassing Maersk Line and the group's port terminals and logistics arms, and another listed firm concentrating on its oil exploration and drilling businesses. That would reassure investors, worried that their money is being used to prop up failing divisions. It could widen its pool of potential investors as well as boost its value, says Neil Glynn of Credit Suisse, a bank.

The outcome of the review is still far from certain, but it is thought likely that Maersk Group will end up more focused on its roots in shipping. Mr Skou, who remains CEO of Maersk Line as well as the overall group, has said he wants to see the group's revenues grow, and its oil division will struggle to play its part in this. One short-term but serious problem for Maersk Oil, for example, is that production could halve by 2018 because its licence to operate Qatar's largest offshore oil field is expiring in July next year.

Maersk Line, in contrast, starts from the position of being the biggest shipping firm in the world. Yet it too has lots of work to do if it is to boost revenues and profits from shipping. A favoured cost-cutting strategy among shipping firms so far has been to form alliances. In January 2015 Maersk Line and Mediterranean Shipping Company (MSC) launched 2M, a partnership to share space on their vessels. This April four others got together, followed by six more in May. These three groups now account for

nearly three-quarters of the global market. But alliances do not solve the problem of overcapacity and they have not stopped freight rates from falling.

Another tack has been to build bigger ships. “When oil prices were high we built bigger ships and pioneered slow steaming to save bunker costs,” says Soren Toft, Mr Skou’s COO and right-hand man. Maersk Line built 20 huge “Triple-E” class vessels that could carry just under 20,000 containers each; its biggest rivals, MSC and CMA CGM, followed its lead. But with fuel prices much lower—in 2015 they accounted for less than 13% of Maersk Line’s costs—the savings are slim. After the last Triple-E ship entered service last year, it cut back on ordering new vessels.

Maersk Group’s big new idea is to make its existing ships smarter. Mr Toft says Maersk Line will focus on using these ships better by embracing the “age of digitisation”. This is an area in which shipping lags well behind other sectors, such as aerospace. Whereas a modern jetliner creates several terabytes of data a day, it takes the average cargo ship 50 days to produce a single one. Most ships do not even have basic sensors to ensure their hatches are closed before leaving port. Until very recently the industry resisted using data properly, says Martin Stopford, president of Clarkson Research, part of a shipbroker. Now it cannot afford to ignore systems that offer the chance of reducing costs by up to 30% by better co-ordinating the interaction of ships and shore, he says.

Maersk Line is retrofitting its ships to collect more data. Last year it installed sensors on its containers that track their location and contents. That makes it easier for port terminals to handle them, so ships can leave and start earning money again more quickly. Software also works out how to stack containers on ships more efficiently.

Empty containers are another drain, costing shipping lines up to \$20

billion a year, according to BCG, another consultancy. Maersk Line is not the only one using data to deal with this problem. Japan's NYK saved over \$100m by getting better at spotting and using empty containers. A new website called xChange, which started operating last November, allows shipping lines to swap spare containers among themselves to maximise efficiency.

The Danish firm's three-year-old analytics team has also worked on discovering the optimal speed and course for its ships. They are trying to cut its big repair bills, too. The hope is that predictive maintenance could achieve this quickly. Instead of waiting for ship engines to break down, sensors will report when they need care.

What Maersk Line does in digitisation is likely to be followed by the rest of the industry in fairly short order. As an executive at one of Maersk Line's rivals admits: "We just watch what Maersk does and copy it." And although few shipping outfits have the resources to build ever bigger ships, even the smallest of them can learn to use data better. Data crunching alone will not save the industry from the current storm; that will require ships to be scrapped. But it may prepare it better for the next one. ■



A.P.穆勒-马士基集团

利润落水

集运业陷入危机，领头羊也难幸免

韩国集装箱船运公司韩进海运（Hanjin Shipping）于8月31日申请破产，让人深刻体会到集运业这场风暴的威力。韩进的破产申请导致旗下载有总值145亿美元货物的66艘货轮被困海上。全球各地的港口，包括东京港，都因担心船运公司无法支付费用而拒绝这些船只进港。英美零售商迟迟收不到货物，均表示担心圣诞购物季的准备工作会议会受到影响。

韩进并非唯一陷入危机的公司。在已公布上一季度业绩的最大12家航运公司中，有11家宣布存在巨额亏损。几家较弱小的企业正濒临破产边缘。在日本，商船三井、日本邮船、川崎汽船这三家公司似乎已不堪一击。维权投资者正施压促使这些公司合并，避免落入与韩进海运同样的命运。

连最强大的企业也难以幸免。世界第三大集装箱承运商法国达飞海运集团公司（CMA CGM）在9月2日公布了上半年的巨额亏损。业界领头羊马士基航运公司（丹麦家族控股企业A.P.穆勒-马士基集团内最大的公司）今年将出现赤字，截至六月的半年时间已亏损1.07亿美元。据德鲁里咨询公司（Drewry）估计，整个集运业今年或将在收入1700亿美元的基础上遭遇高达100亿美元的亏损。

冲击集运业的是两股强大力量。首先是2008年金融危机以来全球贸易的退潮。按价值计算，全球海运贸易有三分之二都是通过集装箱运输，但在2015年，自集装箱在上世纪50年代诞生以来（除了2009年的经济衰退时期），全球GDP增速首次高于全球集装箱运输量的增速。经济增长放缓及贸易自由化进程停滞都加深了问题，制造业的转变也是一个因素。跨国公司越来越倾向在本地市场兴建工厂；例如，通用电气如今会在发动机部件销售市场制造产品，而非从美国发运。

第二个因素是2011年前后开始的货轮订购狂潮导致全球集装箱船队规模激

增。运力过剩压低了运价。据上海航运交易所的数据，现在从上海发运一个集装箱到欧洲，运价仅为2014年时的一半。

集运业经历过很多次危机，但少有如此严峻的情况。业界或许仍不愿像许多人建议的那样，通过直接报废船只来解决运力过剩的问题。但此次衰退的深度及延续时间意味着企业即将转变行事方式。

人们尤其关注一直领航集运业的马士基集团会做出怎样的改变。这家丹麦承运商今年每运送一个集装箱大概仅损失11美元，比韩进这类公司100美元的损失要小，但这在马士基的高层及控股家族看来仍不可接受。他们正考虑分拆集团，并将于本月内公布细节。

马士基集团自上世纪60年代以来投资过各种资产：除了海运，还有超市、航空公司以及近年的石油钻探。其想法是要构建一重保护，对冲运价下跌或油价飙升的冲击。当燃料价格上升挤压集运利润时，油气钻探可让集团保持盈利——当时他们以为会是这样。但自2014年以来，油价和运价都在下跌，集团的海运及能源部门双双被抛进亏损的汪洋之中（见图表）。

今年六月，马士基集团主席迈克·普拉姆·拉斯姆森（Michael Pram Rasmussen）解雇了首席执行官安仕年（Nils Smedegaard Andersen），并让马士基航运公司总裁施索仁（Soren Skou）接任。安仕年曾任丹麦啤酒制造商嘉士伯集团的总裁，是马士基集团首位从公司外部聘请的首席执行官，他主张集团业务保持一定的多元化。施索仁自1983年加入马士基就一直在海运部门工作，人们认为他对业务多元化更多持怀疑态度。

| 前有暗礁

施索仁审视马士基集团的营运情况，着重分析是否应将集团一分为二：一家独立上市的航运公司，包含马士基航运公司和集团下属的港口码头及物流部门；另一家上市公司则专注石油勘探和钻探业务。这样能让投资者安心，之前他们担心自己的资金被用以支撑亏本部门。瑞士信贷银行的尼尔·格林（Neil Glynn）表示，这不但能提升公司市值，也可以吸引更多潜在投资者。

审视的结果还远未确定，但据信马士基集团很可能最终将更专注于航运这一本业。同时担任马士基航运公司及整个集团首席执行官的施索仁表示希望看到集团收入上升，在这方面其石油部门将难以发挥作用。举例来说，马士基石油天然气公司（Maersk Oil）短期内要面对一个严重的问题：公司在卡塔尔最大海上油田的作业许可证即将在明年七月到期，因而其石油产量到2018年可能会减半。

相反，马士基航运公司则是稳居全球最大船运公司之位。但要从集运业务上提升收入和利润，公司仍需做大量工作。迄今为止，船运企业削减成本的惯用策略是打造联盟。2015年一月，马士基航运公司和地中海航运（MSC）推出共享船只空间的合作计划“2M”。今年四月，另外四家航运企业联手经营，五月又有六家仿效。如今这三大集团占据了近四分之三的全球市场份额。但联盟并没有解决运力过剩的问题，也未能阻止运价下跌。

另一惯常策略是建造更大的货轮。“油价高企时，我们建造更大的船只并率先减速航行，以节省燃油成本。”施索仁的首席运营官兼得力助手索伦·托夫特（Soren Toft）说道。马士基航运建造了20艘巨大的“3E”级集装箱船，每艘可装载近两万个集装箱；其最大的对手，地中海航运和达飞海运集团公司随后效仿。但油价已大幅下跌（在2015年，燃油成本只占马士基航运公司运营成本的不到13%），节省的成本微薄。去年最后一艘3E货轮投入服务后，公司已削减了对新船的订购。

马士基集团的最新大计是对现有货轮做智能化改装。托夫特表示，马士基航运公司将致力通过“数字化时代”的技术更好地利用这些船只。在这个领域，集运业远远落后于航空航天等其他行业。现代客机一天就能生成几TB的数据，而一般货轮要50天才生成1TB的数据。大部分船只甚至没配备基本的传感器来确保舱口在离开港口前已关闭。船舶经纪商旗下的克拉克森研究公司（Clarkson Research）的总裁马丁·斯托普福德（Martin Stopford）说，直至最近，集运业还一直不愿好好利用数据。他说，通过更好地协调船只与岸上交互，这些数据系统可使成本削减多至30%，如今这一点再也不容业界忽视。

马士基航运公司正为收集更多数据而改造船只。去年，公司在集装箱上安装了传感器以追踪其位置及所装载货物。这方便了港口码头处理集装箱，货轮可更迅速地出港、更快地展开下一轮赚钱航程。软件也能提供在船上更高效地摆放集装箱的优化方案。

空置集装箱是另一个耗费成本的问题，据波士顿咨询公司（BCG）的数据，这令集运公司每年耗资高达200亿美元。利用数据应对此问题的不止马士基航运公司。日本邮船公司对查找并利用空箱的技术加以改进，已节省超过一亿美元。去年11月开始运营的新网站xChange能让航运公司互相交换空置集装箱，最大限度地提升效率。

马士基航运公司内部成立三年的分析团队还致力于为其船只研究最佳航速及航线。同时它们还在努力减低庞大的维修开支，希望通过预测性维护尽快实现这一目标——不是等船只引擎出现故障后维修，而是通过传感器及时报告维护需求。

马士基航运公司所做的数字化改革很可能很快就会为行内其他企业仿效。其一家对手公司的高管坦言：“我们就看马士基做什么，然后跟着做。”没有几家航运公司有资源建造更大型的货轮，但即便最小的航运公司也可以学习更好地利用数据。集运业无法单靠数据处理技术走出这场风暴；它们还需要报废船只。但这也许能让航运公司更好地应对下一场风暴。■



The Anthropocene

Dawn of a new epoch?

People may have propelled Earth into a novel episode of geological time

ONE way to think of science is as a series of painful demotions. In the 1500s Nicolaus Copernicus kicked Earth from its perch at the centre of the universe. Later, Charles Darwin showed that humans are just another species of animal. In the 20th century geologists found that all human history amounts to less than an eye-blink in the span of a planet that they discovered is 4.6 billion years old.

Now, though, those geologists' spiritual descendants may give humans an unexpected promotion—to the status of geological movers and shakers. On August 29th Colin Waters, the secretary of the Anthropocene Working Group (AWG), an ad hoc collection of geologists, addressed the International Geological Congress in Cape Town. He told his colleagues that there was a good case for ringing down the curtain on the Holocene—the present geological epoch, which has lasted for 12,000 years—and recognising that Earth has entered a new one, the Anthropocene.

As its name suggests, the point of this new epoch would be to acknowledge that humans, far from being mere passengers on the planet's surface, now fundamentally affect the way it works. That sounds hubristic. But it is not a new idea. It was first promulgated in 2000 by Eugene Stoermer, now deceased, and Paul Crutzen.

Dr Crutzen is an atmospheric chemist, and the growth of carbon-dioxide concentrations in the atmosphere is perhaps the most familiar symptom of the Anthropocene. For instance, acidity in oceans caused by extra CO₂ affects the make-up of creatures whose shells will form Earth's future

limestones. Nitrogen, too, is affected. The process by which this vital element cycles through the air, the soil and living organisms has been turbocharged by human use of artificial fertilisers. One consequence is the expansion of food production. In 1750 about 5% of the Earth's surface was farmed. That figure is now around 50%, and the transformation from wilderness to agricultural land leaves lasting changes in the nature of the soil. On top of this, dams hold back billions of tonnes of silt. As a result, river deltas everywhere are shrinking.

Markers of the Anthropocene will surely be visible in the fossil record. On present trends, numerous species will vanish from that record—exterminated by human activity. Meanwhile, “technofossils” will appear. A favourite for long-term preservation, for example, is the porcelain water closet. New types of mineral may come into existence as a result of things like the deposition of elemental aluminium in the soil (the stuff is unknown in nature) and the settling to the sea bed of zillions of plastic scraps now littering the ocean. Beds of fly ash from power stations may get consolidated into novel rocks. And who knows what refuse tips will look like when buried, compressed and metamorphosed?

The AWG, then, believes that the Anthropocene is real. The next question is how to define it. The traditions of geology demand a clear and sudden change, visible in the rocks. There are several contenders, including the appearance of plastics in the 1950s and the exchange of species between the New and Old Worlds in the 1600s. But most of the AWG's members plumped for the high point of nuclear-weapons testing, in 1964. Fallout from those tests scattered plutonium, an element vanishingly rare in nature, far and wide across the planet. Future geologists, depending on precisely how much time has passed and therefore how much radioactive decay has occurred, will be able to see a layer of plutonium, or of uranium, or (eventually) of lead in the rocks. At the congress, the AWG's members voted for this “bomb spike” to be the marker. That makes the Anthropocene

more than half a century old already.

The next step will be to point to a single piece of the geological record (an ice core, perhaps, or samples from lake sediments) that can serve as the officially accepted reference point. Then the proposal must make its way through several strata of geological bureaucracy, any of which could scupper it. The last step will be a vote at a meeting of the International Union of Geological Sciences. If that passes, then geological time, whose passage is famously slow, will have ticked perceptibly on. ■



人类世

新纪元到来？

人类可能已经推动地球进入了一个全新的地质时期

科学发展的历史也是人类尴尬地遭受一连串贬低的历史。16世纪，哥白尼把地球赶下了宇宙中心的崇高地位。而后，达尔文揭示人类仅仅是又一个动物物种。二十世纪，地质学家发现地球已经存在了46亿年，人类的全部历史在其中还不到一眨眼的瞬间。

然而，这些地质学家的精神后裔如今却可能出乎意料地提升了人类的地位——让人成为了改变地质的主导力量。8月29日，地质学家特设组织“人类世工作组”（Anthropocene Working Group，简称AWG）的秘书长科林·沃特斯（Colin Waters）在开普敦召开的国际地质大会（International Geological Congress）上发表讲话。他告诉同僚，有充足的理由宣告1.2万年以来的地质期“全新世”已经终结，并承认地球已进入一个新的地质世代——“人类世”。

正如其名字所暗示的那样，这一新地质时期的意义，是承认人类如今已经远远不止是地球表面的过客，而是从根本上影响了地球的运行。这听起来狂妄自大，但却并非全新的理念。2000年，尤金·斯托默（Eugene Stoermer，已故）和保罗·克鲁岑（Paul Crutzen）最先提出了这一观点。

克鲁岑博士是一名大气化学家，而空气中二氧化碳浓度的增长可能是“人类世”最为人熟知的特征。比如，过多的二氧化碳导致的海洋酸度影响了生物的构造，这些生物的骨骼将构成地球上未来的石灰岩。氮也受到影响。这种至关重要的元素在空气、土壤和生物体中循环的过程因人类使用人造肥料而被增强。后果之一是食物生产扩大。1750年，地球上约5%的土地是耕地，而现在这一比例约达50%。从荒地到农业用地的转变永久地改变了土壤的特性。除此之外，堤坝阻挡了数十亿吨的泥沙流动，世界各地的河流三角洲都在因此缩减。

化石记录中一定会看到人类世的标志物。按照目前的趋势，大量物种将从化石纪录中消失——它们被人类活动消灭。与此同时将出现“工艺化石”。比如，陶瓷抽水马桶就特别适于长久保存。由于土壤中铝元素（自然界中不存在游离态的铝）的沉积以及目前不计其数的塑料垃圾被抛进海洋沉入海床等原因，可能会形成新的矿物种类。来自发电厂的粉煤灰残渣可能会固化，进而成新型岩石。谁又知道垃圾场被填埋、压缩并变形后会变成什么模样？

人类世工作组因此相信人类世已真实存在，问题在于如何界定它。根据地质学传统，地质新世纪必须能在岩石中看见清晰而突然的变化。目前有几个竞争性的事件，包括20世纪50年代塑料的大规模使用，以及17世纪新世界与旧世界间的物种大交换。但工作组大部分成员都赞成以1964年的核试验高峰作为人类世的开端。那些测试产生的辐射在地球上广泛散播了一种在自然界中极为罕见的元素：钚。未来，地质学家将在岩石中看到一层钚或者一层铀，或者（最终是）一层铅——这要看具体流逝了多少时间从而发生了多少放射性衰变。在本届大会上，人类世工作组成员票选出这一“轰炸高峰”作为识别物。据此，人类世已经存在50多年。

下一步是指定一个可被官方接受为参考物的单件地质记录（可能是一个冰核，也可能是湖泊沉积的取样）。而后，提案须通过地质机构的几层审核——可能被其中任一否决。最后一步是在国际地质科学联合会（International Union of Geological Sciences）的会议上进行投票。如果获得通过，那么地质时间这台出了名缓慢的时钟将发出清晰的滴答声。■



Johnson

Of two minds

The advantages of working in your own language are obvious. Those of working in a foreign one are subtle

MORE and more of the world is working in English. Multinational companies (even those based in places such as Switzerland or Japan) are making it their corporate language. And international bodies like the European Union and the United Nations are doing an ever-greater share of business in the world's new default language. At the office, it's English's world, and every other language is just living in it.

Is this to the English-speaker's advantage? Working in a foreign language is certainly hard. It is easier to argue fluently or to make a point subtly when not trying to call up rarely used vocabulary or construct sentences correctly. English-speakers can try to bulldoze opposing arguments through sheer verbiage, hold the floor to prevent anyone else from getting a word in or lighten the mood with a joke. All of these things are far harder in a foreign language. Non-natives have not one hand, but perhaps a bit of their brains, tied behind their backs. A recent column by Michael Skapinker in the *Financial Times* says that it's important for native English-speakers to learn the skills of talking with non-natives successfully.

But, as Mr Skapinker notes, there are advantages to being a non-native, too. These are subtler—but far from trivial. Non-native speakers may not be able to show off their brilliance easily. It can be an advantage to have your cleverness highly rated, and this is the luck of verbally fluent people around the world. But it is quite often the other way round: it can be a boon to be thought a little dimmer than you really are, giving the element of surprise in a negotiation. And, as an American professor in France tells Johnson, coming from another culture—not just another language—allows

people to notice stumbling blocks and habits of thinking shared by the rest of the natives, and guide a meeting past them. Such heterodox thinking can be wrapped in a bit of disingenuous cluelessness: “I’m not sure how things work here, but I was thinking...”

People working in a language not their own report other perks. Asking for a clarification can buy valuable time or be a useful distraction, says a Russian working at *The Economist*. Speaking slowly allows a non-native to choose just the right word—something most people don’t do when they are excited and emotional. There is a lot to be said for thinking faster than you can speak, rather than the other way round.

Most intriguingly, there may be a feedback loop from speech back into thought. Ingenious researchers have found that sometimes decision-making in a foreign language is actually better. Researchers at the University of Chicago gave subjects a test with certain traps—easy-looking “right” answers that turned out to be wrong. Those taking it in a second language were more likely to avoid the trap and choose the right answer. Fluid thinking, in other words, has its down-side, and deliberateness an advantage. And one of the same researchers found that even in moral decision-making—such as whether it would be acceptable to kill someone with your own hands to save a larger number of lives—people thought in a more utilitarian, less emotional way when tested in a foreign language. An American working in Denmark says he insisted on having salary negotiations in Danish—asking for more in English was excruciating to him.

All this applies regardless of the first language. But in the modern world it is English monoglots in particular who work in their own language, joined by non-native polyglots working in English too. Those non-native speakers can always go away and speak their languages privately before rejoining the English conversation. Hopping from language to language is a constant

reminder of how others might see things differently, notes a Dutch official at the European Commission. (One study found that bilingual children were better at guessing what was in other people's heads, perhaps because they were constantly monitoring who in their world spoke what language.) It was said that Ginger Rogers had to do every step Fred Astaire did, but "backwards, and in high heels". This, unsurprisingly, made her an outstanding dancer.

Indeed, those working in foreign languages are keen to talk about these advantages and disadvantages. Alas, monoglots will never have that chance. Pity those struggling in a second language—but also spare a thought for those many monoglots who have no way of knowing what they are missing. ■



约翰逊

两种心思

以母语工作的好处显而易见。以外语工作的好处则微妙难言

世界上越来越多的人用英语工作。跨国公司（即便是总部设在瑞士或日本等地）会以英语作为公司语言。欧盟和联合国之类的国际机构有越来越多的事用这一新的世界默认语言完成。办公室成了英语的世界，其他任何语言都只是存在其中而已。

这对说英语的人来说是优势吗？以外语工作自然十分困难。若无需回想极少使用的词汇，或者不必花费心思正确造句，则更容易流利地表达思想或微妙地阐明观点。说英语的人可以堆砌纯粹的废话压倒反对的观点，口若悬河以免别人插进一个词，或者说个笑话缓解气氛。所有这些要是用外语就难得多。非母语者被束缚的并不是手脚，而可能是一点脑子。迈克尔·斯卡平克（Michael Skapinker）最近在《金融时报》的专栏中写道，对于母语是英语的人来说，学习和非母语者成功交谈的技巧非常重要。

但是，斯卡平克强调非母语者也有优势。这些优势较为微妙，但远非微不足道。非母语者可能无法轻易炫耀自己的卓越才华。聪颖能得到高度评价是一种优势；就此而言，世界各地言语流利的人是幸运的。但其实往往相反：若能被人认为自己比实际更迟钝一些，未尝不是一种福分，在谈判中这可以出其不意。而且，正如一位美国教授在法国告诉本专栏记者的那样，来自另一种文化（不只是另一种语言）能让人发现其他母语者共有的绊脚石和思维习惯，进而引导会议绕过这些障碍。这样非正统的想法可以用一丝狡猾的无知为掩护：“这里怎么做的我不知道，但依我想……”

以非母语工作的人还有其他的好处。在本刊工作的一位俄罗斯人就说，请人说说清楚能赢得宝贵的时间，也可以是分散注意力的好办法。细声慢语让非母语者能选择最恰当的用词，大部分人激动或者情绪化的时候可不会这么做。脑子转的比嘴快是件好事，但反过来就不是了。

最耐人寻味的是，从话语到思想可能有一个反馈回路。聪明的研究人员已经发现有时用外语做决定其实更好。芝加哥大学的研究人员让研究对象接受了一项带有某些陷阱的测试，有些看似正确的答案其实是错误的。以第二语言参加测试的人避免掉入陷阱、选择正确答案的可能性更大。换句话说，思维流畅有它的缺点，而深思熟虑有其优势。这群研究人员中还有人发现即便是在道德选择中，如亲手杀死一个人来解救更多人的生命是否可以接受，用外语接受测试的人也会以更功利实用而不那么情绪化的方式思考。一个在丹麦工作的美国人说在薪资谈判时他坚持用丹麦语，用英语要求更多薪水对他来说是一种折磨。

无论第一语言是什么，这些都适用。但在现代世界里，只会英语的人以母语工作，通晓数国语言的非英语母语的人也用英语工作。那些非母语人士总是可以抽身出去，私下以他们自己的语言交谈，再回到英语对话中。一位在欧盟委员会工作的荷兰官员说，从一种语言跳到另一种语言会不断提醒你别人看问题的方式可能有所不同。（一项研究显示会双语的孩子更会猜测别人的心思，可能因为他们不停在关注他们的世界里谁在说什么语言。）据说金吉·罗杰斯（Ginger Rogers）要对弗雷德·阿斯泰尔（Fred Astaire）亦步亦趋，但是要“反过来做，穿上高跟鞋”。【译注：罗杰斯和阿尔泰斯都是美国上世纪三四十年代活跃的电影演员、舞台剧演员、歌手，二人以默契合作而知名。】毫不意外，这让她成为了一名出色的舞蹈家。

的确，用外语工作的人热衷于讨论这些优点和缺点。唉，只会一种语言的人可没这样的机会。可怜可怜那些在第二语言中挣扎的人吧，但也关心关心那么多只会一种语言的人，他们永远也不知道自己错过了些什么。 ■



A tale of technology

Highs and lows

The strange story of the Iridium project and how it was brought back from the dead

IRIDIUM was among the most ambitious projects in the history of technology. Yet it soon led to one of the world's biggest bankruptcies. Today, 17 years on, Iridium is a remarkable comeback story: a global communications tool of last resort for soldiers, sailors and others who happen to find themselves in the nine-tenths of the world that does not have terrestrial mobile-phone reception and probably never will. The company has nearly 800,000 paying customers who generate annual revenues of more than \$400m.

In the early 1990s global satellite-phone systems had investors enthralled. No fewer than ten different constellations of these systems were supposed to be built, each costing billions of dollars. If all had been launched as planned, the skies would now be teeming with what are essentially flying wireless base stations.

The most ambitious of them all, technically, was Iridium. Instead of plastering the Earth with millions of antennae, the idea went, why not put them on a constellation of satellites that could cover the entire planet with a wireless signal? John Bloom's "Eccentric Orbits", an exhaustive account of the plan, shows how after years of research in the late 1980s, three talented engineers at Motorola, a tech giant, found an impressive solution: 66 satellites in low orbits. Each would move at nearly 17,000 miles (27,360km) an hour 485 miles above the planet. Despite the speed, they could still communicate with each other and with handsets anywhere on Earth, meaning that a call could be routed around the planet without using a terrestrial network.

The launch of the constellation took place without major hiccup. The technology worked largely as planned, too. But as a business Iridium was a disaster: less than a year after the first commercial call the company filed for bankruptcy. It was done for by its big phones with their even bigger antennae, costing \$3,795 each, calling costs of \$4 per minute and a much cheaper terrestrial mobile-phone system. By the time its bosses went to the bankruptcy court in August 1999, Iridium had cost more than \$6 billion to build. It had just 63,000 customers and revenues of a few million.

Not surprisingly, no deep-pocketed buyer emerged. Motorola, Iridium's biggest shareholder and operator, would have unceremoniously destroyed the constellation had it not been for Dan Colussy, an American businessman who had previously worked for Pan Am, a now-defunct airline, and restructured United Nuclear Corporation. Almost single-handedly he persuaded a hotch-potch of investors (including an elusive Saudi prince and an American media mogul), Motorola, the Pentagon and ultimately the White House to give Iridium a second chance. In November 2000 Mr Colussy took control of Iridium for \$25m.

The side plots in the book are even more interesting. One is the role of America's military-industrial complex. Iridium would never have seen the light of day without defence spending. The communications system that links the satellites was a child of Ronald Reagan's "Star Wars" programme. The Pentagon, which needed a portable system to communicate with troops, signed a sizeable contract that allowed Mr Colussy to convince his colleagues to invest. Incidentally, Iridium seems also to be a great global surveillance tool, suggests Mr Bloom: half-a-dozen "government operatives" were stationed at the control centre of the reborn company. ("Colussy didn't know exactly what they did, and didn't want to know," he writes.)

Iridium is also a stark reminder of how rapidly tech giants can decline. A

pioneer of everything from car radios to mobile phones, Motorola had been the Apple of its time. But by the time it launched the satellites, it had become a company dominated by lawyers and accountants. When it set up Iridium as a separate company, Motorola burdened the firm with a monthly operations charge of \$45m—and refused to reduce it even in the face of mounting financial troubles.

Chance too played an important role in Iridium. Only off-the-shelf parts were used for the satellites, which meant that they were equipped with a fuel tank that holds about eight times as much as needed. But engineers then filled them up to the limit, a big reason why the constellation has survived until now, instead of having to be replaced after a few years. Similarly, if Mr Colussy had not joined a friend on his yacht and listened to complaints that his Iridium phone had stopped working because of Motorola's de-orbiting plans, he would probably never have thought about buying the system.

Could the world, under the right circumstances, have ended up dominated by wireless phone systems in the sky, rather than on Earth—the original vision behind Iridium and other such systems? Perhaps. But it is hard to imagine a constellation of satellites big enough to serve billions of smartphones and other untethered devices that exist now. Instead of competing with mobile networks, satellite-phone systems have become a complement.

Most important, the Iridium story will not be over when the original constellation finally starts falling out of the sky at the end of the decade. The firm plans to launch the first next-generation satellites in September—thanks to the French government, which has guaranteed the financing. Exhausting details aside, "Eccentric Orbits" not only offers good corporate drama, but is an enlightening narrative of how new communications infrastructures often come about: with a lot of luck,

government help and investors who do not ask too many questions. ■



技术传奇

起起落落

关于铱星计划及其起死回生历程的离奇故事

铱星计划曾是技术史上最宏伟的计划之一，然而它也很快便引发了世界上最严重的一次破产。17年后的今天，铱星公司卷土重来，引人瞩目：在无法获得正常通讯服务时，这个全球通讯工具就成为了一些人最后可依赖的通信手段。他们当中包括士兵、水手及其他发觉自己所在之地没有地面移动电话信号的人。如今全世界仍有十分之九的地方还没有地面移动电话信号，很可能将来也不会有。这家公司现在拥有近80万付费用户，每年能带来超过4亿美元的收入。

上世纪九十年代初，全球卫星电话系统让投资者们沉醉不已。据估计当时计划建造的各种卫星星群不下十个，每个都造价数十亿美元。假如当初所有的星群都按计划发射了，如今的天空将会遍布会飞的无线基站。

它们当中在技术上最富雄心壮志的便是铱星公司。它的理念是，与其在地球表面安装数百万个天线，为什么不将天线安放在一个卫星星群上？卫星星群发出的无线电信号足以覆盖整个地球。约翰·布鲁姆（John Bloom）的《轨道卫星》详尽无遗地记述了这一计划。书中讲述道，上世纪八十年代后期，来自科技巨头摩托罗拉的三位富于才干的工程师通过多年的研究得出了一个令人赞叹的解决方案：66颗低轨道卫星。每一颗卫星都会在离地球485公里的高度以每小时近1.7万英里（27360公里）的速度飞行。即使是这样的速度，也可以实现卫星之间的通讯，卫星也可以同地面任何地方的电话联络。这意味着无需地面网络，一通电话就可以漫游地球。

卫星星群的发射并未经历太大的波折，技术大致上也按计划得以实现。但在商业运营上铱星公司却遭遇惨败：在开通了第一通商用电话后不到一年，公司即申请破产。它所生产的大部头电话配上个头更大的天线，每台成本为3795美元，每分钟的通话成本也高达4美元，而地面移动电话系统则便宜得多。这些因素击垮了铱星公司。1998年8月铱星的老板走上破产

法庭时，打造铱星系统已耗资逾60亿美元。可那时铱星只有6.3万个客户，及几百万美元的营收。

毫不意外，当时并没有财力雄厚的买家出现。若不是因为丹·库罗西（Dan Colussy），铱星公司最大的股东及运营者摩托罗拉很可能就会将卫星星群草草摧毁了事。库罗西是个美国商人，曾供职于现已不复存在的泛美航空，还曾重组了联合核能公司（United Nuclear Corporation）。他几乎是凭一己之力，成功说服了一群形形色色的投资人（包括一位神秘的沙特王子和一位美国传媒业大亨）、摩托罗拉、五角大楼，最终还说服了白宫，使铱星公司又获得了一次机会。2000年11月，库罗西以2500万美元的价格取得了铱星的控制权。

这本书的旁枝末节还要更有趣。其中一则讲述了美国军工复合体所扮演的角色。要是没有国防预算，铱星公司可能永远也不会获得一线生机。将卫星彼此连接起来的通讯系统则是罗纳德·里根总统“星球大战”计划的产物。五角大楼需要一个便携系统与军队联络，便与铱星签下了一份大为可观的合约。这让库罗西得以说服他的同事们进行投资。库罗西暗示，铱星系统不经意间还成为了进行全球监视的有力工具：在这家重获新生的公司中，有五六位“政府的特工人员”被派驻在控制中心。（作者写道：“库罗西并不知道他们到底在做什么，也不想知道。”）

铱星计划也让人们清楚地认识到，科技巨头的陨落可以有多么迅速。从车载收音机到移动电话，摩托罗拉曾是一切事物的开拓者，那时的它相当于现在的苹果。但当卫星发射升空后，摩托罗拉已变成一家由律师和会计师所掌控的公司。当它将铱星剥离成为一家独立的公司后，摩托罗拉令其承担每月4500万美元的运营费用。即使其财务困境愈演愈烈，摩托罗拉也拒绝削减这项支出。

偶然因素也在铱星计划中起了重要作用。卫星只使用了可以购得的现成零部件，这就意味着卫星所配备的燃料箱的实际容积大约是卫星所需燃料的八倍。尽管如此，工程师们还是将燃料箱装得满得不能再满，这是卫星星群之所以能运行到现在而不是用上几年就要更换的一个重要原因。同样，

库罗西要是没到朋友的游艇上，没听到他抱怨摩托罗拉的撒星计划让自己的铱星电话不能用了，他很可能就不会想到要去买下这套系统。

如果当初境况顺遂，主导世界的会不会就是天空中的无线电话系统，而非地面系统——就像铱星及其他类似系统最初所设想的那样？可能会。但很难想象会有哪个卫星星群大到足以服务现存的数十亿部智能手机和其他不依赖网络共享的设备。卫星电话系统不再与移动网络抗衡，而是成为了它的补充。

最重要的是，即使这个十年快结束时最初的卫星星群会开始从天空中坠落，铱星的故事也不会完结。有了法国政府在财政上的保证，铱星公司计划在9月发射第一批新一代的卫星。抛却各种纷繁冗杂的细节，《轨道卫星》一书不仅呈现了精彩的商业大戏，其对新型通讯基础设施成型过程的叙述也给人以启迪：很多的好运气，来自政府的帮助，以及不会问太多问题的投资人。■



Schumpeter

Be nice to nerds

Forget the cool kids. Geeks are now shaping new products and services

FIVE years ago Zach Sims, a sprightly, striving 21-year-old, launched Codeacademy, a startup, to offer online courses about how to write software. He remembers pitching his idea to prospective investors only to hear a “chorus of no”. At the time, the naysayers thought coding was a weird, fringe activity for computer-science geeks. They were wrong. Since 2011, more than 25m people have signed up for Codeacademy. Meanwhile, in-person crash courses that teach computer programming, called coding boot-camps, have spread worldwide, as more people aspire to tech jobs or running their own startup. This year tuition fees at these boot-camps will reach around \$200m in America alone.

“Be nice to nerds. Chances are you may end up working for them,” wrote Charles Sykes, author of the book “50 Rules Kids Won’t Learn in School”, first published in 2007. Today there are more reasons than ever to treat nerds with respect: never mind the fact that every company is clamouring to hire them, geeks are starting to shape markets for new products and services.

Stephen O’Grady of RedMonk, a consultancy, calls developers the “new kingmakers”: they are driving decisions about the technology that their companies use to an extent that has never before been possible. From personal computers to social-media companies like Twitter and Facebook, many gadgets and platforms started out with curious tech enthusiasts experimenting in their garage or dorm room, only to turn into mainstream hits. Slack, a two-year-old messaging firm that aims to displace e-mail, started as a tool for software developers to communicate with one another before it spread to other functions and companies.

But nerds' influence now goes well beyond technology. They hold greater cultural sway. "Silicon Valley", a show on HBO which will soon start filming its fourth season, presents the "brogrammer" startup culture in all its grit and glory, and suggests that mass audiences are transfixed by what really happens behind closed (garage) doors. Techies in San Francisco don not only hoodies but also T-shirts with "GΣΣK" emblazoned on the front. Those too risk-averse to become university dropouts like Microsoft's Bill Gates and Mark Zuckerberg of Facebook rush in rising numbers to Silicon Valley as soon as they graduate, forsaking careers on Wall Street to code their way into the 1%.

Nerds carry more clout in part because their ranks have swelled. IDC, a research firm, estimates there are now around 20m professional and hobbyist software developers worldwide; that is probably low. Geeky, addictive video games are drawing more into the fold. Each month at least 70m people play "League of Legends", a complex multiplayer online game; that is more than play baseball, softball or tennis worldwide.

As a result, companies had better pay attention to the rise of a "nerd economy" that stretches well beyond their direct technology needs. Venture capitalists were first to pick up on this. Chris Dixon of Andreessen Horowitz, a Silicon Valley venture-capital firm, says he is constantly watching "what the smartest people are doing on the weekends", because it hints at what the mainstream will be up to in ten years' time. With this rationale, Andreessen Horowitz has invested in various gadgets and products that early adopters have embraced, including a nutrient-rich drinkable meal for engineers too busy to take a break from coding, called Soylent. Another investment is in a company called Nootrobox, which makes chewable coffee for people too lazy or antisocial to order a liquid shot from a barista. The "mouth of the cultural river" has shifted from New York and Los Angeles to San Francisco, says Mr Dixon.

Not only nerd food has won venture capitalists' attention, but also their fashion choices. Warby Parker, a glasses firm, and Stance, a startup that makes bright, geeky socks, have attracted \$200m in venture capital. Both cater to techies as well as the fashion-aware (the line between hipster and nerd can be fuzzy). The "sharing economy", exemplified by Lyft and Airbnb, also was originally a nerd thing: they prefer renting to buying stuff.

Incumbent businesses, too, have started to take their cue from all this nerdiness. Brands like Mountain Dew and Doritos have sponsored video-game competitions and "rodeos" where competitors race drones around stadiums. By intrepidly going where the nerds go, brands hope to get some credibility. "Hackathons", where companies invite prospective and current employees to stay up all night, eat pizza and code, are de rigueur as a means to recruit engineers. Even very traditional companies like MasterCard and Disney have started to hold them.

Sometimes, however, it can all be a bit embarrassing. GE, an industrial giant, has run a television ad campaign about how it hires software developers that feels as awkward to watch as an engineer trying to do stand-up comedy for the first time. Haagen-Dazs, an ice cream-maker, has put up billboards in San Francisco that proudly declare "We're a 56-year-old startup" and present the written recipe for vanilla ice cream as if it were code.

| *It's all geek to me*

As the success of Pokémon Go, an augmented-reality game, shows, there can be big profits in the avant-garde areas where nerds like to experiment. Unfortunately, trying to observe and appeal to nerds is not a sure-fire strategy. Not every product or pastime embraced by software engineers will become a hit. "Brogrammers" may embrace Soylent and Nootrobox. But your correspondent, who has tried both to her stomach's displeasure, is sceptical on whether they will ever be a match for solid food and hot coffee.

And if they try too hard to speak geek, large companies will come off as inauthentic and alienating, exactly what they were trying not to be. Nerds may be a powerful commercial force, but many of them harbour disdain for big brands and overt marketing. Firms will have to try hard to send a cool, coded message. ■



熊彼特

善待怪才

忘掉那些酷炫的小孩吧，极客们正在塑造新产品和服务

五年前，21岁的扎克·西姆斯（Zach Sims）活力充沛、拼劲十足。他创建了Codecademy，提供编写软件的在线课程。他记得向潜在投资者推介想法时只听到“一片否定之声”。当时，反对者认为编程是计算机极客专属的奇特小众活动，但他们错了。自2011年以来，在Codecademy注册报读课程的人数已经超过了2500万。同时，随着越来越多人有志于投身高科技职位或者自己创业，被称为“编程新手营”的计算机编程面授速成班已在全球兴起。单在美国，这些训练营的学费收入今年就将达两亿美元。

“善待怪才。你很可能最终得为他们工作。”查尔斯·赛克斯（Charles Sykes）如此写道。他是2007年首次出版的《学校学不到的50条法则》（50 Rules Kids Won't Learn in School）一书的作者。今天我们有更多的理由敬重怪才：不但每家公司都争相聘用他们，而且极客们已开始塑造新产品和服务的市场。

咨询公司RedMonk的斯蒂芬·奥格雷迪（Stephen O'Grady）称开发人员为“新的拥立国王者”：他们正以前所未有的程度掌控着企业对所用科技的决策。从个人电脑到Twitter和Facebook等社交媒体，许多科技产品及平台最初都源于爱探究的技术发烧友在自家车库或宿舍捣鼓的实验，最终变成主流的大热项目。成立仅两年、旨在取代电子邮件的通讯公司Slack一开始只是软件开发者互相通讯的工具，之后才扩展至其他功能及公司。

然而，怪才的影响力现已大大超越了技术的范畴，他们在文化上变也得更举足轻重。美国HBO的电视剧《硅谷》（Silicon Valley）很快将开拍第四季，该剧呈现了“爷们程序员”（brogrammer，意指善于社交、时尚酷感的新型程序员）创业氛围的苦与乐，也表明广大观众着迷于（车库）门背后的内幕故事。旧金山的技术怪才们不但会穿连帽衫，也会穿胸前绣有“GΣΣK”字样的T恤衫。越来越多的大学生虽不敢像微软的比尔·盖茨和

Facebook的马克·扎克伯格那样辍学，却也一毕业就奔往硅谷。他们放弃在华尔街奔前程，转投编程事业以期挤进顶尖的1%。

怪才的影响力增长，一定程度上是由于其队伍的壮大。研究公司IDC估计，现在全球约有2000万专业及业余软件开发人员。这个数字很可能偏低了。令人沉迷其中的技术型电子游戏正吸引越来越多的人进入这一行列。每个月至少有7000万人在玩《英雄联盟》这一复杂的多人网络游戏，比全世界玩棒球、垒球或者网球的人还要多。

其结果是，公司最好留心“怪才经济”的崛起——其影响范围早已超越直接的技术需求。最早觉察这一趋势的是风投家们。硅谷风投公司安德森-霍洛维茨（Andreessen Horowitz）的克里斯·迪克森（Chris Dixon）表示一直在关注“最聪明的那些人周末都在做些什么”，因为那暗示着十年之后主流社会的发展方向。按此思路，安德森-霍洛维茨已投资了许多受早期尝鲜者青睐的装置和产品，包括一款名为“Soylent”、富含营养的饮用食品，专为忙于编程无暇用餐的工程师们而设计。还有一笔资金投向制造咀嚼型咖啡的Nootrobox公司，其产品面向那些因太懒或不愿交际而不从咖啡店买液体咖啡的人。迪克森说，“文化河口”已从纽约和洛杉矶转移到旧金山。

赢得风投家关注的不仅有怪才偏爱的食品，还有他们的穿着时尚。眼镜公司瓦尔比派克（Warby Parker）及制造艳丽奇异袜子的创业公司Stance已融得2000万美元的风险投资。两者都面向极客人群及具有时尚嗅觉的人士（潮人和怪才之间的界限有时很模糊）。以Lyft和Airbnb为代表的“共享经济”也是源于小众怪咖：他们更喜欢租用而非购买物品。

传统企业也已开始从这些怪异潮流中得到启示。激浪（Mountain Dew）和多力多滋（Doritos）等品牌开始赞助电子游戏竞赛，以及在场馆内进行的无人机竞速比赛。这些品牌希望通过大胆跟随怪才的步伐来赢得他们的信任。邀请在职员工及有意加入的人士通宵吃披萨写代码的“黑客马拉松”已成为公司招募工程师的流行做法。连万事达和迪士尼这样极为传统的企业也开始举办此类活动。

不过有些时候这也会弄得有点尴尬。工业巨头通用电气投放了介绍其如何聘用软件开发人员的电视广告，看上去就像一位工程师初次说单口相声般蹩脚。冰激淋制造商哈根达斯在旧金山树立起广告牌，自豪地宣称“我们是具56年历史的创业公司”，并把香草冰激淋的配方像代码一样展示出来。

| 极客世界我不懂

正如增强现实游戏《精灵宝可梦GO》（Pokémon GO）的成功所展示的那样，怪才喜欢探索的前卫领域可能会创造丰厚的利润。但不幸的是，紧盯怪才并迎合他们并非万全之策。软件工程师们推崇的产品或消遣不一定都能一炮而红。“爷们程序员”或许喜欢Soylent和Nootrobox，但笔者亲身体验发现，两者口味都不敢恭维，令人深深怀疑其是否真的能与固体食物和热咖啡一较高下。

假如大公司过于刻意地以极客自居，便会显得矫揉造作，令人难以接近，而这恰恰有违其初衷。怪才也许是强大的商业力量，但他们中许多人对大品牌 and 过度营销心怀厌恶。企业传递的信息不但要酷，还要如代码般含蓄得体。 ■



Machine learning

Of prediction and policy

Governments have much to gain from applying algorithms to public policy, but controversies loom

FOR frazzled teachers struggling to decide what to watch on an evening off, help is at hand. An online streaming service's software predicts what they might enjoy, based on the past choices of similar people. When those same teachers try to work out which children are most at risk of dropping out of school, they get no such aid. But, as Sendhil Mullainathan of Harvard University notes, these types of problem are alike. They require predictions based, implicitly or explicitly, on lots of data. Many areas of policy, he suggests, could do with a dose of machine learning.

Machine-learning systems excel at prediction. A common approach is to train a system by showing it a vast quantity of data on, say, students and their achievements. The software chews through the examples and learns which characteristics are most helpful in predicting whether a student will drop out. Once trained, it can study a different group and accurately pick those at risk. By helping to allocate scarce public funds more accurately, machine learning could save governments significant sums. According to Stephen Goldsmith, a professor at Harvard and a former mayor of Indianapolis, it could also transform almost every sector of public policy.

In hospitals, for instance, doctors try to predict heart attacks so they can act before it is too late. Manual systems correctly predict around 30%. A machine-learning algorithm created by Sriram Somanchi of Carnegie Mellon University and colleagues, and tested on historic data, predicted 80%—four hours in advance of the event, in theory giving time to intervene.

Policing may be helped, too. Last year a policeman in Texas, who had responded to two suicide calls that day, was dispatched to a children's pool party and ended up pulling out his gun. Ideally, the station would have sent a less stressed officer. Many police chiefs already have a simple system to flag "at risk" officers. No one can be sure that machine learning would have prevented the Texas scare. But a system developed by Rayid Ghani at the University of Chicago and others increases the correctness of at-risk predictions by 12% and reduces the incorrect labelling of officers as being at risk by a third. It is now being used by the Charlotte-Mecklenburg police department in North Carolina.

Chicago's Department of Public Health is another early adopter. It used to identify children with dangerous levels of lead in their bodies through blood tests and then cleanse their homes of lead paint. Now it tries to spot vulnerable youngsters before they are poisoned. And in India, Microsoft and the state government of Andhra Pradesh are helping farmers choose the best time to sow their seeds. In August, eyeing new government contracts, Microsoft held its first machine-learning and data-science conference in Bangalore.

But the case for code is not always clear-cut. Many American judges are given "risk assessments", generated by software, which predict the likelihood of a person committing another crime. These are used in bail, parole and (most controversially) sentencing decisions. But this year *ProPublica*, an investigative-journalism group, concluded that in Broward County, Florida, an algorithm wrongly labelled black people as future criminals nearly twice as often as whites. (Northpointe, the algorithm provider, disputes the finding.)

To limit potential bias, Mr Ghani says, avoid prejudice in the training data and set machines the right goals. Machines are trained to find patterns that predict future criminality from past data. They can therefore be told to find

patterns that both predict criminality and avoid disproportionate false categorisation of blacks (and others) as future offenders. When a new defendant is tested against these patterns, the risk of racial skewing should be lower.

Bail decisions, in which judges estimate the risk of a prisoner fleeing or offending before trial, seem particularly ripe for help. Jens Ludwig of the University of Chicago and his colleagues claim that their algorithm, tested on a sample of past cases, would have yielded around 20% less crime (see chart), while leaving the number of releases unchanged. A similar reduction nationwide, they suggest, would require an extra 20,000 police officers at a cost of \$2.6 billion. The White House is taking notice. Better bail decisions are a big priority of its Data-Driven Justice Initiative, which 67 states, cities and counties signed in June.

Still, people want to know how decisions that affect them are made. The European Union is considering giving citizens affected by algorithmic decisions the right to an explanation. “Transparency, transparency, transparency” is needed, says Jay Stanley of the American Civil Liberties Union. But private companies may be loth to divulge their special sauce. For Boston’s chief information officer, Jascha Franklin-Hodge, that is a motivation to develop machine learning in-house. Analytical skills, however, are scarce.

Other obstacles may also slow adoption. Getting enough data for a project can be hard. Combining supposedly confidential data sets can heighten the risk of accidentally identifying individuals. Some applications may be thought unethical. Mr Mullainathan and his colleagues show that machine learning can help predict the risk of death. That could, say, help focus hip replacements on those likely to live longest. Some may think that a step too far.

Prediction is anyway probabilistic, not perfect. Officials still have to act. Getting rid of lead paint may be easy; even with clever algorithms, stopping traumatised policemen from drawing their guns is not. For governments that embrace machine learning, the future will depend on how well they marry its predictive power with old-fashioned human wisdom. ■



机器学习

关于预测与政策

在制定公共政策时引入算法，政府会获益颇多，但争议也日益显现

精疲力竭的老师们得了一晚的闲功夫，却不知看点什么来打发时间？有人能帮得上忙。一家在线流媒体服务商的软件可根据类似人群过去的选择预测老师们可能会愿意看什么内容。但是这些老师如果试图找出哪些孩子最有可能面临辍学的危险，却不能得到类似形式的帮助。不过，哈佛大学的桑希尔·穆莱纳桑（Sendhil Mullainathan）注意到，上述问题有着相似之处——它们都需直接或间接地依据大量数据作出预测。他认为，很多领域的政策制定都可以多少借助些机器学习的帮助。

机器学习系统善于作出预测。为了训练系统，一个常用的方法是向其展示大量数据，如学生信息及其成绩。软件会仔细分析这些数据，并探明哪些特征在预测一个学生是否有可能辍学时帮助最大。一旦训练完毕，机器学习系统还可对另一学生群体进行研究，并在其中准确地识别出有辍学风险的人。机器学习通过帮助政府更精准地分配公共基金，可能会节省下大笔经费。曾任印第安纳波利斯市长的哈佛大学教授史蒂芬·戈德史密斯（Stephen Goldsmith）认为，机器学习或许可以变革公共政策的每个领域。

例如，在医院里，医生们力图预知病人何时会心脏病发作，以便提前诊治。手动系统正确预测的比例是30%左右。卡内基梅隆大学的斯里拉姆·索曼奇（Sriram Somanchi）及同事们创建的机器学习算法对历史数据进行测试，预测的准确率达80%，并可在病发前四小时得出结果，理论上可予以医生介入的时间。

机器学习或许还可为警务工作提供帮助。去年，德克萨斯州的一名警察被派往一个由青少年举行的泳池派对，结果却拔出了枪——当天这名警察刚处理过两通与自杀有关的电话。按理说，警察局本应派一位压力不那么大的警察前去才对。已有很多警察局长开始使用一种简单的系统来标记“有

危机的”警官。没人能确定机器学习原本可以阻止德州的恐慌事件，但雷伊德·甘尼（Rayid Ghani）于芝加哥大学开发的系统及其他类似系统将风险预测方面的准确率提高了12%，将警官误标记为有危机的情况也减少了三分之一。目前北卡罗来纳州的夏洛特-梅克伦堡警察局（Charlotte-Mecklenburg police department）已在使用这个系统。

芝加哥公共卫生局（CDPH）也较早采用了机器学习系统。该部门过去常利用血检来识别体内铅含量已达危险水平的儿童，并随后将他们家中含铅的油漆清除干净。现在，该部门正尝试在易受毒害的青少年中毒前就将他们找出来。在印度，微软与安得拉邦（Andhra Pradesh）政府也在帮助农民选择播种的最佳时机。八月，微软在班加罗尔举办了首次机器学习与数据科学大会，以期与政府订立新合同。

但机器学习在法规上的应用就没那么明晰无误了。在美国，许多法官会收到由软件生成的“风险评估”报告，可用以预测一个人再次犯案的可能性。它们还被用来帮助决定保释、假释以及判决（这一点最具争议）。但是今年新闻调查机构ProPublica发现，在佛罗里达州的布劳沃德县（Broward County），一种算法错误地将黑人犯罪的可能性预测为将近白人的两倍。（该算法提供者Northpointe对此调查结果并不认同。）

甘尼指出，为了遏制潜在的偏差，训练系统时所采用的数据应避免偏见，并为机器设立正确的目标。对机器进行训练是为了从过去的数据中找出可预测犯罪发生的规律，因而可以命令机器去寻找那些既能预测犯罪，又不会以错误的比例将黑人（及其他人种）归为潜在犯罪者的规律。当一名新被告与这些规律进行比对测试，造成种族偏见的风险应该会低些。

在做保释决定时，法官会评估一名犯人在审讯前出逃或犯罪的风险；这方面似乎尤其到了该寻求帮助的时候。芝加哥大学的延斯·路德维格（Jens Ludwig）及其同事们称他们的算法就过往的案例样本进行了测试，应该会将犯罪数量减少20%（见图表），同时保持获得保释的犯人人数的不变。他们还指出，若想在全美范围内将犯罪数量减少至类似水平，需额外组织两万人的警力，且会耗资26亿美元。这引起了白宫的注意。六月，67个

州、城市及县签订了“用数据驱动司法公正”的倡议，更好地下达保释决定便是这一倡议的重中之重。

然而，人们还是想知道那些能对他们产生影响的决定是如何做出的。对于那些受算法所做决定影响的公民，欧盟正考虑赋予其寻求解释的权利。美国公民自由联盟（American Civil Liberties Union）的杰伊·斯坦利说道，人们需要的是“透明，透明，还是透明”。但各家私营企业也许并不愿透漏自己的“独门秘笈”。在波士顿的首席信息官亚沙·富兰克林-霍奇（Jascha Franklin-Hodge）看来，正是出于这一原因，这些企业选择内部开发机器学习。然而，有分析能力的人员颇为难找。

其他一些障碍也有可能延缓采用机器学习的进程。为一个项目获取足够的数据并非易事，将本应是机密的数据集集中起来也许会提高个人信息被意外暴露的风险。有些数据的使用也许还有不道德之嫌。穆莱纳桑及同事们还表示，机器学习可以帮助预测死亡的危险。有了这个“功能”，便可优先为那些最有可能活得久的人进行髋关节置换手术。有些人会认为这种做法未免太过分。

不过，预测只能揭示可能性，并不完美。官员们仍需有所行动。清除含铅油漆也许并不难，阻止遭受创伤的警察们拔枪却不容易，即使有最高明的算法帮助也是如此。对于那些积极拥抱机器学习的政府来说，将来情形会如何，就要看它们将机器学习的预测能力与传统的人类智慧结合得有多好了。■



Satellites

The small and the many

Flocks of cheap little satellites could transform the space business

ROCKETS are the thrilling, spectacular bit of space flight. But without something useful to carry they are basically just fireworks. To get a sense of the new entrepreneurial approach to unearthy enterprise, start instead with the radical changes in what it takes to make a spacecraft.

In Palo Alto, California, there is a factory that has been making spacecraft since the year Sputnik was launched, and before anyone in Palo Alto had heard of Silicon Valley. SSL, previously known as Space Systems/Loral, has built more than 100 communications satellites, of which 81 are still in operation today. The dozen or so currently spread through this warren of clean rooms the height of cathedral naves represent more than a year of the company's order book.

They are all based on the same structure: a cylinder 1.2 metres across enclosed in a square box. The more the satellite has to do, the taller the box it is built on, the longer its solar panels and the larger and more complex the array of antennae and reflectors through which it sends data to its earthbound clients. Sky Muster II, nearing completion, is among the biggest. Designed to provide broadband communications across the less densely populated parts of Australia, it stands nine metres tall, with a complex array of reflectors tailored to serve the outback.

The communications-satellite business is dominated by four operators, Eutelsat, Inmarsat, Intelsat and SES. They make most of their money from companies that want to send television signals to people's homes, but also serve markets for data transfer and mobile communications. They demand ever more of the handful of aerospace companies like SSL that have the

expertise to compete for their custom, says Paul Estey, head of engineering and operations at the factory.

The industry is innovative but also very loss-averse. The smallest of the SSL communications satellites may sell for \$100m or so, the biggest for perhaps three times that. Add on \$100m for the launcher, and the satellite may not start showing a profit for a decade. Because of the need for a long lifetime in a hostile environment with no chance of any repair, a new technology that carries any significant risk will simply not be flown.

An hour's drive up Route 101 you will find a very different spacecraft factory. Planet, until recently known as Planet Labs, occupies a shabby-chic building in the South of Market area of San Francisco. A room the size of a largish Starbucks on the ground floor houses the desks and tools needed to build 30cm-long satellites each weighing about five kilos. If you know what to look for, you will recognise many of the components as coming from other sorts of device, most notably smartphones. Making one of these "Doves" (pictured), as Planet calls them, takes about a week. At the back of the room there are dozens packed up ready to be shipped off. This is the new face of space: small objects, large numbers.

Doves are part of an extended family of very small satellites known as cubesats. In the late 1990s researchers at Stanford University and California Polytechnic State University in San Luis Obispo realised that a certain amount of standardisation would make very small satellites much easier to launch. They came up with a standard called the "1U" cubesat: a box 10cm by 10cm by 11.5cm with electronic and physical interfaces that would allow it to fit alongside others of its ilk in a dispenser that could fly as a "secondary payload" (launchers often have more capacity than they need for their main cargo). The standard caught on. By early 2013 some 100 cubesats had flown, and the tools required to design and build one were so well developed that a class of schoolchildren with an inspired teacher

could take on the task.

Planet's founders, Chris Boshuizen, Will Marshall and Robbie Schingler, thought cubesats might be the basis of a business. While working at NASA's Ames Research Centre in the early 2010s, they looked at what could be done with the largest telescope that would fit into a "3U" cubesat, three 1Us stuck end to end. Pointed towards Earth from a low orbit like that of the ISS, such a telescope could take pictures with a resolution of five metres or a bit better. That was nothing like as good as the images being sold by companies using bigger telescopes in much larger satellites. But 3U cubesats could be deployed by the dozen or the hundred. For some markets, such as agricultural monitoring, the sheer quantity of the information gathered by such flocks might make up for the low resolution.

The first 28 Doves were sent up from where they were deployed to the ISS in 2014. The launch was celebrated at Planet's headquarters with a pancake breakfast, as has been each of the 13 launches since. Planet currently operates 63 spacecraft. Their capabilities may be limited by their size, but the company claims that the sophistication of their technology is a match for any satellite anywhere. And they support a promising business model. Mr Marshall says Planet now has over 100 customers for the data that the Doves send back. It looks poised for significant growth.

Planet's success stems partly from the continuously falling cost and rising capability of consumer electronics—especially components for smartphones, which sell by the billion and where size and low power usage are crucial. But that would be of no use without a willingness to improve the satellites frequently—indeed, incessantly. By June this year the Doves had been through 14 upgrades. Today's spacecraft have a different camera from their predecessors, new antennae, rebuilt electronics and a power system based on the lithium-ion battery packs used in Tesla cars, rather than the original AA battery format. The satellites now "see" in four colour

bands rather than the original three. They have become much better at telling where they are and which way they are pointing. According to Mr Marshall, in terms of performance per kilo the Doves are now 100 times better than the state of the art five years ago. Such agile innovation is normal in Silicon Valley, but it is not something the satellite world has seen before.

| *Fly, my pretties*

To do things this way requires an attitude to risk alien to the world of big, expensive satellites: Planet expects some of its innovations to fail. It knows that Doves launched from the ISS have only a short life anyway, re-entering the atmosphere after nine to 18 months aloft. This attitude speeds up progress and provides resilience for the company as a whole. A big communications satellite can carry the fate of a whole company with it. When Astra1A, the first dedicated direct-broadcast television satellite, was sitting on top of Europe's first Ariane 4 rocket in 1988, Rupert Murdoch knew that if it blew up, his nascent Sky broadcasting business would blow up with it—quite possibly taking the rest of his media empire down in flames too. Planet has twice had the bad luck to see a flock of Doves fall to Earth from the fiery wreck of a failed launch, and lived to tell the tale.

A company can welcome risk only if its investors take the same view. Planet's do. This is another consequence of building a business on small, cheap satellites; the amount of capital needed is relatively modest. Planet has raised almost all its capital from Silicon Valley angel investors and venture funds. Just as technological improvement can be accelerated when your satellites weigh just a few kilograms and have parts lists in the 1,000s, so getting funding is a lot easier when their cost is a few hundred thousand dollars or less. The total invested in Planet to date, after three rounds, is \$158m; at SSL that would buy a single satellite.

In 2001-05, venture investments in space businesses worldwide totalled

just \$186m. In 2011-15 they had risen to \$2.3 billion, according to a study by the Tauri group. Half of those investors were based in California, and most of this money has gone either into small satellites or into new launchers tailored to those satellites' requirements. Venture capitalists feel increasingly at ease about the technology involved.

The business aspirations of companies like Planet are familiar, too. As the Tauri report puts it, the new wave of space companies has been able to sell itself to VCs as a way to “follow the path terrestrial tech has profitably travelled: dropping system costs and massively increasing user bases for new products, especially new data products”. Fashion is another factor. Like Doves, Silicon Valley investors flock; the past few years of success for SpaceX, founded by one of their own, has made space a particularly appealing place for the flock to settle. This new source of capital looks like producing a great many satellites. In July Euroconsult, a consultancy, estimated that in the period from 2016 to 2025 some 3,600 commercial small satellites might be launched, including over 2,000 flown by VC-funded Earth-observing companies.

Others, including some with deeper pockets, want to take the smallsat revolution further. Today's big communications satellites are almost all to be found in an orbit 36,000km above the Earth. This is because, at that height, it takes them 24 hours to go round once—which means that, seen from the ground, they seem to sit stationary in the sky. In businesses that depend on a single antenna pointed in a single direction, that is a huge advantage. But it has costs. The amount of data you can handle with a given antenna and amplifier drops off according to the square of its distance from the surface. This means that closer to Earth you can do more with less. You can do it faster, too: going 36,000km up to “geostationary” orbit and back again delays a radio signal by a quarter of a second, a problem for some applications.

All the same, communications satellites have mostly forgone the advantages of lower orbits, for two reasons. The lower the orbit, the more satellites you need to make sure one can always be seen from the ground. And satellites that move across the sky require receivers that can track them. This does not mean moving dishes; today's receivers can track electronically. But such technology is demanding.

| *The more the merrier*

OneWeb, a project being put together by, among others, Intelsat, the Virgin Group and Airbus Industries, is based on the idea that modern antennae can surmount this communication problem, and that the smallsat approach can sort out the coverage problem. It plans to use some 648 satellites in orbits just 1,200km up to offer seamless communications to any spot on Earth. Its business plan turns the need to cover everywhere to cover anywhere into a feature by focusing on developing countries; nowhere will be too remote for it to serve. The first satellites are to be launched next year.

This is not something you can do with cubesats, or on a startup budget. OneWeb is a multi-billion-dollar proposal. Its prototypes are being made at an Airbus plant in Toulouse. In Florida OneWeb and Airbus Space and Defence are building a factory where they hope to produce up to four 150kg spacecraft every day, using highly automated systems; that is more by an order of magnitude than anything the satellite world has seen before.

Not only is the project technologically very ambitious; it also faces a lot of competition. Google, where OneWeb's innovators were working at one point, is looking at stratospheric balloons as an alternative way of providing connectivity in the developing world. Facebook is eyeing high-flying solar-powered drones.

The incumbent communications-satellite industry is paying attention, too.

At Google the OneWeb founders worked on a system called O3B, named for the “other three billion” people not yet getting data services. After they left, the system went forward without them. When it is finished, it will consist of 20 satellites orbiting at about 8,000km. This summer SES, one of the big four comsat operators, took complete control of the project, buying out Google and its other original partners. Meanwhile SpaceX, which until now has operated purely as a launch provider, is talking about a low-orbit communications system of its own, with perhaps 4,000 small satellites. That one project would use three times as many spacecraft as there are in the skies today. ■



卫星

个小数量多

成群的低成本小卫星有可能改变航天业

火箭是令人振奋、蔚为壮观的一种太空飞行，但如果不装载点什么有用的东西，火箭基本上就是烟花。要了解这一航天行业的最新创举，首先去看看航天器制造领域发生了什么巨变吧。

在美国加州的帕洛阿尔托（Palo Alto），有一家工厂从前苏联发射人类第一颗人造卫星“伴侣号”（Sputnik）那年就开始制造航天器，那时候在帕洛阿尔托还没有人听说过硅谷呢。SSL，曾名Space Systems/Loral，已经制造了100多颗通讯卫星，其中81颗仍在服役。这里有数间拥挤而整洁的房间，每间都有大教堂中殿那么高。目前里面摆放着几十颗卫星，相当于该公司一年多的订单量。

这些卫星都是同样的结构：直径1.2米的圆柱体封在一个方形的箱子里。卫星要完成的任务越多，外罩的箱子就越高，太阳能板就越长，用于将数据传回地面客户的天线和反射器阵列也更大更复杂。快要完工的Sky Muster II是其中最大的一颗卫星，用于为澳大利大人口不太稠密的地区提供宽带通讯。它高9米，定制有复杂的反射器阵列，适于服务该国的内陆地区。

通讯卫星业务主要由四家卫星运营商主导，它们分别是欧洲通讯卫星组织（Eutelsat），国际海事卫星组织（Inmarsat），国际通讯卫星组织（Intelsat）和环球卫星公司（SES）。它们的收入主要来自需将电视信号传送到用户家中的公司，但也服务于数据传输和移动通讯市场。SSL工程和运营主管保罗·埃斯蒂（Paul Estey）说，这些卫星运营商为了竞争客户，对SSL这样为数不多的专业飞行器制造公司的需求越来越多。

卫星行业锐意创新，但也谨慎规避损失。SSL最小的通讯卫星售价一亿美元左右，最大的价格大概是三亿美元。加上运载火箭所需的一亿美元，卫星有可能十年之后才能开始产生利润。由于卫星要在恶劣环境下运行，且

没有维修的可能，还要保证很长的工作寿命，所以不会采用带有任何重大风险的新技术。

沿着101公路驱车一小时会看到一家完全不同的飞行器工厂。Planet Labs最近更名为Planet，它的工厂占据了旧金山市场街南区一栋老旧但别致的建筑。底层一间跟较大的星巴克差不多面积的房间里摆放了很多工作台和工具，用于制造三十厘米长、每个重约五公斤的卫星。如果你能分辨，就会发现很多元件是用于制造其他设备的，最多的就是智能手机的元件。制造一颗Planet称之为“鸽子”的卫星（见图）需要大概一周。房间最里面有几十个卫星已经打包好准备发货。这便是航空事业的新面目：小而多。

超小型卫星被称为立方体卫星，“鸽子”卫星正是这一大家族中的一员。上世纪九十年代末，斯坦福大学和位于圣路易斯奥比斯波（Obispo）的加州州立理工大学的研究人员认识到，只要有一定数量的标准化就可让发射超小型卫星变得简单许多。他们制定出了一个叫“1U”立方体卫星的标准：这是一个大小为 $10\text{cm} \times 10\text{cm} \times 11.5\text{cm}$ 的箱体，配备电子和物理接口，可以和其他类似设备一起放入一个分配器——该分配器可作为次级有效载荷发射（卫星发射器的设计载荷能力经常会大于主载荷所需）。这个标准广为业界接受。截止2013年初，已经发射了约100颗立方体卫星。用于设计和制造这种卫星的工具已经非常完善，一个富有创意的老师带领一班学生也可以尝试造一颗卫星。

Planet创始人克里斯·保舒仁（Chris Boshuizen）、威尔·马歇尔（Will Marshall）和罗比·申格勒（Robbie Schingler）认为立方体卫星有可能成为一个行业的基础。几年前在美国国家航天航空局埃姆斯研究中心

（Ames Research Centre）工作的时候，他们研究了一个3U立方体卫星（三个并排放置的1U）所能装载的最大望远镜可以实现什么功能。在像国际空间站那样的低轨道位置将这样的望远镜朝向地球，所拍摄照片的分辨率可以达到五米或者更高一些。通过在更大的卫星上安装更大型的望远镜拍摄，其他公司所出售的卫星图像分辨率要高很多，立方体卫星拍出的照片根本没法与之相比。但3U立方体卫星可以几十或几百颗地部署。例如在农业监控这样的市场，以数量弥补质量，大批小型卫星所收集到的海量信

息也许能弥补分辨率低的不足。

2014年，首批28颗“鸽子”卫星从部署地发射至国际空间站。Planet总部举办松饼早餐会庆祝这次发射，之后的13次发射也都延续了这一传统。

Planet目前运营的飞行器有63个，其能力也许受大小所限，但公司称它们的技术复杂度堪比任何地方的卫星。而且这些小卫星撑起了一个潜力巨大的商业模式。马歇尔说Planet现在有超过100个客户购买“鸽子”卫星发回的数据，而且这一数字还有望大幅增加。

Planet的成功一定程度是因为消费电子产品成本不断下降以及功能不断增强，尤其是智能手机元件。手机销量以十亿计，其元件越来越小，耗电量也越来越低，这些都很关键。即便如此，没有经常改进卫星的意愿也没用，准确说是要持续改进。截至今年六月，“鸽子”已经经历了14次升级。如今，卫星上装配了和以前不同的照相机，使用了新天线，采用了重建的电子元件，电源系统则是基于特斯拉汽车所用的锂离子电池组，而不再是原来的AA电池。卫星现在能“看到”四个颜色波段，以前只有三个。卫星在定位和定向方面的表现也有极大提升。马歇尔说，按每公斤的性能来比较，“鸽子”比五年前的尖端技术要好上100倍。这种快速创新在硅谷很正常，但在卫星业界却是前所未见。

| 飞吧，小宝贝

相比昂贵的大型卫星，开发小型卫星需要对风险有不同的态度。Planet预料到有些创新会失败，也清楚国际空间站发射的“鸽子”卫星寿命本来就很短，一般飞行9到18个月后会重新进入大气层。这种态度加快了进步的步伐，提升了公司整体的适应能力。一个大型通讯卫星可能会决定一家公司的命运。1988年首个专用于电视直播的卫星Astra1A由欧洲首枚阿丽亚娜4型火箭装载发射。鲁伯特·默多克知道，如果火箭中途爆炸，他刚起步的天空广播公司也就跟着完蛋了，还有可能将他媒体王国的其余部分一并卷入火海。Planet已经历了两次运气不佳的发射，眼看着整批“鸽子”卫星在一片火光中坠向地球，但公司仍屹立不倒。

一个公司愿意承担风险的前提是其投资者对风险有同样的态度，而Planet

的投资者正是如此。这是打造小型低成本卫星业务的另一个结果；这种业务所需的资本相对较少。Planet几乎所有资金都来自硅谷的天使投资者和风险基金。当卫星只有几公斤重、零件只有几千个，技术进步能够得以加速；同理，当卫星的成本每颗只有几十万美元甚至更少，融资也就变得容易多了。经过三轮融资之后，目前Planet的总投资额为1.58亿美元。换做SSL，这点钱只够买一颗卫星。

弗吉尼亚州航空航天分析机构Tauri Group的一项研究显示，2001至2005年间，全球航天业的风险投资总额仅为1.86亿美元，2011至2015年间上升至23亿美元。其中一半的投资者来自加州，大部分投资要么投向小型卫星，要么投向专为小型卫星特殊要求而定制的发射器。风险资本家对其中涉及的技术也越来越放心。

像Planet这样的公司也的商业愿景听起来也很熟悉。Tauri Group的报告指出，新兴起的航天公司在向风险资本推销自己的时候，已经可自称在“追随地面科技走过的高回报的历程：降低系统成本，大幅增加新产品的用户数量，尤其是新数据产品”。流行趋势是另一个因素。和“鸽子”一样，硅谷的投资者也是成群结队。近几年，其中一位所创立的SpaceX的成功让航天业变得尤为引人注目，吸引了大批投资者。新的资本来源看似催生了很多卫星。七月，咨询公司Euroconsult估计，2016到2025年将会发射约3600颗小型商用卫星，其中超过2000颗属于风险资本投资的对地球进行观测的公司。

其他公司，包括一些资本雄厚的公司，则想让小型卫星革命更进一步。如今，大型通讯卫星基本都在距离地球3.6万公里的轨道上飞行，这是因为在这个高度，卫星绕地球飞行一圈需要24小时。这就意味着从地面上看，它们好像是静止不动的。对于依赖一根天线指向同一方向的业务来说这是一个巨大的优势，但也有代价。一条特定的天线和信号放大器可以处理的数据量与到地表距离的平方成反比。也就是说，距离地球越近，可以处理数据便越多。同时也会更快：无线电信号经过3.6万公里到达“地球静止”轨道再回到地球会有四分之一秒的延迟，这对有些应用来说是个问题。

尽管如此，通讯卫星大都已经放弃了较低轨道的优势，这有两个原因。轨道越低，就需要越多的卫星以确保在地面总能看到一颗。在太空移动的卫星需要接收器来跟踪，这并不是说要有移动“大锅盖”；现在的卫星接收器可以进行电子跟踪，但这样的技术要求很高。

| 越多越好

OneWeb是由包括Intesat、维珍集团和空客公司在内的多家公司合作的一个项目，其基本理念就是现代天线可以克服这一通讯难题，以及使用小卫星能够解决信号覆盖的问题。该项目计划利用轨道高度仅1200公里的648颗卫星为地球上任何一个地方提供无缝通讯服务。这一商业计划聚焦发展中国家，把全面覆盖、随意连接的需求变成了服务特性，即便再边远的地方也能覆盖得到。首批卫星将在明年发射。

靠立方体卫星是无法做到这一点的，仅凭创业公司的预算也不够。

OneWeb是一个数十亿美元的项目，位于图卢兹的空客工厂正在制造卫星原型。在佛罗里达州，OneWeb和空客的航天与防务公司正在建立一间工厂，在此它们希望可以利用高度自动化的系统每天生产4颗150公斤重的飞行器。这种生产规模在卫星行业前所未见，足足多出了一个数量级。

该项目不仅在技术上非常大胆，还面临着诸多竞争。谷歌（OneWeb的创新者曾在此就职）正在研究同温层气球作为替代来为发展中国家提供网络连接。Facebook正在研究太阳能驱动的高空无人机。

仍占主导的通讯卫星行业也在关注最新的发展。在谷歌时，OneWeb创始人曾研究过一个称之为O3B的系统，系统以还未享受到数据服务的“另外三十亿人”（other three billion）来命名。他们离开谷歌后，该系统仍在继续发展。如果系统建成，将会由20颗在距离地球8000公里轨道上飞行的卫星构成。今年夏天，四大通讯卫星运营商之一的SES收购了谷歌和其他初始合作者的股份，从而完全掌控了这个项目。同时，在此之前仅从事发射业务的SpaceX也在谈论建立自己的低轨道通讯系统，可能会运行4000颗小型卫星。仅这一个项目所需的卫星数量就相当于目前在轨卫星数量的三倍之多。■



Schumpeter

Revenge of the nerds

Silicon Valley's geeks are trying to turn themselves into jocks

AS THE new year dawned Mark Zuckerberg informed the world that his resolution for 2016 was to run 365 miles over the coming year—and challenged his legions of Facebook followers to do likewise. Mr Zuckerberg has hit his target, and is now hard at work on his next challenge, competing in a triathlon. This summer he fell off his bike and broke his arm but forges on as best he can.

Gone are the days when geeks wore shapeless T-shirts to prove that they didn't care about physical appearances. Now they wear tight tops designed to show off their arms and torsos. Tim Cook, Apple's CEO, gets on the treadmill by five in the morning. Jack Dorsey, Twitter's boss, is a fan of squats, push-ups and jogging. Brian Chesky, a co-founder of Airbnb, was once a competitive bodybuilder. Jeff Bezos and Elon Musk both reportedly have "pecs to die for".

Why limit yourself to such plebeian gyrations as running, bicycling and weightlifting when you have several billion dollars to burn? Larry Ellison, Oracle's chairman, races his own yachts and plays tennis to a reasonable standard (he picks up tips from watching the Indian Wells tournament, which he owns). Sergey Brin, Google's co-founder, pushes his body to the limits in a variety of sports: skydiving, rollerblading, roller hockey, "ultimate Frisbee" and high-flying trapeze. Mr Brin can be found in some surprising poses, walking around his office on his hands, and in some unexpected places, such as trapeze classes at local circuses.

Vigorous exercise regimes often go hand-in-hand with exotic diets. Mr Zuckerberg once set himself the challenge of eating meat only if he killed it

himself, for a year—which, given that he lives in San Francisco and works 60 hours a week, means he was a de facto vegetarian. Mr Dorsey follows a Paleo diet (no gluten, dairy, sugar or alcohol). Nor is the obsession with health confined to a few fanatics at the top. Tech companies expect employees to make full use of amenities such as rock-climbing walls. Even strapped-for-cash startups make sure they have table-tennis tables. The streets of San Francisco are lined, along with the homeless, with gyms offering something called SoulCycle, as well as CrossFit training and Zumba dancing, and restaurants purveying gluten-free this and macrobiotic that.

Predictably, the nerds are trying to “reinvent” fitness much as they are trying to reboot everything else. They talk about how physical fitness is just another code to be hacked, and festoon their bodies with fitness bands and other measuring devices. They surround themselves with ever more exotic gadgets such as self-balancing unicycles (which are like hover boards but have one wheel rather than two) and aqua-cycles. Alex Debelov, the CEO of Virol, a video advertising platform, has an oxygen-filtering mask to optimise his workouts.

Equally predictably, the nerds are also trying to reinvent the business of fitness. A former boss of Twitter, Dick Costolo, is building a software platform designed to help people work out together and motivate each other to stay fit. Zepp Labs helps golfers and tennis and baseball players to improve their games by collecting data on their swings using 3-D motion sensors. Strava, a mobile app, allows cyclists and joggers to compete with each other even if they live thousands of miles apart.

There are two reasons why the tech titans are obsessed with healthy living. One is that the American elite in general has rediscovered the Victorian adage “mens sana in corpore sano”. Being fit sharpens your mind and boosts your energy (though American productivity growth was significantly

higher in the days of three-martini lunches and steak dinners). And California has always been at the centre of America's fitness culture: witness the surfers of San Diego and the bodybuilders of Venice Beach. Drop America's most ambitious people into the most body-obsessed of its 50 states and a plague of fitness crazes will inevitably follow.

There is also a more intriguing explanation: the revenge of the nerds. American high schools have always been divided between "jocks" and "nerds". The nerds excel at academic work. But the jocks excel in all the things that teenagers care about—getting on the football team, winning running races and attracting women. In the early stages of the tech revolution the nerds got their revenge by earning more money than the jocks ever dreamed of. Now they are going further and proving they can beat the jocks at their own game. The athletes can never catch up with the nerds when it comes to algebra or earning power (and indeed many of them run to fat as they get older), but the nerds can become alpha males physically as well as intellectually, particularly when they can afford to hire personal trainers and dieticians.

| *All they need is a lobotomy and some tights*

Yet however hard they exercise they cannot extirpate the memories of their high-school years. Chris Anderson, the CEO of 3D Robotics, a drone company, and former editor-in-chief of *Wired*, argues that would-be alpha nerds are condemned not just to overcompensation but to escalation in their overcompensation. Wind boarding leads to kite surfing which leads to fly boarding. Rollerblading leads to hover boarding which leads to electric unicycling. Unicycling leads to wire walking which leads to trapeze artistry which leads to skydiving. Skydiving leads to flying planes which leads to flying fighter jets which leads to flying spaceships.

The Silicon Valley fitness craze clearly has a long way to go. But the anxieties that drive it are eternal. Tech billionaires may hone their bodies

with high-powered exercise machines and scientifically formulated diets. They may blast themselves into outer space. They may even discover the secret of perpetual youth. But as they float around in outer space, their bodies finely toned, their life-force rejuvenated by the blood of 20-year-olds, their bank accounts swollen from three commas to four, they will still be, in their deepest selves, the puny nerd who cowered, sweating and miserable, before some muscle-bound jock. ■



熊彼特

书呆子复仇记

硅谷极客力求变身运动健将

新年到来之际，马克·扎克伯格告知全世界2016年他给自己定的新年目标是全年跑完365英里，并号召他在Facebook上的众多追随者挑战同样的目标。扎克伯格已经达到目标，目前正在努力完成下一个挑战——参加铁人三项赛。今年夏天他骑单车不慎摔伤，手臂骨折，但仍然全力向前。

以前，极客成天穿着没型的T恤以证明他们不在乎外表，那样的日子已经一去不复返。如今他们穿着紧身上衣来显示手臂及身体的线条。苹果CEO蒂姆·库克早上五点就已在跑步机上跑步。推特老板杰克·多尔西（Jack Dorsey）喜欢壁球、俯卧撑和慢跑。Airbnb联合创始人布莱恩·切斯基（Brian Chesky）曾是专业健美运动员。杰夫·贝佐斯和埃隆·马斯克据说也都有“迷死人的胸肌”。

拥有亿万身家，为何还要将自己的体育爱好局限于跑步、单车和举重之类的大众型运动？甲骨文董事长拉里·埃里森（Larry Ellison）自己驾驶游艇参赛，网球水平也相当了得（他观看自己拥有的印第安维尔斯大师赛，从中取经）。谷歌联合创始人谢尔盖·布林（Sergey Brin）参与各种运动将自己的身体推向极限，其中包括跳伞、轮滑、旱冰曲棍球、“极限飞盘”和高空飞人。人们常常会看到布林做一些让人惊异的姿势，比如在办公室倒立行走；他的身影也会出现在一些人们意想不到的地方，比如当地马戏团的飞人训练班。

与高强度训练方案相伴的往往是异乎寻常的饮食安排。扎克伯格曾经给自己定下一个挑战，一年之内只吃自己屠宰的肉品。鉴于他在旧金山生活且每周工作60小时，这意味着他实际上就是只吃素食。多尔西遵从一种原始人饮食法（不摄入谷物、奶制品、糖或酒精）。这种对健康的执着不仅局限于少数身居高位的狂热分子。科技公司希望员工能充分利用公司的运动设施，如攀岩墙，即使是资金紧张的创业公司也会保证摆放乒乓球台供员

工使用。旧金山的街道两旁除了流浪汉，还有林立的健身房，提供名为SoulCycle的动感单车训练，还有全面强健身体的Crossfit以及尊巴课程，餐厅则提供各种或是无麸质或是养生的食品。

可以预见，书呆子们将要“重塑”健身这档事，就像他们重塑其他一切事物那样。他们谈到身体健康就好像它是一条待修改的代码，身上则戴着各种健身手环和其他测量设备。他们为自己配备了越来越奇特的器械，比如自动平衡的单轮车（就像平衡车，不过不是两轮而是一轮）和水上自行车。视频广告平台Virool的CEO艾利克斯·德拜洛夫（Alex Debelov）有一个氧气过滤面罩，用来强化锻炼效果。

同样可以预见的是书呆子们还将重塑健身行业。推特前老板迪克·科斯托洛（Dick Costolo）正在打造一个软件平台，用于帮助人们一同锻炼，互相鼓励保持健康。Zepp Labs通过使用3D运动传感器收集人们在打高尔夫球、网球和棒球时的挥臂数据来帮助他们提升运动表现。手机运动软件Strava让人们即使相隔千里也能进行单车或长跑比赛。

科技巨人们执着于健康生活的原因有两个。其一是美国精英阶层大体上重新认识了维多利亚时代的格言：“高尚的灵魂寓于强健的身体。”身体健康令人头脑清晰，精神饱满（尽管在午餐都要三杯马提尼、晚餐大吃牛排的时代，美国的生产率提升明显更高）。加州在美国的健身文化中一直处于中心地位：看看圣地亚哥的冲浪者和威尼斯海滩上的健美健将就知道了。把美国最有雄心壮志的人放在其50个州中最注重身材的那个州里，健身热潮必然随之而来。

还有一个更有趣的解释：书呆子的复仇。美国的高中里一直被分为两派——“运动健将”和“书呆子”。书呆子学习成绩优异，但运动健将则在青少年所关心的各个方面表现突出——加入橄榄球队、赢得赛跑和吸引女生眼球。在技术革命早期，书呆子们的复仇方式是赚运动健将们做梦也想不到的大笔金钱。现在他们更进一步，证明自己在运动领域也不输给运动健将。运动健将们在代数或赚钱能力方面永远赶不上书呆子们（而且很多当年的运动健将随着年龄的增长都发福了），但书呆子们不管在体力还是智

力方面都能成为充满男子气概的领袖人物，尤其是因为他们可以请得起私人教练和营养师。

| 他们只需做一个额叶切除术，再穿上紧身衣

然而，不管他们多么刻苦训练，也无法磨灭高中时代的回忆。无人机公司3D Robotics的CEO、同时也是《连线》（Wired）杂志前主编的克里斯·安德森（Chris Anderson）认为，那些想要领袖群雄的书呆子们注定会陷入对自己的过度补偿中，而且还会越陷越深，不断升级这种过度补偿：他们从空中滑翔到风筝冲浪升级到飞人冲浪；从轮滑升级到平衡车，再到电动独轮车；从独轮车升级到走钢丝，再到空中飞人，再到跳伞；从跳伞升级到开飞机，再到开战斗机，之后再开宇宙飞船。

硅谷健身热潮显然还会延续很久，但推动这个热潮的焦虑感却是永恒的。科技巨富们通过高性能健身器材和科学定制的饮食安排来磨练身体。他们也许会飞到外太空，甚至会发现青春永驻的秘密。但在外太空漂浮之际，他们尽管身体线条优美，注入青春的血液在体内激发出蓬勃活力，银行账户还有着超10位数的余额，但在最深层的自我中，他们仍是在满身肌肉的运动健将面前那个身材瘦小、畏畏缩缩、满头大汗、渺小可怜的书呆子。





Earth observation

Anywhere and everywhere

Earth-observation satellites are changing the world—yet again

IN TERMS of engineering ambition, operational complexity and capital requirements, big communications-satellite constellations outstrip the small-satellite revolution in Earth observation. In terms of world-changing potential, though, things may well be the other way round.

Satellites are only a marginal part of the communications business; they matter in some niches, such as multichannel television, but they represent only a small fraction of the \$2 trillion telecoms business. The marginal can still matter. The as-yet-unconnected “other three billion” that projects like O3B and OneWeb aim to serve are on the margins of the world economy, and systems that connect them up affordably would be a great boon. But it would be an expansion of the remarkable transformation in computing and communications already being wrought by smartphones connected in all sorts of other ways. What is now happening in Earth observation, on the other hand, is a whole new story. For the fourth time in 60 years, space is revolutionising the way people think about the planet.

The first revolution might be called an anywhere revolution. From the early 1960s on, spy satellites were able to look wherever their handlers wanted them to, even deep into enemy territory. They allowed cold-war adversaries to assess each other’s nuclear and other capabilities and provided a way of monitoring arms-control agreements. That helped to keep the cold war cold.

The second revolution was an everywhere revolution. The pictures of the Earth taken by the Apollo astronauts gave the planet’s inhabitants their first sight of their common home seen from afar. Contrasted with the dead husk

of the moon and the infinite emptiness of space it seemed small, beautiful, intensely precious. Those pictures accelerated the advent of modern green politics.

The third revolution was another anywhere revolution. This time, though, the novelty was to know your position anywhere that you happened to be. The GPS satellites launched by America's Department of Defence allow billions of devices to pinpoint their precise positions. That smartphones, cars, goods containers and girl guides know exactly where they are is now central to everything from orienteering to Uber.

The current, fourth revolution is both an anywhere and an everywhere revolution. It is the transformation of the Earth into a gigantic set of data that can be both interrogated and extrapolated.

The number of Doves Planet is able to fly allows it to provide images of every point on the planet fairly frequently; its ambition, likely to be realised fairly soon, is to use "sun-synchronous" orbits (see graph) to image everywhere on Earth at the same time every day. Spire, another cubesat startup based in San Francisco, does not look at the Earth's surface but listens to its radio signals. Every ship on the planet is required to have a transmitter that continuously broadcasts its location, and before long Spire expects to have data on every ship on the planet every hour.

| *All-seeing*

BlackSky, a startup based in Seattle, is at the anywhere end of the market. Its satellites are larger than Doves, and their bigger optics give them better resolution (one metre or so, meaning that they can pick up cars, which matters for a lot of applications). They can also be made to take pictures of targets off their orbital track, rather than seeing only straight below them. With 60 of these satellites in a range of orbits, the company aims to be able to produce a picture of any point on the Earth's surface between 55° N and

55° S within 90 minutes of being asked. Other new outfits offer different combinations of resolution and repeat visits.

Cloud storage and processing play a big part in this new revolution. Planet has invested heavily in the pipeline that takes raw data from its 12 ground stations around the world and turns them into a usable product, but it buys storage and processing power as needed from cloud-computing companies. Without such services, startups could never cope with the terabytes of data that their satellites produce every day.

New markets matter too. The Earth-observation companies that started up in America in the 1990s all had a single dominant and expert customer for their high-resolution images: the little-known National Geospatial-Intelligence Agency in Virginia. Serving its requirements made money for the companies involved but hardly encouraged diversity. The industry eventually coalesced into a single company, DigitalGlobe. It is thriving; this September it will launch another of the big, capable high-resolution satellites it puts into orbit every few years. But the government still accounts for well over half its sales.

The new companies will also sell to the government, but few if any of them are relying on it. Instead, their hopes of rapid growth rest on customers who have not previously used satellite data but have questions they want answered. Both the satellite companies and the third parties that use their data have invested heavily in machine-learning technologies that can extract those answers from the huge amounts of data stored in the cloud by understanding what they see and recognising when things change.

They can tell a shipping line—or, soon, an airline—exactly where all its vessels are. They can chart economic growth by recognising the spread of cities and the traffic within them, or the amount of light that they give off at night. They can provide a reinsurance company with daily updates on any

changes relevant to its risk portfolio. They can inform futures traders about the state of crops across an entire continent, or individual farmers about the state of crops in a particular field. They can combine their data with other georeferenced data, such as Twitter feeds, to produce images of disasters, demonstrations, conflagrations and celebrations as they happen.

If you think the best way to look for some truth about America is to count the cars on the New Jersey Turnpike, it is easily done. The same applies to any equally obscure metric in any other country. The potential of immense sets of data that cover the world in growing detail, are refreshed more or less in real time and can learn to pick up all sorts of objects and phenomena autonomously seems inexhaustible.

In among all the novelty, old sorts of forecasts will be overhauled, too. As well as hearing radio signals from the Earth below, Spire's satellites can listen to the transmissions from America's 24 GPS satellites, and from similar systems being fielded by Europe, Russia and China. Given their different orbits, the Earth will sometimes come between the two satellites, and its radio signal will have to pass through some of the Earth's atmosphere before the planet blocks it out completely. The way that the signal fades in the atmosphere can be used to calculate the temperature and pressure along the line connecting the two spacecraft, providing a valuable new source of raw data for weather forecasting. Spire has 12 satellites today and hopes to have 44 before the year is out. By the time it has 1,000, it could be producing 100,000 atmospheric cross-sections every day: terabytes of valuable data from thin air. ■



地球观测

任何地方，所有地方

地球观测卫星正再一次改变世界

论及工程目标、运行复杂程度和资本需求，大型通信卫星星群在地球观测方面要胜过小型卫星带来的革命。不过说到改变世界的潜力，则可能恰恰相反。

卫星只是通信行业的边缘业务；在某些特殊领域，比如多信道电视，它们至关重要，但在两万亿美元电信行业中只占了很小一部分。然而偌大的行业，其边缘部分仍需被重视。O3B和OneWeb之类的项目计划服务的尚未联网的那“另外三十亿人”处于世界经济的边缘，用他们能负担的系统将他们连接起来将是一大幸事。以其他多种方式互相连接的智能手机已促成了计算和通信的变革，上述计划只是这种革新的进一步扩展而已。而另一方面，在地球观测领域正在发生的变革则是个全新的故事。这是六十年来太空第四次革命性地改变人们看待地球的方式。

第一次革命可以称作“任何地方革命”。从上世纪60年代初开始，操作人员想让间谍卫星观测哪里，它们就能看到哪里，即便是深入敌后。它们让冷战的两方能够评估对手的核实力及其他能力，并提供了一种方式以监控军控协议的执行情况。这有助于让冷战保持冷静状态。

第二次革命是“所有地方革命”。阿波罗号宇航员拍摄的地球照片让这个星球的居民第一次从远处看到了他们共同的家园。它看起来那么小、那么美、异常珍贵，与月球死气沉沉的表面以及无边无际的空旷太空形成鲜明对比。这些照片加速了现代绿色政治的到来。

第三次革命是另一场“任何地方革命”。不过这一次的创新之处在于无论你在何处，都能知道自己的位置。由美国国防部发射的GPS卫星可以为数十亿的设备准确定位。智能手机、汽车、货物集装箱、女童子军清楚知道自己的位置，这是做定向越野到优步打车等各种事的核心。

目前的第四次革命既是一场“任何地方革命”，也是一场“所有地方革命”。它将地球转变为一个庞大的数据集，不仅能用来查询，还可以用来推断。

Planet公司能发射的“鸽子”卫星的数量令其能以相当高的频率提供这个星球上每一地点的图像；它的目标可能很快就能实现——使用“太阳同步”轨道（见图）于每天同一时间对地球上所有地方成像。另一家位于旧金山的立方体卫星创业公司Spire所关注的则不是地球表面，而是其无线电信号。地球上每艘船只都需配备不停发送其位置信息的发射机，用不了多久，Spire有望获得每一小时内地球上每艘船只的数据。

| 一览无余

西雅图一家创业公司BlackSky处于市场中“任何地方”这端。它的卫星比“鸽子”大，光学器件也更大，因此分辨率也更高（一米左右，意味着它们能拍到汽车，这对很多应用来说十分重要）。它们还可以实现对运行轨道之外的目标拍照，而不是只能看到自己的正下方。该公司在一系列轨道上拥有60颗这样的卫星，目标是能够在接到要求后90分钟内获得地球表面北纬55°到南纬55°之间任何一点的图像。其他新机构也提供了不同分辨率和重访频率的组合。

云存储和处理在这次新革命中起到了重要的作用。Planet投入巨资建设传输渠道，可从全球12个地面卫星接收站获取原始数据，并将其转化为可用的产品，但它也得按照需要从云计算公司那里购买存储和处理能力。如果没有这样的服务，创业公司也许就无法处理它们的卫星每天产生的太字节级别的数据。

新市场也至关重要。20世纪90年代在美国创立的那些地球观测公司制作的高分辨率图像都只服务于一位占据主导地位的专业客户：位于弗吉尼亚、鲜为人知的美国国家地理空间情报局（National Geospatial-Intelligence Agency）。满足它的要求让参与的公司都赚到了钱，但却没能促进多样化。这一行业最终合并成为一家公司——DigitalGlobe。该公司正蓬勃发展；每隔几年它都要发射一颗大型高分辨率卫星，9月将发射最新一颗。不过政府业务仍占其过半的销售额。

新兴公司也会向政府销售产品，但其中即便有依赖于政府的公司，数目也很少。相反，它们快速发展的希望全靠那些之前没使用过卫星数据、却有 问题渴望得到解答的客户。卫星公司和使用它们数据的第三方机构都在机器学习技术方面投入不菲，这些技术能理解它们所见、识别情况变化，从而可在存储于云端的大量数据中提取答案。

它们可以告诉一家航运公司其所有船舶的具体位置，甚至很快就会覆盖航空公司的飞机。它们可通过确定城市扩张、城中的交通情况或晚上的发光量做出经济增长图表。它们能够向再保险公司提供与其风险投资组合相关的任何变化的每日更新。它们可向期货交易商提供整个大洲农作物的状况，或者向单个农场主提供具体某片田地庄稼的情况。它们还可将自己的数据和其他与地理位置相关的数据如Twitter消息结合起来，在灾难、游行、火灾和庆典发生时做出实时图片。

如果你认为一窥美国真实情况的最佳方式是数一数新泽西收费高速公路（New Jersey Turnpike）上的汽车数量，这很容易办到。这还可以应用于其他任何国家的任何同样难以处理的度量指标。巨量数据正在越来越详细地展现整个世界，这些数据差不多都在实时更新，机器学习还能学会从这些数据中自动找到各种各样的物体和现象，看起来，这一领域的潜能无穷无尽。

在所有新颖之处中，旧有的预测功能也将得到改进。除了探听地面上的无线电信号，Spire的卫星还能接收到由美国24颗GPS卫星传送的信息，以及欧洲、俄罗斯和中国部署的类似系统的信息。考虑到卫星轨道不同，地球有时会位于两个卫星之间，在地球完全挡住卫星发射出的无线电信号之前，这些信号必然会穿过地球的一部分大气层。信号在大气中减弱的情况可以用来计算两颗卫星之间连线上的温度和气压，从而可为天气预报提供宝贵的新型原始数据。Spire目前有12颗卫星，年底前有望达到44颗。等它有一千颗卫星时，每天将产生十万个大气横断面：可从稀薄空气中获得数以太字节计的宝贵数据。■



Crime prevention

Cutpurse capers

Artful dodger, your time may be up

SMART-CARD public-transport ticketing systems let people hop between buses, subways, trams, surface rail and river boats—even when these are operated by different companies—without having to buy new tickets. This undoubted good, though, has ramifications. One is that anyone with access can, by following individual passengers (or, at least, their cards), study precisely where people are going.

Companies use this knowledge to optimise services—again, an undoubted good. But many other things, some disturbing to freedom lovers, might also be done with smart-card data. One, outlined in San Francisco in August at the Knowledge Discovery and Data Mining conference, seems completely un sinister on the face of it. This is to use such data to catch pickpockets.

The idea is the brainchild of Xiong Hui of Rutgers University, in New Jersey, and Du Bowen and Hou Zhenshan of Beihang University, in Beijing.

Together, they studied the movements of passengers on Beijing's buses, trains and subways. As might be expected, most moved swiftly from A to B—taking the least time or smallest number of transfers to do so, and made similar journeys day after day. A small proportion, though, undertook trips that made little sense, or suddenly varied in their pattern.

Many of these anomalies have innocent explanations: a forgotten briefcase, perhaps, or a journey in an unfamiliar part of town. But sometimes the cause is more nefarious—a pickpocket plying his trade on the network, possibly employing a stolen travelcard to do so.

Thankfully, pickpockets are rare. But that makes detecting them all the

more challenging. Dr Xiong used a two-step system. First, a computer program called a classifier looked at the peregrinations of 6m travelcards in and around Beijing between April and June 2014 and separated the outliers from the mundane travellers. A second classifier, primed with information about pickpocketing hotspots gleaned from police reports and social-media posts, then tried to spot the pickpockets among these outliers.

In this, it succeeded. It identified 93% of known pickpockets (ie, those caught by the police during the period in question). However, a second goal is to cast suspicion on as few innocents as possible. Here, its performance was equivocal. Only one out of every 14 suspicious individuals was a known pickpocket. On the other hand, that number presumably included some unknown pickpockets, too.

Even with a false-positive rate this high, though, Dr Xiong thinks he has developed a powerful tool. Monitoring a suspicious few using closed-circuit cameras is less daunting than following millions of riders. He says the technology will soon be piloted in Beijing and rolled out subsequently in other Chinese cities.

Not all experts are convinced. Shashi Verma, chief technology officer at Transport for London, and thus the man ultimately responsible for the smooth operation of that city's Oyster card system, says his records show millions of ordinary people making all sorts of "weird, wonderful, complicated" journeys. Picking the criminal needles from the haystack of innocents is not as easy as it sounds. Dr Xiong is, however, confident in his team's approach—so confident that they propose to investigate the movement patterns of other "asocial groups" such as "alcoholics, drug-users, homeless people and drug-dealers" on public-transport networks. Such mission creep is precisely what gives freedom lovers the willies. Picking up pickpockets is one thing. Using artificial intelligence to pursue those at the margins of society is quite another. Technology does not know

the difference. But people need to. ■



预防犯罪

扒窃图谋

妙手神偷逍遥的时间可能不多了

智能卡公共交通票务系统让人们可以在公共汽车、地铁、电车、轻轨和轮渡之间穿梭而无需另行购票，即使它们由不同的公司运营也不例外。这无疑是一件好事，不过它还有别的影响。其中之一就是任何有访问权限的人都可以跟踪每个乘客（或者至少是他们的公交卡），研究人们到底会去哪儿。

公司会利用这些知识来优化服务——这无疑又是一件好事。但利用智能卡数据还可以做很多其他的事，其中一些会令自由爱好者不安。八月，在旧金山举办的知识发现和数据挖掘会议上就介绍了这样一项工作。它表面上看来完全没有什么坏处——利用这些数据来抓扒手。

这个想法是由新泽西州罗格斯大学的熊辉与北京航空航天大学的杜博文和侯振山提出的。他们合作研究了北京的公共汽车、轻轨和地铁乘客的行程。不出所料，大多数人都是迅速从A地到B地——利用最短的时间或最少的转乘次数，日复一日地完成类似的行程。然而有一小撮人的行程却没有什么意思，或是会突然改变自己的行动模式。

大部分这样的异常都有清白的解释：公文包忘带了，或是来到城市中不熟悉的区域。但有时候背后的原因则更为恶劣——扒手正在公交网络上出没，用的还可能是偷来的公交卡。

值得庆幸的是，扒手并不多。但这样一来要侦查出他们就更加困难。熊博士的方法分为两步。首先，一个称为“分类器”的计算机程序会分析在2014年4月至6月间北京市中心及周边600万张公交卡的行程，并将异常值与普通旅客分离开来。第二个分类器则配有从警方报告和社交媒体发帖中收集来的扒窃热点信息，然后试图在这些异常值中找出扒手。

就此而言，它成功了。它找出了93%的已知扒手（即在同一时期被警方抓获者）。然而，第二个目标是尽可能减少对无辜人员的怀疑，在这方面它的表现还不尽人意。每14个受怀疑的人中只有一个是已知的扒手，不过数据中大概还包含一些未知的扒手。

即使误报率这么高，熊博士还是认为自己开发了一个强大的工具。用闭路摄像机监视少数可疑分子，总比跟踪上百万乘客要容易一些。他说，这项技术很快将在北京进行试点，随后在中国其他城市推广。

然而并非所有专家都对此深信不疑。沙西·维尔马（Shashi Verma）是伦敦交通局首席技术官，也就是最终负责保证伦敦蚝卡（Oyster）系统顺畅运行的人。他说他的记录显示，数以百万计的普通人做出种种“怪异、精彩而复杂”的行程。从无辜群众的汪洋大海中捞出那几个罪犯可不像听起来那么容易。不过熊辉还是对自己团队的做法信心满满，甚至自信到建议调查其他“反社会团体”，如“酗酒者、吸毒者、无家可归者和毒贩”在公共交通网络中的行动模式。恰恰是这种目标的变化令自由爱好者心惊肉跳——抓小偷是一回事，采用人工智能去跟踪那些身处社会边缘的人则完全是另一回事。技术不明白其中的差别，但人可得清楚。■



Measuring companies

The watchers

Alternative-data firms are shedding new light on corporate performance

FINANCIAL statements are both infrequent and backwards-looking, so getting a sense for how a business is performing in the present can be nearly impossible. But a cottage industry of a few dozen firms, mostly in America, is gleaning “alternative” data from novel sources, ranging from satellite images to obscure corners of social media.

The growth of small, low-cost satellites and machine learning means companies can quickly and cheaply parse millions of satellite images a day. A common trick is to analyse photos of car parks outside big-box retailers such as Walmart to get a sense of daily revenues. A Chicago-based data firm, RS Metrics, sells estimates on the productivity of factories by tracking the number of lorries parked outside. Bad weather can make such analysis difficult in some places, but satellite-image analysis of, say, Elon Musk’s new “gigafactory” making batteries for Tesla’s electric cars in Nevada is more straightforward under the desert’s clear skies.

A bit of ingenuity along with some elementary geometry goes a long way. Data analysts estimate the size of oil stocks by looking at the lengths of shadows cast by oil tanks in satellite pictures (the height of the roofs of most crude-oil tanks varies depending on how full the tank is). Several firms, such as Orbital Insight, in Palo Alto, also study farmland to estimate crop yields before official statistics are reported by America’s Department of Agriculture, and often do it better (see chart). Investors are particularly keen for firms to study pictures that yield rare data on, say, steel production in China or Russia, where official data can be patchy.

Dataminr, a startup in New York, mines social media for happenings on

which to alert its clients, which include hedge-fund traders and big newsrooms. Twitter has taken a 5% stake in the firm. Early this year a local reporter tweeted that the FBI was raiding the offices of United Development Funding, a sponsor of real-estate investment trusts in Grapevine, Texas. It took other investors around ten minutes to hear the news and to push its shares down by 50%, by which time Dataminr's clients had been able to short them.

Some social-media firms are themselves branching out into alternative data. Foursquare, which is known to consumers for its mobile app that provides restaurant recommendations based on its users' locations and histories, now sells data. Foursquare can accurately guess if someone is a patron of a particular shop based on how long he has stopped moving (five minutes or more is the trigger).

Alternative-data firms also offer insights into private companies, such as technology "unicorns" (firms that have yet to come to the stockmarket but are valued at \$1 billion-plus). Second Measure, based in San Francisco, claims it can show how many subscribers Netflix had this month, or how Uber, a ride-sharing service, is doing relative to Lyft, a rival. The information comes from data that Second Measure collects on credit-card transactions. For venture capitalists, alternative-data firms may be the only objective source of sales data.

There have been plenty of acknowledged triumphs. In a blog post earlier this year, the boss of Foursquare, Jeff Glueck, used his company's foot-traffic data to predict, correctly, that same-store sales at Chipotle, a restaurant chain affected by an outbreak of *E. coli*, would fall by 30%. Shares in Chipotle fell by 6% when the company reported earnings.

One impediment to broad adoption of alternative data is a cultural divide between west-coast techies and buttoned-up east-coast financiers, notes

the boss of one data provider. He was dismayed to find, on a visit to one richly-resourced fund, that it was guilty of what techies consider the ultimate sin: using Windows computers. Such data is also expensive, and the payoff can take time. But the value of the information to hedge funds and other investors is growing fast. ■



衡量公司业绩

观察者

另类数据公司正在为解读公司业绩提供新方法

财务报表发布频次有限，还只能回顾过去，所以想要了解企业目前的表现几乎不可能。但由几十家公司（主要集中在美国）经营的一桩小生意正在从新奇的源头（从卫星图像到社交媒体的隐蔽角落）收集“另类”数据。

小型低成本卫星数量的增长和机器学习能力的提升意味着企业可以每日快速而廉价地解析数以百万计的卫星图像。一个常见的窍门就是分析沃尔玛之类巨型零售商的露天停车场照片，以大体了解其每日的营业额水平。总部设在芝加哥的数据公司RS Metrics通过追踪停车场上货车的数量来估计工厂的生产力，并出售相关数据。恶劣天气下，在一些地方进行这样的分析非常困难，但在沙漠晴朗的天空下分析超大工厂的卫星图像就要简单得多，比如伊隆·马斯克（Elon Musk）在内华达州为特斯拉电动汽车生产电池的新厂Gigafactory。

一点创意加上一些基本的几何知识便能大有作为。数据分析师可以通过观察卫星照片中储油罐投影的长度估计石油库存量（大多数原油储罐的罐顶高度都会因罐内原油量而变化）。有几家公司，如位于加州帕洛阿尔托（Palo Alto）的卫星图像分析公司Orbital Insight还会分析农田照片以估计粮食产量，并在美国农业部公布官方粮食产量之前得出数据，而且往往结果更为精确（见图表）。投资者尤其期望数据分析公司可通过分析图片来得出一些较为稀罕的数据，比如中国或俄罗斯的钢铁产量，因为这些国家的官方数据可能不够完整。

纽约的创业公司Dataminr通过挖掘社交媒体上的数据来发现偶然事件，为包括对冲基金公司和大型新闻媒体在内的客户提供预警。推特已经持有该公司5%的股份。今年年初一名当地记者发推特说，FBI正在突袭联合发展基金（United Development Funding）位于德州格雷普瑞恩（Grapevine）的办公室，这家基金专注于地产投资信托。Dataminr的客户立即卖空其股

票，而其他投资者约十分钟后才得到这个消息，并抛售股票使其股价下跌50%。

一些社交媒体公司自身也开始涉足另类数据业务。Foursquare因其根据用户的地点和消费历史推荐餐厅的手机应用而广为消费者所知，如今它也在出售数据。Foursquare可以根据某人停止移动的时间长度来精确估计他是否为某家店铺的常客（停留5分钟或以上触发分析）。

另类数据公司同时也提供对私人企业的洞察，例如科技“独角兽”公司（还未上市但估值在10亿美元以上的公司）。总部设在旧金山的Second Measure声称其现在可以获知视频网站Netflix当月付费用户的人数，或者拼车服务提供商优步相较于其竞争对手Lyft表现如何。这些信息来源于Second Measure所收集的信用卡交易数据。对风险资本家来说，另类数据公司可能是销售数据唯一的客观来源。

另类数据公司已有多次公认的成功之举。今年年初发布的博客中，Foursquare的老板杰夫·格鲁克（Jeff Glueck）利用其公司的步行数据准确预测出受大肠杆菌影响的墨西哥连锁快餐店Chipotle的同店销售额将下降30%。Chipotle公布业绩后股价下跌了6%。

一家数据供应商的老板指出，另类数据广泛应用的一个障碍是西海岸的科技精英和东海岸持重保守的金融家之间的文化差异。他在访问一家资源丰富的基金公司时吃惊地发现，该公司犯下了科技精英们眼中的终极罪恶：使用Windows系统的电脑。此类数据同样价格高昂，利用其获取收益还有待时日。但对于对冲基金和其他投资者来说，这些信息的价值正在迅速增长。■



Software

Engines of creation

The slick graphics of modern video-games are spreading ever further outside their native industry

JUNE 22nd is the 20th birthday of “Quake”. Its release, by a Texan firm called id Software, was a milestone in the history of video games. “Quake”, a grim and gory fantasy “shoot-’em-up”, pioneered many now-commonplace features of computerised play. Its most striking innovation was its fully three-dimensional world. This was drawn by a piece of software, called a game engine, regarded at the time as jaw-dropping.

These days “Quake” looks like a muddy brown mess. Two decades of advances in processing power, allied with cut-throat competition between games designers, have advanced the art tremendously. Game engines are now a product in their own right. Besides drawing the graphics, they handle tasks like simulating physics (such as gravity, say, or object collisions) and connecting players to each other online. They are, in other words, the platforms upon which games are built. Most games companies buy them pre-made, off the shelf. And not just games companies. Game engines have become so good at creating high-quality facsimiles of reality that they are attracting the attention of firms that, until now, have had nothing to do with video gaming at all.

One such outsider is PLP Architecture, a big London partnership. PLP has been experimenting with two leading game engines, Unity (made by Unity Technologies, of San Francisco) and Unreal (made by Epic Games, of Cary, North Carolina). Architecture businesses have long used graphics to give their customers virtual tours of as-yet-unbuilt edifices. But, says Richard Woolsgrove, who is in charge of “visualisation” at PLP, these were often just pre-cooked animations. Game engines, by contrast, let clients wander

wherever they like. Mr Woolsgrove's group has created virtual versions of proposed buildings using one or other of the engines it is testing, and invited people to walk around and inside them, using a video-game controller to do so. The ability to explore a virtual building in this way, Mr Woolsgrove says, gets clients much more excited than they were by the old approach.

| *Game on*

Architects are not the only non-gamers interested in extending the uses of game engines. NASA, America's space agency, is a fan. It is experimenting with a virtual-reality (VR) system based on Unreal to train astronauts for stints on the International Space Station. And this year's Game Developers' Conference, an industry shindig held every March in San Francisco, featured an eclectic range of firms, from McLaren, a British sports-car company, to Disney, an American entertainment giant, talking about how they were using game engines either to sell products or to help design those products in the first place.

According to Clive Downie, Unity Technologies' chief marketing officer, the main advantage game engines give organisations is the ability to do instantaneously what used to take minutes or even hours. Before such engines were applied to the task, creating high-quality renderings required computers to crunch tediously through the calculations needed to simulate how light rays bounce around rooms and interact with objects. Some individual frames of "Toy Story", the first fully computer-animated film, took 30 hours to produce. Game engines avoid all that by employing a host of mathematical shortcuts to make images 30 times a second or more. The price is a lower-quality image. But as computing power has grown, the trade-off between speed and quality has become less and less noticeable (see picture: the game-engine version is above, the photograph from life is below).

If artists want to add to the renderings, speed also lets them tweak their creations on the fly. If the lighting is not quite right, or a piece of virtual furniture is made of the wrong material, that can be changed without waiting while the scene is laboriously redrawn. This dramatically speeds up the production process.

One way to think of a video game is as a primitive sort of virtual reality, in which a consistent, computerised world is generated and then presented to the player through a screen. “Proper” virtual reality, in which the illusion is made all-consuming by being supplied through a headset that blocks out the real world, is all the rage this year. Two retail headsets, one from Facebook and one from HTC, have already been launched; a third, from Sony, is expected before the end of the year. For now, VR is aimed mostly at gamers. But Tim Sweeney, Epic’s founder, points out that even non-gaming VR applications—such as a relaxing beach simulation or a shared virtual workspace—require slick, fast, computer-generated imagery of exactly the sort that his company sells.

The same is true of VR’s cousin, augmented reality (AR), in which computer-generated imagery is painted on top of the real world. Again, big firms are cooking up consumer products. Google is working on a new version of its delayed Glass headset, and Microsoft is preparing for the release of an AR product dubbed the HoloLens. Game engines could become to VR and AR what Windows is to the PC—the base layer on which other products are built.

Nor need those products be intended only for retail consumers. Ncam is a special-effects firm based in Soho, an arty district of London. It makes its living developing game-engine-based technology that lets film and TV directors drop virtual objects straight into scenes in real-time. A recent demonstration involved Nic Hatch, Ncam’s boss, setting up one of the firm’s special cameras in the lobby of its office and pointing the lens at the

empty middle of the room. A TV connected to the camera showed the same lobby, but with a convincing-looking McLaren sports car sitting in it. This was generated by Unreal from computer models supplied by McLaren's designers. The firm also has clips of commentators walking around other virtual vehicles, explaining the finer points to viewers, and of weather forecasters sharing studios with computer-generated tornadoes that are, apparently, crossing the American Midwest.

The killer app of this sort of technology, though, will probably come in the film industry, on the "green screens" in front of which actors have to perform when computer-generated scenes are to be added later in a process called post-production. Green-screening requires actors to move around obstacles that are not there, and to interact with empty space where computer-generated characters will eventually stand. This is hard. Done badly, the results can look wooden and artificial. Technology like Ncam's lets directors see what the special effects will look like while scenes are being filmed. They can thus manage the actors sensibly, telling them exactly where to look and how to behave.

| *I'm the king of the swingers*

Ncam's products have already been employed in big-budget films such as "White House Down". A remake of "The Jungle Book", released this year by Disney, used Unity. Mr Downie points to "Adam", a short sci-fi movie shot entirely in Unity, and speculates that the first feature film made from start to finish in a game engine may not be far away. Mr Hatch thinks game engines may one day make conventional post-production obsolete.

Game engines may arrive on TV screens even quicker, though, if Future Universe, a small company based in Oslo, has its way. Future Universe plans to use game engines to merge video games with live television. According to Bard-Anders Kasin, one of the firm's founders, their first endeavour will be a green-screened game show, with a game engine

drawing a virtual world around the contestants. When the result is broadcast, viewers with tablets or smartphones will be able to jump into the action—such as a car race—and play alongside those in the studio.

Future Universe's approach has attracted interest from TV networks. Mr Hatch says he knows of at least ten big TV companies that are actively experimenting with game engines. He speculates about using the engines to do everything from training car mechanics to building theme parks. "Imagine," he posits, "if your kids could drop into a scene with Olaf and Elsa [a snowman and a princess from "Frozen", a Disney film released in 2013]." Parents, worried about the costs of film spin-offs, may be less than delighted by that particular augmentation of reality. The prospect of a virtual sunlounger on a Caribbean island of their choice may help to ease the pain. ■



软件

造物引擎

现代电子游戏的炫酷图像技术正在更广泛地应用于其他行业

6月22日是“雷神之锤”（Quake）的20岁生日。这款由德州公司id软件（id Software）发布的游戏是电子游戏史上的一座里程碑。“雷神之锤”是一款残酷血腥的幻想型射击游戏，电脑游戏中许多现在看来司空见惯的特性就是由它开创了先河。它最震撼人心的创新是纯3D世界，用一种被称作游戏引擎的软件绘制而成。这一手段在当时令人叹为观止。

如今“雷神之锤”看起来像是一团泥巴浆。20年来运算能力的进步，以及游戏设计师之间你死我活的激烈竞争，都极大地促进了这一技术的发展。现在游戏引擎本身就已是产品。除了绘制图像，它们还处理模拟物理规律（如重力、物体碰撞等）和让线上玩家相互连接之类的任务。换言之，它们是用以创建游戏的平台。很多游戏公司购买预制的成品，而且买家还不仅限于游戏公司。游戏引擎在创造高质量现实仿真方面十分出色，因而吸引了一些其他公司的注意，而这些公司在此之前与电子游戏毫无关联。

这类行业外公司是其中一家是伦敦的大型建筑事务所PLP Architecture。PLP正在尝试两款领先的游戏引擎，Unity（由旧金山的Unity Technologies推出）和Unreal（由北卡罗来纳州卡瑞市的Epic Games推出）。建筑公司早就开始用图形技术让它们的客户虚拟游览尚未建成的宏伟楼群，但是在PLP负责“可视化”的理查德·伍尔斯格鲁夫（Richard Woolsgrove）说这些通常只是事先做好的动画。相比之下，游戏引擎能让客户随心所欲地漫步。利用正在测试的某个引擎，伍尔斯格鲁夫的团队已经制作了一个虚拟的拟建楼群，并且邀请人们使用电子游戏手柄游览楼宇的周边及内部。伍尔斯格鲁夫说，比起老办法，客户在以这种方式探索虚拟建筑时要兴奋得多。

| 游戏开始

有意拓展游戏引擎用途的非游戏玩家不止建筑师这一群体。美国航空航天

局（NASA）也是其拥趸之一。它正在测试一套基于Unreal的虚拟现实（VR）系统，用来训练要在国际空间站上完成任务的宇航员。每年三月在旧金山举行的游戏开发者大会（Game Developers' Conference）是业内的盛会。在今年的大会上，各行各业的公司汇聚于此，其中既有英国跑车公司迈凯伦（McLaren），也有美国娱乐业巨头迪士尼。它们谈论如何使用游戏引擎售卖产品，或是在一开始就用它来辅助产品设计。

Unity Technologies的首席营销官克莱夫·唐尼（Clive Downie）认为，游戏引擎带给这些机构最主要的优势，是能够在瞬间做到以往要花几分钟甚至几小时才能完成的事。在利用游戏引擎完成这些任务之前，为了制作高质量的渲染图，计算机需要完成大量枯燥的运算来模拟光线在房间中的反射以及与物体的相互作用。在全球首部完全由电脑制作的动画电影《玩具总动员》中，有些画面做一帧就要耗费30个小时。游戏引擎则绕开了所有这些工作，它使用大量数学上的捷径来制作图像，每秒可绘制30帧甚至更多——代价是图像质量较低。但是随着计算能力的增强，速度和质量之间的取舍越来越不容易看出来。（见图片：上图为游戏引擎生成的图像，下图为真实照片）。

如果绘图者想给渲染图加点什么，这样的速度也能让他们随时调整作品。如果光线不太对，或者某件虚拟家具的材质错了，改起来也无需等待费力地重绘场景。这极大地加快了创作进程。

电子游戏可以被视作一种简单原始的虚拟现实，它创造了一个统一的电脑化世界，并经由屏幕呈现给玩家。“真正的”虚拟现实（VR）今年风行一时，它通过头戴设备将我们与真实世界隔离开来，形成让人全心投入的幻象。两款由Facebook和HTC分别推出的零售头戴设备已经上市，索尼预计在今年年底前推出第三款产品。目前VR主要针对游戏玩家。但是Epic的创始人提姆·斯威尼（Tim Sweeney）指出，即使是非游戏的VR应用，如让人放松的虚拟海滩或者共享的虚拟办公场所，也需要炫酷、快速的计算机成像，而这正是他的公司销售的产品。

VR的表亲增强现实（AR）也是如此，在AR中计算机成像被绘制在真实世

界之上。大公司又在策划消费产品了。谷歌正忙于延迟推出的Glass头戴设备的新版，微软则准备发布被称作全息眼镜（HoloLens）的AR产品。游戏引擎与VR和AR的关系，可能就像Windows之于个人电脑，可成为其他VR和AR产品的基础层。

这些设备并不一定只针对零售消费者。Ncam是位于伦敦艺术区索霍（Soho）的一家特效公司，它研发基于游戏引擎的技术，让电影和电视导演可以实时将虚拟物体直接加入场景。在最近的一次演示中，Ncam的老板尼克·哈奇（Nic Hatch）在办公室大堂里设置了一个该公司特制的摄像头，将镜头对准空荡荡的房间中央。连接在这个摄像头上的电视展现出同一个大堂，但停着一辆逼真的迈凯伦跑车。图像由Unreal通过迈凯伦设计者提供的电脑模型生成。这家公司还有一些视频，画面上有解说员在其他的虚拟车辆周围走来走去，向观众解释其精妙之处；由电脑生成的、貌似席卷美国中西部的龙卷风也可与天气预报员一起出现在演播室。

不过，这类技术的杀手级应用很可能在电影行业的“绿幕”技术上——演员必须在绿幕前表演，在所谓的“后期制作”流程里再加入电脑生成的场景。绿幕要求演员在不存在的障碍物周围移动，和空气互动，而电脑生成的角色最后才会站在那儿。这真的很难。演得不好的话，会看起来既木讷又做作。像Ncam这样的技术能让导演在拍摄场景时就能看到特效会是什么效果。这样一来他们指导演员就会比较有感觉，可以告诉演员究竟该往哪儿看，怎么表现。

| 我是林间攀藤摆荡之王

Ncam的产品已经在像《白宫陷落》（White House Down）这样的大制作电影中得以应用。迪士尼今年重新制作的《奇幻森林》（The Jungle Book）用到了Unity。唐尼举了完全由Unity制作的科幻短片《亚当》（Adam）的例子，并预测首部从头到尾都由游戏引擎制作的剧情片也许并不遥远。哈奇认为游戏引擎有一天可能会淘汰传统的后期制作。

如果奥斯陆的小公司Future Universe能够得偿所愿，游戏引擎可能会更快地登上电视屏幕。Future Universe计划使用游戏引擎将电子游戏融入电视

直播。据公司创始人之一巴德-安德斯·卡辛（Bard-Anders Kasin）所说，他们的首个尝试将是一场绿幕技术下的电视竞赛节目，用游戏引擎在选手周围画出一个虚拟世界。当结果播出时，持有平板或智能手机的观众可以立即加入行动——比如赛车，并和演播室里的人一起玩。

Future Universe的方式已经引起了多家有线电视网的兴趣。哈奇说，据他所知至少有十家大型电视公司正在积极尝试游戏引擎。他对引擎的使用做了很多设想，从训练汽车修理工到建造主题公园都能大有所为。“想想看，”他提出，“要是你的孩子能跳进有雪宝和艾莎（迪士尼2013年推出的电影《冰雪奇缘》里的雪人和公主）的场景会怎么样。”担心电影周边花销的父母也许对于这种类型的增强现实不太高兴。在虚拟世界里选个加勒比小岛，躺在虚拟的日光浴椅上看看风景或许有助于缓解肉疼。■



Quantum computing

Now try this

IBM is making a quantum computer available for anyone to play with

USING the rules of quantum mechanics to carry out computations far faster than any conventional machine can manage is an idea that goes back decades. It was proposed in the early 1980s, but was confined to the blackboards of theoreticians until the late 1990s, when experimentalists gave it life by building simple machines which proved that the equations on those blackboards worked in practice. Now it has bloomed into a corporate project. Google, Microsoft, Hewlett-Packard and IBM each have dedicated quantum-computing research groups.

What quantum computing has not done, though, is make much impact on the outside world. And in some part that is because those quantum computers which do exist are still confined to laboratories. Only researchers have been able to tinker with them. Until now. For, on May 4th, IBM announced that it would connect one of its quantum computers to the internet and make it available for anyone to play with.

Quantum computing is exciting because it offers the promise of computers that can crunch through some kinds of mathematics (though not all) far faster than any classical computer that could ever be built could manage. This power comes from two counterintuitive phenomena: superposition and entanglement.

Superposition turns the fundamental unit of classical computing, the bit, into the qubit. A bit represents the smallest possible dollop of information: on or off; yes or no; 1 or 0. A qubit, though, is a mixture of both, superimposed upon each other. A classical computer with, for example, four bits can represent 16 different states. This machine can, however, exist

in only one of those states at any given time. Its quantum equivalent, by contrast, can exist in a superposition of all 16 states at once.

But it is entanglement, which binds the fates of particles together, that really makes quantum computers sing. Entanglement makes it possible to manipulate groups of qubits all at once—so, as the number of qubits grows, the number of states a machine can occupy rises, quite literally, exponentially. A 300-qubit computer would have more possible states than there are atoms in the universe.

The result could manipulate prodigious amounts of information with ease. It could thus crunch through many tricky problems, from cracking cryptographic codes to simulating chemical reactions accurately at the molecular level. That is something ordinary computers find intractable, but which would prove useful for all manner of industrial processes.

A 300-qubit machine is far in the future. IBM's current offering is a five-qubit processor built on a chip from loops of superconducting metal (see picture). It is suspended at the bottom of a large helium fridge at the firm's research centre in Yorktown Heights, New York. This chills it to within a whisker of absolute zero—the lowest temperature possible—so that the chip's delicate innards remain undisturbed by any stray puffs of heat. The chip is programmed by squirting carefully calibrated doses of microwaves into the fridge, with each qubit responding to a different frequency.

| *Qubit by qubit*

None of that fiddly technical stuff, however, will be visible to users. Instead, they will be presented with something that looks rather like a musical staff: five horizontal lines, each representing one of the qubits. A collection of symbols, one for each quantum operation, can be dragged onto the staff. When a program, which IBM calls a “score” in a nod to the musical analogy, is ready, the user can press a button and the chip will

execute it.

The Economist watched as Jerry Chow, who is in charge of the project, made the machine run Grover's algorithm, a quantum algorithm designed to search through unsorted piles of data, and to do so faster than any classical machine. A classical computer could take as many tries to find an item as there are things to be searched through (so up to 52 attempts to locate the ace of spades in a 52-card pack, for instance). A quantum computer can do it in a number of steps equal to slightly less than the square root of the number of items to be searched. In the case of the cards, it needs just six attempts.

By itself, though, a five-qubit chip is not going to set the world on fire. A run-of-the-mill laptop can simulate quantum computers with as many as 40 or 50 qubits, says Scott Aaronson, a quantum-computing researcher at the Massachusetts Institute of Technology. According to Dr Chow, IBM plans to upgrade its quantum chip as the technology improves. But the main idea is not, yet, to produce a commercially valuable machine. Instead, he hopes to introduce the principles of quantum computing to as wide an audience as possible, to encourage understanding of those principles by potential programmers. The best way to do that, he thinks, is to give people "hands-on" time with a real machine.

Unlike classical machines, quantum computers answer questions probabilistically rather than definitely. A given result has only a certain chance of being correct. Exploiting their power is tricky. To get an answer it is necessary to measure the machine. That causes its quantum superposition to vanish, which leaves it in a single state, just like a classical computer. To ensure that state is the one containing the answer needs careful management, so that the probability of getting the correct answer is reinforced, while the chances of getting a wrong answer are suppressed.

Quantum computers thus need a great deal of coddling. Their superposed states are delicate and the slightest intrusion from outside—a stray electromagnetic wave or a tiny change in temperature—can make those states vanish prematurely. To work properly, then, a quantum computer must be isolated as much as possible from the rest of the universe. Bulky shielding and cryogenic cooling mean they are unlikely ever to fit on a desktop or into a smartphone. This means that big, commercially useful quantum computers will probably, like the prototype just unveiled, live in remote data-centres, wired up to the internet, waiting to be called upon by ordinary, classical machines whenever their specialised talents are required. ■



量子计算

来试试这个

IBM开放量子计算机供公众试用

利用量子力学原理进行传统计算机远不能及的高速运算，这一想法可追溯至几十年前。它提出于上世纪80年代初，然而当时只是理论家们的纸上谈兵。直至90年代末，实验家建造了简单的机器证明了纸面上的公式切实可行，这个想法终于焕发生机。如今它已发展为企业项目，谷歌、微软、惠普和IBM都设有专门的量子计算研究团队。

不过，量子计算尚未对外界造成太大影响，某种程度上是因为现有的量子计算机仍然停留在实验室里，只有研究人员能摆弄这些机器。现在不一样了，因为在5月4日，IBM宣布将把一台量子计算机接入互联网，任何人都可以试用。

量子计算令人兴奋，因为量子计算机处理某些（尽管并非全部）运算的速度远高于任何传统计算机。这种能力源自两种不合直觉的现象：叠加和纠缠。

叠加现象把传统计算的基本单位“比特”（bit）转变为“量子比特”（qubit）。一个“比特”代表可能的最小信息单位：开或关、是或否、1或0。量子比特则是两种状态的混合，彼此叠加。例如，经典计算机的四个比特可以表示16种状态，但计算机在某一时刻只能处于其中一种状态。相反，量子计算机则可同时以16种状态的叠加态存在。

但真正让量子计算机大放异彩的，是将粒子的性质关联在一起的“纠缠”。纠缠让同时操控多组量子比特成为可能，而随着量子比特增加，可以毫不夸张地说，计算机可占用的状态数量将呈指数级上升。一台300量子比特的计算机的可能状态数量比宇宙中的原子还多。

这样做的结果是机器能轻松处理巨量的信息。从破解密码到精确地在分子

水平模拟化学反应，许多棘手的计算问题都会因此迎刃而解。这是普通计算机难以做到的，并将对各种各样的工业过程大有裨益。

300量子比特计算机的面世还言之尚早。IBM目前提供的是一个五量子比特的处理器，在超导金属线圈组成的芯片上构建而成（见图）。该处理器被悬置在IBM位于纽约州约克城高地（Yorktown Heights）的研究中心的一台巨型氦冷冻机底部，冷冻至非常接近绝对零度（理论上的最低温度），让芯片娇贵的内部免受任何杂散热量的干扰。芯片的编程通过向冷冻机发射精密测定的一定量微波来实现，每一个量子比特会对不同的频率作出反应。

| 每次一个量子比特

但用户无缘目睹那些精密繁琐的技术程序。呈现在他们面前的将是看似五线谱的东西：五条平行线，各代表一个量子比特。而一系列符号可以被拖放至谱线上，每个符号对应一个量子操作。当编程（IBM称之为“配乐”，对应乐谱的比喻）完毕后，用户按下一个按钮，芯片就会执行命令。

《经济学人》见证了项目的负责人杰里·周（Jerry Chow，音译）在该机器上运行格罗弗算法（Grover's algorithm），一种用于从大量无序数据中搜索信息的量子算法，其速度比任何传统计算机都要快。传统计算机在查找信息时，需要尝试的次数最多可能和逐个查找一样多。比如要在52张扑克牌里寻找黑桃A，最多需要尝试52次。量子计算机需要的步骤数则略少于供查找项目数的平方根。对于扑克牌而言，只需尝试六次就能找到。

不过单凭其本身，五量子比特芯片并不能就此掀起全球热潮。美国麻省理工学院的量子计算研究员斯科特·阿伦森（Scott Aaronson）说，一台普普通通的笔记本电脑也可以模拟四五十量子比特的量子计算机。周博士表示，IBM计划在技术进步后升级其量子芯片。但当前主要的目的还不是生产具有商用价值的机器。相反，他希望向尽量广泛的受众介绍量子计算的原理，鼓励潜在的程序员理解这些原理。他认为，要做到这点，最好的办法是让人们在真机上“动手实践”。

与传统计算机不同的是，量子计算机给出的答案是概率性而非确定性的。某一结果只有一定几率是正确的。要让其发挥威力并不容易，因为要得到答案就必须对机器做测量，而这会导致量子叠加态消失，使其和传统计算机一样处于单一状态。为确保这个状态恰好包含想要的答案，这需要精心管理，提高得到正确答案的概率，同时降低得到错误答案的几率。

因此，量子计算机需要倍加呵护。其叠加态很脆弱，外界的丝毫侵扰——比如杂散电磁波或者温度的细微变化——都足以令这些状态过早消失。所以要正常运作，量子计算机必须尽量隔离于宇宙万物之外。庞大的屏蔽体及低温冷却意味着量子计算机也许永远都无法装进桌面设备或智能手机。也就是说，大型商用量子计算机将很可能跟其刚亮相的原型一样，将寄身于遥远的数据中心里，接入互联网，等待着普通的传统计算机的调用去发挥其专长。■



Financial education

Quantum of scholars

The promise of a faster and cheaper path to Wall Street

MATHEMATICAL wizards known as quants are prized by trading firms in Chicago, hedge funds in Greenwich, Connecticut, and big banks in New York, London and Hong Kong. They wear T-shirts, not suits, and can bring in fatter pay-packets than bankers for less gruelling hours. But becoming a quant is hard: a PhD in maths or physics usually helps.

More and more universities are trying to provide students with a short cut to Wall Street, via master's degrees in quantitative finance. Familiarity with advanced calculus, probability and programming are minimum requirements. Since Carnegie Mellon University launched the first computational-finance programme in 1994, more than 40 universities worldwide, including Columbia, MIT and Oxford, have followed.

These courses, usually 12 or 18 months long, are faster and cheaper than either doctoral programmes or typical MBAs. They are popular, too: last year the median master-of-finance programme (a broader category that includes quantitative finance) received 5.2 applications for each place, against 4.5 for MBAs, reports the Graduate Management Admission Council, a global group of management colleges. In the early 2000s many students were already working in general finance or technology. Today, over half of would-be quants at American universities are new graduates. Between 70% and 80% are foreign, mainly from China, India and France.

Demand for mathematical skills is on the rise. In trading people are needed to design strategy and write codes, rather than execute individual deals. Fintech startups are keen on data-mining and machine-learning skills. Courses have adapted to shifts in Wall Street's requirements. Since the

financial crisis, banks have become more worried about quantifying risk and less keen on designing exotic products; Carnegie Mellon has cancelled advanced derivatives courses and started ones on risk management.

Graduates from the best programmes can expect well-paid jobs: the average starting salary for alumni of the University of California, Berkeley, was \$154,668 last year. Freshly minted quants must still compete against PhDs, who are better trained to research and build models. Graduates are up against computer-science types and recruits from the tech industry. But any quantitative analysis would conclude that demand for these students is healthy, and growing. ■



金融教育

计量专才

更快更省入行华尔街之路

数学奇才也被称为量化分析师，芝加哥的贸易公司、格林威治（康涅狄格州）的对冲基金和纽约、伦敦及香港的各大银行都趋之若鹜。他们身着T恤牛仔而非西装革履，不用那么辛苦加班，还拿着比银行家们更为丰厚的薪酬。但要成为一个量化分析师却并非易事：有个数学或物理博士学位通常能帮上点忙。

越来越多的大学都在尝试通过开设计量金融学研究生课程来为学生提供一条通往华尔街的捷径。熟悉高等微积分、概率学和编程是最基本的要求。自卡耐基梅隆大学率先于1994年开设计量金融学课程之后，包括哥伦比亚大学、麻省理工学院和牛津大学在内的全球40多所高校相继效仿。

完成这些课程一般需要12或18个月，比博士学位或一般的MBA课程所需时间更短、成本更低。这些课程也备受欢迎：管理专业研究生入学考试委员会（the Graduate Management Admission Council，全球多个管理学院的组织）的数据显示，一个排名中位的金融硕士课程（一门更广泛的学科类别，包括计量金融学），申请录取比为5.2:1，MBA课程则是4.5:1。21世纪头几年里，很多学生都已经在常规金融或技术领域工作。如今在美国大学里，想要成为量化分析师的学生超半数都是应届毕业生。其中70%至80%是外国人，主要来自中国、印度和法国。

对数学技能的需求呈上升趋势。在交易中，交易员要具备设计策略和编程的能力，而不仅是执行每一笔交易。金融科技创业公司非常热衷于数据挖掘和机器学习能力。各高校也根据华尔街需求的变化对课程进行了调整。金融危机以来，银行更为关注量化风险，不像以前那么重视设计新奇产品。卡耐基梅隆大学已经取消了高级衍生品课程，转而开设风险管理的相关课程。

名校毕业生有望找到高薪工作：去年加州大学伯克利分校毕业生的平均起薪为154668美元。初出茅庐的量化分析师仍必须与博士们竞争，后者在研究和建模方面更为训练有素。新毕业生还要面对来自计算机科学专业和从科技行业挖来的人才。但任何量化分析都会得出一个结论：对此类学生的需求是健康且不断上升的。 ■



The tourism industry

Nothing to see here

OTHERWISE law-abiding citizens confiscating drivers' keys, kettles that reek of crabmeat, and twenty-somethings unable to afford apartments; these phenomena seem unconnected. Yet locals see a common culprit: tourists. Troublesome tourists are nothing new. "Though there are some disagreeable things in Venice, there is nothing so disagreeable as the visitors," quipped Henry James. But the volume of tourists in popular destinations is new, as well as the fact that many places are restricting or even banning them.

From October visitors will be turned away from Koh Tachai island, a snorkelling paradise in Thailand, to save the coral from death by a thousand plastic fins. Sun umbrellas will go from three nearby islands, as they curb tourism too. At the height of summer some 10,000 holidaymakers per day trundle off cruise ships into the alleyways of Santorini, a Greek island. The authorities now have a cap of 8,000 a day.

In the Seychelles, the government has banned large hotel developments indefinitely. Both Barcelona and Amsterdam have banned construction of new complexes in the city centre to appease locals. That answers a common complaint of residents, which is that the fruits of tourism mostly go to large firms such as hotel groups, not to small entrepreneurs.

Blocking new Hiltons does little to stop the growth of Airbnb, a room-sharing service, another reason why some destinations have such an influx of visitors just now. Airbnb is making city living unaffordable for residents as well as crowded, many complain. Authorities in Berlin, Barcelona and Iceland have responded with new limits on it. But that is unlikely to satisfy all locals. "Tourist you are the terrorist" can be found spray-painted across a

stone wall in Palma de Mallorca. In New Zealand people are confiscating car keys from tourists who (allegedly) drive badly.

This summer in Barcelona, around eight out of ten people on Las Ramblas, a famous street, will be tourists. Many residents say their homes are being “Disneyfied”. The operators of Disneyland might view that as harsh: drunk and naked tourists, a boom in illegal flat rentals, and too many knick-knack shops are bigger problems in Barcelona than in the American firm’s theme parks. The city’s new mayor, Ada Colau, was elected on a manifesto of clamping down on tourists.

The Chinese come in for particular criticism. One in ten international tourists now comes from China. Seychellois hoteliers are fed up with one of their habits, which is to boil fresh crabs inside the hot water kettles in their rooms. The head of New Zealand’s tourism body admitted last year that the growth in the number of Chinese visitors is higher than it would like.

Mark Tanzer, head of the Association of British Travel Agents, has warned that without controls, tourists could kill tourism. But local officials will need to tread carefully when putting them in place. Tourism now accounts for nearly a tenth of global GDP, and is a reliable source of growth for many places that would otherwise struggle. In Barcelona it provides 120,000 jobs, and in the Seychelles tourism was almost two-thirds of GDP last year.

Many problems may in fact be caused as much by inadequate planning by local governments as by a surfeit of day-trippers. They can be slow to build infrastructure that could ease the burden, for instance free public toilets for those tourists who are on a tight budget. Not all are good at crafting rules that protect local ambience without discouraging tourists altogether. They’ll need to get better at it. Vast crowds of visitors may be a new challenge, but it’s one that is here to stay. ■



旅游业

无景可看

平时遵纪守法的市民拔走驾驶员车钥匙；烧水壶里一股子蟹肉的味道；20来岁的年轻人租不起房子——这些现象看似毫无关联，但当地人却从中看到了一个共同的罪魁祸首：游客。讨厌的游客并不是什么新鲜话题，（美国小说家）亨利·詹姆斯（Henry James）就曾嘲讽道：“尽管威尼斯有些令人不快的方面，但什么也比不上那些令人不快的游客。”然而，热门旅游地的游客人数不断增加，而且很多地方开始限制甚至禁止游客到访——这些可都是新鲜话题。

十月开始，泰国浮潜天堂达差岛（Koh Tachai island）将停止接待游客以保护珊瑚，使其免受千百只脚蹼的致命危害。临近的三个岛屿也会限制游客，沙滩遮阳伞将随之撤去。盛夏之际，每天有一万名度假游客踱步走下游轮，走进希腊圣托里尼岛（Santorini）狭窄的小巷。现在官方已将游客人数上限定为每日八千人。

在塞舌尔，政府已经无限期禁止兴建大型酒店。巴塞罗那和阿姆斯特丹为平息当地居民的怨气，禁止在市中心新建大型酒店。这些举措回应了居民普遍的不满，即旅游业的油水大都流去了酒店集团等大企业，小企业主则少有受益。

禁止新建希尔顿酒店并不妨碍提供房屋分享服务的Airbnb的发展，这也是眼下一些旅游景点游客密集的另一个原因。很多人抱怨Airbnb让当地居民的城市生活成本过高，并让城市拥挤不堪。柏林、巴塞罗那和冰岛政府因此对它做了新的限制，但这一举措不太可能满足所有当地居民。西班牙帕尔马-马洛卡岛（Palma de Mallorca）的一面石墙上可以看到用油漆喷上去的一句话——“游客，你就是恐怖主义者”。在新西兰，人们会拔走（据说）驾驶行为恶劣的游客的车钥匙。

今年夏天，在巴塞罗那知名的兰布拉大道（Las Ramblas）上，路人中八

成会是游客。很多当地居民都说他们的家园正在被“迪士尼化”。迪士尼乐园的经营者可能会认为这样的看法太过苛刻：游客酒气熏天、穿着暴露、非法公寓出租兴旺发达、廉价旅游纪念品小店充斥，这些问题在巴塞罗那可比在这家美国公司的主题公园里严重多了。巴塞罗那新任市长阿达·蔻拉（Ada Colau）正是因其将严格限制游客的竞选宣言而当选的。

中国人在这方面尤其饱受批评。现在国际游客中有一成来自中国。塞舌尔酒店业主们对他们的一个习惯非常反感，即在房间用烧水壶煮新鲜螃蟹。新西兰旅游当局主管去年承认中国游客的人数增长比他们乐见的要多。

英国旅行社协会（British Travel Agents）主管马克·坦泽（Mark Tanzer）警告说，若不加控制，游客将会扼杀旅游业。但当地官员采取措施时将需小心谨慎。现在旅游业几乎占全球GDP的十分之一，并且是很多原本经济困难的地区可靠的增长来源。旅游业在巴塞罗亚提供了12万个就业机会，去年在塞舌尔占了GDP的近三分之二。

事实上，一日游游客过多与当地政府规划不力都有可能是很多问题的原因所在。政府在建设可缓解压力的基础设施方面（比如为预算不多的游客建立免费公厕）动作迟缓。并非所有政府都擅长制定既能保护地方生活环境、又不会阻遏游客的规定，它们在这方面需要有所改进。大量游客的到来可能是一项新挑战，但绝不是暂时现象。■



Anti-submarine warfare

Seek, but shall ye find?

A proliferation of quieter submarines is pushing navies to concoct better ways to track them

DURING war games played off the coast of Florida last year, a nuclear-powered French attack submarine, *Saphir*, eluded America's sub-hunting aircraft and vessels with enough stealth to sink (fictitiously) a newly overhauled American aircraft-carrier, *Theodore Roosevelt*, and most of her escort. An account of the drill on a French defence-ministry website was promptly deleted, but too late for it to go unnoticed.

Nor was this French victory a fluke. In 2006, in what was very far from being a war game, a Chinese diesel-electric submarine surfaced near Okinawa within torpedo range of another American carrier, *Kitty Hawk*, without having been detected by that carrier's escort of more than a dozen vessels and anti-submarine aircraft. And, from the point of view of carrier-deploying navies, things are threatening to get worse. *Saphir*, launched in 1981, hardly represents the state of the art in underwater undetectability; in the decade since the Okinawa incident diesel-electrics have become even quieter. For an inkling of the silence of the new generation of such subs when they are running on battery power alone, without their engines turning, Jerry Hendrix, a former anti-submarine operations officer on the *Theodore Roosevelt*, asks: "How loud is your flashlight?"

Moreover, submarines are spreading. Since the cold war ended, the number of countries deploying them has risen from a dozen or so to about 40. Many of the newcomers are not part of the Western system of alliances. Some are actively hostile to it. And more may join them. A secondhand diesel-electric boat—not state of the art, admittedly, but effective nevertheless—can be had for as little as \$350m.

Worse, for those trying to defend ships from submarine attack, Western powers have routinely cut anti-submarine spending since the end of the cold war. American carriers retired the S-3 Viking submarine-hunting warplane in 2009, leaving shorter-range helicopters to compensate. Since the Soviet Union's demise the average surface escort of an American carrier has shrunk from six vessels to four.

Modern submarines are not merely quieter than their predecessors, they are also better armed. Many carry anti-ship guided missiles as well as torpedoes. One such, the CM-708 UNB, was shown off by China in April. It packs a 155kg warhead and, after popping out of the water, flies at near the speed of sound for about 290km. An export version is available but, if you prefer, Russia's submarine-launched Kalibr-PL missile offers a bigger warhead and a terminal sprint at Mach three. In December a submerged Russian submarine hit Islamic State targets in Syria with four similar missiles.

Potential adversaries operate or have ordered more submarines than Western powers could feasibly find and track with their existing defences. Even Iran has more than a dozen well-armed "midget" subs that hide in the shallows of the Persian Gulf, as well as three big Russian-made *Kilo* class diesel-electrics. Israel's navy trains as if this trio carry the Kalibr-PL's export variant, according to an Israeli expert. Countries which plan to arm submarines with that missile include China, India and Vietnam. The upshot is that many warships are in jeopardy and may only learn just how great that jeopardy is, says Alain Coldefy, a former vice-chief of France's defence staff, once a missile is closing fast.

| *Automating the hunt for Red October*

Perhaps belatedly, but certainly determinedly, a new approach to the submarine threat is now being developed. It is based on a simple principle: since submarines are hard to detect, when you do find one you should

never let go.

Shadowing threatening submersibles is nothing new. Trailing something is a much easier sensory task than discovering it in the first place, when you have an entire ocean to search. But at the moment this job is done by destroyers and (for those that have them) nuclear submarines. These cost billions of dollars to build and tens of millions a year more to run. Instead, the idea is to use smallish unmanned ships—marine drones, in effect—to do the job. These will be packed with enough sensors and artificial intelligence to follow adversaries' submarines automatically.

Half a dozen Western naval powers are conducting the R&D needed to build these, according to Eric Wertheim, author of the US Naval Institute's reference doorstop "Combat Fleets of the World". America is furthest along. In June its Office of Naval Research and its Defence Advanced Research Projects Agency, DARPA, began tests in the Pacific of the Sea Hunter, an unmanned (and, for now, unarmed) 40-metre trimaran, pictured below. It is designed to follow an enemy submarine from the surface relentlessly for months, even in high seas. While the crew of the boat being tailed will probably be able to hear their pursuer's diesel engine, that is not really a problem. Short of a torpedo launch, which would be an act of war, "there's nothing you can do about it", says Nevin Carr, a retired rear admiral in the American navy who now works at Leidos, the firm which designed Sea Hunter.

Sea Hunters will cost just \$20m each, according to Leidos. America will be able to let lots of them loose, says Scott Littlefield, head of the Sea Hunter programme at DARPA—or, rather, the "anti-submarine-warfare continuous trail unmanned vessel" (ACTUV) programme, as the agency prefers to call it. Mr Littlefield thinks of these robots as pawns to be put in harm's way without risking loss of life or great treasure. Likening them to the chessboard's lowliest piece, however, is slightly misleading. They will

eventually need enough artificial intelligence not to be outfoxed by the manoeuvrings of the world's best submarine commanders.

Designing the software to do this has been hard, Mr Littlefield says. DARPA therefore asked video gamers for help. In 2011 the agency released "ACTUV Tactics Simulator", a modified version of a game called "Dangerous Waters", in which players chose the sensors for a Sea Hunter-like craft that they piloted to follow an enemy submarine. Having played, they repaid DARPA by uploading relevant data from their game sessions. These were analysed by the agency's naval-warfare experts and tactics judged useful then programmed into the Sea Hunter's software or passed on to contractors to improve the design of the ship. Even so, more advances are needed before the system can match an enemy submarine's crew, according to Mr Carr.

But naval drones will still be useful before then. With greater manoeuvrability, endurance and speed than manned diesel-electric submarines, they will find employment in many sorts of mission besides tracking the boats of potential enemies. This autumn, for example, Norway begins sea trials of ODIN, an 11-metre-long surface drone. ODIN will first sweep for underwater mines, since these are static and cannot take evasive action. Eventually, though, upgrades should give its software the wit to follow manned submarines.

Some navies hope to make the drones themselves submerge. America's putative SHARK class (an acronym contrived from "submarine, hold at risk") is the furthest advanced in this area, says Andrew Krepinevich, a former adviser to three American defence secretaries—but China and Japan are not far behind. Underwater drones are harder to detect, and thus counter, than surface drones are because sound radiates from them through the water as a sphere, rather than the hemisphere occupied by the waterborne sonic emissions of a drone at the surface. Filling a larger volume at any given distance from its source, the sound of a submarine

drone therefore dissipates faster than that from a surface drone.

| *Some needle, some haystack*

All this technological change is ushering in a new era for anti-submarine warfare, according to Gunnar Wieslander, a former commander of Sweden's submarine flotilla who now runs Saab Kockums, an exporter of diesel-electric manned submarines. Saab Kockums's new 62-metre A26 model will sport a tube from which an underwater drone could slip out to attack surface drones. This, Mr Wieslander says, is the first time that such a feature has been fitted to a production submarine. Mr Krepinevich, however, counsels caution regarding underwater drones. They are fine for attacking other drones, but without huge advances in battery technology, no such machine could keep up for long with a big submarine that charges its batteries from a diesel engine and can travel at up to 20 knots—much less with a faster nuclear-powered one.

What, though, of the crucial task of detecting the submarines to be trailed in the first place? The phrase “surfaced within torpedo range” may bring to mind an image of a boat popping up a few hundred metres from its target—as, perhaps, in a film about the second world war. In the Okinawa incident, though, the distance was probably about five nautical miles (the details remain classified). Sound, whether of engines turning or sonar pulses returning, obeys the inverse-square law. Its strength changes in inverse proportion to the square of the distance it has travelled. That means it falls off fast. Ideally, therefore, detectors need to be close to their targets.

One way to do this, at least for home waters, is to have a dense grid of fixed detectors. One of the more advanced of these is Singapore's. It consists of underwaterbuoys called acoustic nodes that are tethered to the sea bed two or three kilometres apart. These nodes can talk to each other. They communicate by broadcasting precisely calibrated vibrations through the water. At the moment they are sending test messages, but eventually they

will be equipped with their own submarine-detecting sensors.

More sophisticated systems than this are in the works—including anti-drone countermeasures. According to Torstein Olsmo Sæbo, a scientist at FFI, Norway’s defence-research establishment, drone-towed acoustic arrays can now mimic the signature of a big submarine, luring a drone off in the wrong direction. (Just because Norway’s nascent flotilla of underwater drones could be programmed to do this, he adds, does not mean that it has been.) DARPA, meanwhile, is planning sea-floor pods which pop open to release drones that swim closer to an enemy submarine, or, after rising to the surface, fly off to deliver or collect more intelligence.

The arms race between surface vessels and submarines has been going on for almost exactly a century—since Germany’s demonstration to its enemies in the first world war of the threat from its U-boats. By the end of the second world war, the Allies had become so good at finding U-boats that German crews taking to the sea had a life expectancy of about a week. As the examples of the *Kitty Hawk* and the *Theodore Roosevelt* show, the balance at the moment has tipped back in favour of the submariner. The great question is how long it will stay that way. ■



反潜战

猫鼠游戏？

更安静的潜艇数目大增，促使海军思索更好的办法来追踪它们

去年在佛罗里达附近海域进行的军事演习中，法国蓝宝石号（*Saphir*）核动力攻击型潜艇悄悄避开了美国猎潜飞机和舰船部队，“击沉”（只是演习）了美国新翻修的西奥多·罗斯福号（*Theodore Roosevelt*）航母及其大部分护航舰艇。法国国防部网站在刊登了有关此次演习的一则报道后又迅速将其撤下，但消息已经传播开去。

法国此次胜利并非偶然。2006年——那回可不是演习——中国一艘柴电潜艇出现在冲绳附近水域，进入了美国另一艘航母“小鹰号”（*Kitty Hawk*）的鱼雷射程内，而为该航母护航的十多艘舰艇及反潜飞机对此浑然不觉。部署航母的海军认为，事情还可能变得更糟。1981年下水的蓝宝石号并不能代表潜艇隐蔽性的最新水平；冲绳事件过后的十年里，柴电潜艇已经变得愈发静默。当这类新一代潜艇关掉发动机而单单依靠电池运转时，其隐蔽性将达到怎样的程度？曾在西奥多·罗斯福号上担任反潜行动指挥官的杰里·亨德里克斯（*Jerry Hendrix*）这样问道：“你的手电筒有多响？”

与此同时，潜艇正在扩散。自冷战终结以来，部署潜艇的国家已从十多个增加到约40个。许多新加入的国家并非西方联盟体系成员，其中一些还与西方国家强烈敌对，而更多国家可能将与之为伍。购买一艘二手柴电潜艇最少只要花费3.5亿美元，虽然设备不够尖端，但已经够用。

雪上加霜的是，尽管人们努力保护舰船不被潜艇突袭，自冷战终结以来西方国家却在不断削减反潜开支。美国航母群自2009年起停用了S-3“北欧海盗”（*S-3 Viking*）反潜机，代之以行程更短的直升机。苏联解体后，美国航母的平均海面护航舰数量已从六艘减至四艘。

相较其前身，现代潜艇不仅更安静，装备也更先进。许多潜艇搭载了反舰导弹和鱼雷。中国在今年4月就展示了这样一颗导弹。CM-708 UNB的战斗

部重155公斤，射离水面后可接近音速飞行约290公里。这颗导弹已有一个出口型号。不过你也可能更喜欢俄罗斯的Kalibr-PL潜射导弹，其装弹更多，终级速度达三马赫。去年12月，一艘俄罗斯水下潜艇用四颗类似导弹击中了叙利亚境内的“伊斯兰国”组织（IS）目标。

潜在对手部署和订购的潜艇数量已经超过了西方国家现有防御力量所能侦测和追踪的水平。连伊朗都拥有十多艘装备精良的小型潜艇，隐身于波斯湾浅滩，此外该国还有三艘俄罗斯制造的大型基洛级（*Kilo*）柴电潜艇。一名以色列军官透露，以色列海军在备战训练中假定伊朗这支“三剑客”搭载了Kalibr-PL潜射导弹的出口版本。中国、印度和越南都有计划在潜艇上配备这种导弹。法国前国防事务副参谋长阿兰·科尔德菲（Alain Coldefy）称，结果是许多战舰已处境危险，它们或许要到导弹急速逼近时才能看清危险之大。

| 自动猎杀“红色十月号”

面对潜艇的威胁，一种新对策正在成形。它可能姗姗来迟，但势在必得。它基于一条简单的原则：既然潜艇很难被发现，那么一旦你找到一艘，就决不可放过。

跟踪具威胁的潜艇，此事毫不新鲜。比起首先要在茫茫大海中找到某样东西，跟踪的任务在传感技术上要容易得多。不过，目前这项工作是由驱逐舰和核潜艇（对那些拥有它们的国家而言）完成。这些舰艇的造价高达几十亿美元，每年的运营费用另需几千万美元。新的办法是让小型无人舰船——其实就是海洋无人机——来干这个活。它们会被配备足够多的传感器和人工智能来自动追踪敌方潜艇。

撰写了美国海军研究所（US Naval Institute）大部头参考目录《世界战斗舰队》（*Combat Fleets of the World*）的埃里克·沃特海姆（Eric Wertheim）称，六个西方海军强国正在研发这类无人舰。其中美国走得最远。6月，美国海军科研办公室（Office of Naval Research）和国防部先进研究项目局（以下简称DARPA）开始在太平洋上测试一艘40米长的无人三体舰（目前尚未武装）“海上猎人”（Sea Hunter，见下图）。其任务是

在海面上持续不断地追踪一艘敌方潜艇长达数月，即使是在公海上。尽管被跟踪潜艇上的船员可能会听到追踪舰的柴油引擎发出的声响，但这不是什么大问题。除了发射鱼雷（这将构成战争行为），“你对此无能为力”，美国海军退役少将内文·卡尔（Nevin Carr）说。他目前在设计“海上猎人”的公司Leidos任职。

据Leidos公司称，“海上猎人”每艘造价将只需两千万美元。美国将能部署大量“海上猎人”，DARPA“海上猎人”项目主管斯科特·利特菲尔德（Scott Littlefield）说。（DARPA更常称该项目为ACTUV项目，即“反潜战持续跟踪无人舰”。）在利特菲尔德眼里，这些机器人就像国际象棋里的兵，它们被送上危险之路，却不会造成生命或重大财产损失。不过，把它们比作国际象棋中地位最低的棋子却略有些误导。它们最终将需要足够强大的人工智能，才能不输给世界顶尖潜艇指挥官的谋略。

设计这样的智能软件很难，利特菲尔德说。DARPA为此向视频游戏玩家求助。2011年该机构发布了游戏“危险水域”（Dangerous Waters）的改版“ACTUV战术模拟器”（ACTUV Tactics Simulator）。在游戏中，玩家选择传感器以操控一艘类似“海上猎人”的船来追踪敌方潜艇。玩过了新游戏后，他们给予DARPA的回馈是上传自己在游戏中产生的数据。DARPA的海战专家分析了这些数据，被判定为有用的战术随后被编入“海上猎人”的软件中，也有些数据被传给承建商来改善船只设计。但即便如此，据卡尔称，该系统若要和敌方潜艇船员的智慧相匹敌，还需要更多改进。

不过，在此之前，海上无人舰仍然有其用处。相比载人柴电潜艇，它们的灵敏度、持久性和速度都更佳，除追踪潜在敌人的潜艇外，还会在许多不同种类的任务中找到用武之地。比如，今年秋天挪威开始在海面上测试一艘11米长的海面无人舰ODIN（“奥丁”）。一开始ODIN将用于扫除水雷，因为水雷静止不动，不会采取规避动作。但最终，其软件将被升级，使其有能力跟踪载人潜艇。

一些海军部队想让无人舰自身也能潜水。曾给三名美国国防部长担任顾问的安德鲁·克雷皮内维奇（Andrew Krepinevich）说，美国计划中的“鲨

鱼”无人艇（SHARK，名字取自“submarine, hold at risk”的首字母缩写，意为置潜艇于风险之中）是这个领域里最先进的设计，但中国和日本紧随其后。水下无人艇相较海面无人舰更难被侦测到，因此也更难反击，这是因为它发出的声波在水中呈球形扩散，而海面无人舰的声波在水中穿越时呈半球形扩散。无论在距声源多远的位置，水下无人艇的声波都要填充更大的范围，因此其声音比海面无人舰的声音消散得更快。

| 小机器，大网络

这一技术变革正在开创一个反潜战的新时代，瑞典潜艇舰队的前指挥官冈纳·维斯兰德（Gunnar Wieslander）这样认为。他目前正在运营出口柴油载人潜艇的萨博-考库姆公司（Saab Kockums）。该公司新推出的62米长A26型潜艇将配有一根管道，一台水下无人艇将悄无声息地从管道内飞出，袭击海面无人舰。维斯兰德说，批量生产的潜艇首次被配备了这样的功能。不过，克雷皮内维奇对水下无人艇提出了预警。它们在袭击其他无人舰这一点上并无问题，但如果电池技术不能有重大进展，这些机器无一能长久地追踪大型潜艇。后者由柴油发动机供电，能以高达每小时20海里的速度行进——核动力潜艇的速度还要快得多。

但是，首先需要找到那些将被追踪的潜艇，在这项决定性的任务上，情况又如何呢？当你看到“在鱼雷射程内浮出水面”这一表述时，脑子里可能出现这样的画面：一艘船在距其目标几百米处突然出现——你可能曾在描述二战的电影里见过这样的场面。而在冲绳事件中，这一距离约为五海里（细节仍属机密）。无论是引擎转动的声音还是反射回来的声纳脉冲，都遵循平方反比定律，即其强度的变化和其穿越的距离平方呈反比。这意味着声音会迅速减弱。因此，理想的办法是侦测设备要足够靠近目标。

办法之一是创建一个密集的稳定侦测器网络，至少在本国领海可以这么做。这类网络中较为先进的一个例子在新加坡。它由名为“声节点”的水下浮标组成，这些浮标被拴在海床上，彼此间距两三公里。这些节点会“通话”，通过在水中发送精确校准的振动来交流。目前它们正在发送测试信号，但最终将被配备侦测潜艇的传感器。

比这种网络更为复杂的系统也在开发中，包括对抗无人舰艇的反制措施。挪威国防研究院（FFI）的科学家托尔施泰因·奥尔斯莫·赛博（Torstein Olsmo Sæbo）说，受无人舰艇牵引的声波阵列如今能模仿一艘大型潜艇的信号，诱骗对方的无人舰艇驶往错误方向。（他补充说明，只是因为挪威新建的水下无人艇队可以出击，并不表示它已经这么做了。）与此同时，DARPA正计划部署海床发射架，它们会突然打开，释放出无人机靠近敌方潜艇，或在上升到海面后迅速飞离，传送或收集更多情报。

海面舰船和潜艇之间的军备竞赛已经持续了将近整整一个世纪，起点是德国在一战中向敌军展示其U型潜艇的威慑力。到了二战尾声，盟军已经非常擅长侦测U型潜艇，以至于派往海战的德国船员往往都活不过一周。正如小鹰号和西奥多·罗斯福号的例子所展示的那样，目前天平已经重新向潜艇倾斜。最大的问题是这还能持续多久。■



Mankind tomorrow

Future shock

A bestselling Israeli historian looks at where mankind is heading

“SAPIENS”, Yuval Noah Harari’s previous book which came out in 2011, looked to the past. Zipping through 70,000 years of human history, it showed that there is nothing special about our species: no divine right, no unique human spark. Only the blind hand of evolution lies behind the ascent of man. That work ended with the thought that the story of *Homo sapiens* may be coming to an end. In his new book, “Homo Deus”, the Israeli historian heads off into the future.

In one thrilling sweep, Mr Harari proclaims that the old enemies of mankind— plague, famine and war—are now manageable. “For the first time in history,” he writes, “more people die today from eating too much than from eating too little; more people die from old age than from infectious diseases; and more people commit suicide than are killed by soldiers, terrorists and criminals combined.” Instead, the challenges of the third millennium will be how to achieve immortality, happiness and divinity, the latter in the sense of enhancing people’s physical and cognitive abilities beyond the biological norm.

This might sound like good news, but the author has a dystopian vision. People, increasingly, will cede jobs and decisions to machines and algorithms. The “useless masses” cast aside by this development will pursue the mirage of happiness with drugs and virtual reality. Only the super-rich will reap the true rewards of the new technologies, commandeering evolution with intelligent design, editing their genomes and eventually merging with machines. Mr Harari envisages an elite caste of *Homo sapiens* evolving into something unrecognisable: *Homo deus*. In this brave new world, the rest of mankind will be left feeling like “a

Neanderthal hunter in Wall Street”.

Mr Harari’s prophecy is bleak, but it is far from new. More interesting is the way he roots his speculation about technology in the context of how liberal democracy has evolved. For most of human history, Mr Harari says, humans believed in gods. This lent their world a cosmic order. But then, at least in some parts of the world, science began simultaneously to give mankind power and to strip it of meaning by relegating religion to the sidelines. This existential hole was filled by a new religion, humanism, that “sanctifies the life, happiness and power of *Homo sapiens*”, he writes. The covenant between humanism and science has defined modern society: the latter helps people achieve the goals set by the former.

But the life sciences are now undermining free will and individualism, which are the foundations of humanism. Mr Harari describes scientific research that, in his eyes, proves that the “free individual is just a fictional tale concocted by an assembly of biochemical algorithms”. As it dawns on mankind that free will is an illusion and external algorithms can predict people’s behaviour, Mr Harari believes liberal democracy will collapse. What will replace it? Perhaps a techno-religion such as “Dataism” that treats everything in terms of data processing and whose supreme value is the flow of information. In this context, *Homo sapiens* is a rather unimpressive algorithm, destined for obsolescence—or an upgrade.

Although there is plenty to admire in the ambitious scope of this book, ultimately it is a glib work, full of corner-cutting sleights of hand and unsatisfactory generalisations. Mr Harari has a tendency towards scientific name-dropping—words like biotech, nanotechnology and artificial intelligence abound—but he rarely engages with these topics in any serious way. Instead, he races along in a slick flow of TED-talk prose. Holes in his arguments blur like the spokes of a spinning wheel, giving an illusion of solidity but no more. When the reader stops to think, “Homo Deus” is

suddenly less convincing, its air of super-confidence seductive but misleading.

Correction: The Three Gorges dam is on the Yangzi River in China, and not on the Yellow River as implied in our review last week (“Water, water, everywhere”). ■



人类的明天 未来震撼

以色列畅销历史学家展望人类未来

尤瓦尔·诺亚·赫拉利（Yuval Noah Harari）的上一本书《人类简史》（Sapiens）出版于2011年，书中回顾了人类一路走来的历程。这本书穿越7万年的人类历史，向读者说明我们这个物种毫无特别之处：没有神授的权力，没有独一无二的人性火花。值得称道的只有人类的攀升背后那只看不到的进化之手。该书在结尾给人留下的思考是，“智人”时代可能即将终结。在新书《人神合一》（Homo Deus）中，这位以色列历史学家将目光投向未来。

赫拉利在新书中以振奋人心的笔调宣称：人类的夙敌——瘟疫、饥荒和战争——如今已经可以控制。“在人类历史上第一次出现了这样的情况，”作者写道，“死于暴饮暴食的人多过死于饥饿的人；寿终正寝的人多过死于传染疾病的人；自杀身亡的人多过死于战争、恐怖主义和犯罪的人之和。”但新的问题接踵而至，第三个千禧年的挑战将是如何获得永生、幸福和神性，后者的意思在于超越自然法则，增强人类的身体和认知能力。

这听起来可能是好消息，但作者却给出了一个反乌托邦的景象。人类将更多地把工作和决策权交给机器和算法。被机器和算法的发展抛在一边的“无用的大众”将通过药物和虚拟现实追求幸福的幻象。只有超富人群才能真正收获新技术发展带来的回报：他们将通过智能设计来掌控进化的进程，例如编辑基因组以及最终实现人机合一。赫拉利设想出一个“智人”精英阶级，它会演进得让人无法辨认，成为“人神共体”。在这样一个美丽新世界里，其他人将会感觉如同“行走于华尔街上的穴居猎人”。

赫拉利的预言很黯淡，但也并不新颖。更为有趣的是他论述观点的方式，他将关于技术的思索置于自由民主演变的背景之下。赫拉利说在人类历史的大部分时间里，人类都信仰诸神。这种信仰赋予人类世界一种宇宙秩序。然而后来，至少是在世界部分地区，科学发展开始给予人类力量，同

时将宗教挤到边缘位置，剥夺了人类曾经笃信其中的意义。赫拉利写道，这种存在性的空洞被一种新的信仰所填补，即“圣化人类生命、幸福和力量”的人文主义。人文主义与科学之间的契约定义了现代社会：后者帮助人类实现前者定下的目标。

然而生命科学正在削弱人文主义的基础：自由意志和个人主义。赫拉利写道，在他看来，科学研究证明了“自由个人只不过是由一组生化算法炮制出来的一种假象”。赫拉利认为，当人类逐渐明白自由意志是一种假象，而外部算法可以预测人类行为的时候，自由民主将会垮塌。取而代之的会是什么呢？也许是像“数据主义”这样的科技宗教，从数据处理的角度看待万物，认为宇宙的最高价值就是信息流。在这个背景之下，“智人”只是个很不起眼的算法，终究要被淘汰——或是升级。

尽管这部雄心大作有不少可圈可点之处，但终究只是哗众取宠，书中充满投机取巧的花招和并不令人满意的空洞概括。赫拉利喜欢堆砌科技术语来提升作品身价——例如生物科技、纳米技术和人工智能等名词的大量使用——但却很少以任何严肃的方式深入探讨这些话题。相反，他像做TED演讲一样洋洋洒洒，长篇大论。论点中的漏洞像高速旋转的车轮辐条一样变得模糊不清，制造出一种论据充分的假象，除此之外再无他物。当读者放下书本思考的时候，“人神合一”的概念突然不那么令人信服了，那种超级自信的光环很诱人，却也很误导人。

Harvill Secker出版社；25英镑■



Global inequality

Shooting an elephant

Charting globalisation's discontents

THE “elephant chart” began life in 2012, hidden in the middle of a World Bank working paper by Branko Milanovic, an authority on global inequality. It turned a few heads in the *New York Times* in 2014, then graced Mr Milanovic’s well-received book on global inequality earlier this year. Somewhere along the way it acquired its name, which helped it stampede across social media, brokers’ notes and even a ministerial speech this spring and summer. “I’m about to bring an elephant into the room. A wild, angry, and dangerous elephant,” joked Lilianne Ploumen, the Dutch trade minister, in August, before unveiling the chart to her audience. Now, its critics are trying to shoot it.

The distinctively shaped chart summarised the results of a huge number (196) of household surveys across the world. It was created by ranking the world’s population, from the poorest 10% to the richest 1%, in 1988 and again in 2008. At each rank, the chart showed the growth in income between these two years, an era of “high globalisation” from the fall of the Berlin Wall to the fall of Lehman Brothers.

When drawn for individual countries, charts of this kind tend to slant upwards (the rich gain more than the poor) or downwards. The global chart was unusual in sloping up, down, then upwards again, like an inverted S on its back, or an elephant raising its trunk. The chart showed big income gains at the middle and very top. But the era of globalisation seemed to offer little for the people in between: households in the 75th to 85th percentile of the income distribution (who were poorer than the top 15% but richer than everyone else) seemed scarcely better off in 2008 than they had been 20 years before. They constituted a decile of discontent, squeezed

between their own countries' plutocrats and Asia's middle class. This dramatic dip in the chart seemed to explain a lot. "Cue Donald Trump. Cue nationalism. Cue Brexit," wrote Mr Milanovic's publisher.

But who exactly occupies this dangerous decile? A report in September by Adam Corlett of the Resolution Foundation, a British think-tank, examines this group more closely, taking aim at some simplistic interpretations of the chart. Many people assume the chart shows how people in this controversial income bracket back in 1988 fared over the subsequent 20 years. But that is not quite the case. Instead it compares the people in this bracket in 1988 with people in the same bracket 20 years later. They may not be the same people. They may not belong to the same class. They may not even belong to the same country.

What accounts for the changing constituents of each income bracket? Fast growth will, of course, carry people up the income ranks. Data, dissolution and demography also play a part. The countries included in the 1988 and 2008 rankings differ because data did not exist for both years or because the country did not (several emerged only after the Soviet Union dissolved). In addition, faster population growth among people in the lower reaches of the income distribution will automatically shunt everyone above them further up the income ranks, even without any improvement in their fortunes.

To see why, imagine a simple world populated by 750m poor Southerners and 250m rich Northerners. Imagine that incomes do not change over the next 20 years, but the South's population doubles. That would increase its share of mankind from 75% to over 85%. For that simple reason, in the 75th to 85th percentiles of the global income distribution poor Southerners would replace rich Northerners. Any comparison of this income bracket with the same bracket 20 years before would thus show a big decline in fortunes, even though no one is worse off.

| *Turbulent deciles*

In reality, better-off Latin Americans and Westerners of modest means dominated the 75th-80th percentiles of the global income distribution in 1988. By 2008, rich Chinese had encroached upon this income bracket. The flat incomes shown by the elephant chart do not, then, reflect the stagnant fortunes of Trumpians and Brexiteers. They instead reflect a comparison between the original Latin American and Western occupants of this income bracket and the Chinese who jumped into it 20 years later.

None of this will be new to readers of Mr Milanovic's academic work. He and his co-author, Christoph Lakner, were quite clear about the shifting composition of the troublesome deciles. Their journal article also included an alternative chart, which does what many people assumed the elephant chart had done: it illustrates how each income group in each country in 1988 fared over the subsequent 20 years. In its shape, the chart looks recognisably elephantine. But the top 1% do markedly less well in this alternative chart than in the more famous one, and even the worst performing groups (now around the 90th percentile) boast income growth of 20% or more over 20 years.

Both charts show that China's middle classes and the world's rich have gained handsomely in the era of globalisation. It also remains true that the lower middle classes in rich countries have fared less well. The elephant shape remains, even if its dimensions are different. The Resolution Foundation's critique added little to the original academic papers (except a reason to go back and read them). But it clarified a misunderstanding shared by many of the pundits and drumbeaters who made such a noise about the rampaging chart. Like the elephant George Orwell described in a famous essay about his time as a colonial policeman in Burma, this one was shot chiefly to silence a crowd. ■



全球不平等 射杀大象

绘出全球化的满腹牢骚

“大象曲线”始于2012年，隐身于布兰科·米拉诺维奇（Branko Milanovic）撰写的一份世界银行工作文件中，米拉诺维奇是研究全球不平等问题的权威。2014年它在《纽约时报》上引发了些许关注，之后又为米拉诺维奇今年年初一本颇受欢迎的关于全球不平等的新书增色不少。这期间的某个时候，它得到了这个名称，使其在社交媒体和股票经纪人的评论中频频出现，甚至今年春夏一位部长的讲话中也提到了它。“我要牵头大象进来了。一头狂野愤怒又危险的大象。”八月在向听众展示这幅图之前，荷兰对外贸易大臣莉莲·普璐曼（Lilianne Ploumen）开玩笑地说道。现在，批评人士开始要射杀这头大象了。

这幅形状特别的曲线图浓缩了全球范围内大量家庭调查的结果（共196项）。它将1988年和2008年的世界人口分别按照从最贫困的10%到最富裕的1%排列。在每个等级，这一图表都反映出这两个年份之间的收入增长。这是一段“高度全球化”的时期，从柏林墙的倒塌直到雷曼兄弟的破产。

如果是为某个国家单独绘制，这样的图表往往是斜向上行（富人所得增加高于穷人）或斜向下行。全球图表的不同寻常之处在于曲线先上行，再下滑，又再向上走，像一个放平后上下翻转的S形，也像一头扬起鼻子的大象。这一曲线显示中间阶层和顶层富人的收入增长很大。但这两个阶层之间的人从全球化时代获得的收益极小：在收入分配第75到第85百分位之间的家庭（不及最顶层的15%富裕，但胜过其他阶层）似乎在2008年并不比20年前富裕多少。他们成了满腹牢骚的一群人，挤在本国的富豪和亚洲的中产阶级之间。曲线上这一显著的下降看似解释了很多问题。“可以解释特朗普现象。可以解释民族主义。可以解释英国脱欧。”米拉诺维奇的出版商如是写道。

但这一危险群体里究竟包括哪些人？英国智库决议基金会（Resolution Foundation）的亚当·科利特（Adam Corlett）九月发布的报告将矛头对准一些对这一曲线过于简单化的阐释，更加详细地考察了这一群体。很多人认为这一曲线显示的是1988年处于这一引发争议的收入档次的人群20年之后的境况。但事实并非如此。它是将1988年处于这一收入档次的人和20年后处于同一收入档次的人相比较。他们可能并不是同一群人。他们可能不属于同一阶层。他们甚至可能并不在同一个国家。

是什么引起了各个收入档次人群的变化？快速增长当然会把人带入更高的收入档次。数据、解体和人口结构变化也起到一定作用。1988年和2008年参与排名的国家不同，因为有些国家没有这两个年份的数据，或者连国家也不存在（有几个国家是苏联解体后才出现）。而且，位于收入分配低层的人群人口增长更快，自动将他们之上的群体推进了更高的收入等级，尽管这些群体的财富并没有任何增长。

为了说明这一点，可以想象一个简单的世界，只由7.5亿贫困的南方人和2.5亿富裕的北方人组成。假定今后20年收入不变化，但南方人口翻倍。这会让南方人口占全部人口的比例从75%升至85%。因为这个简单的原因，贫困的南方人将取代富裕的北方人成为全球收入分配第75至第85百分位的人群。因此把这一收入档次和20年前同样收入档次做任何比较都会得出财富大幅下降的结论，尽管并没人变得更穷。

| 骚动的群体

实际上，较富裕的拉美人和中等收入的西方人构成了1988年全球收入分配中第75至第80百分位。到了2008年，富裕的中国人已经侵占了这一收入档次。所以大象曲线显示的收入停滞并不是指特朗普的支持者和主张英国脱欧人士的财富停滞不前。相反，它们反映的是之前位于这一收入档次的拉美人和西方人与20年后跃入这一档次的中国人之间的比较。

读过米拉诺维奇学术著作的人对这些都不会感到新奇。他和他的合著者克里斯托夫·雷克纳（Christoph Lakner）很清楚这一恼人群体的构成变化。他们的学术文章还包括一幅修正图表，这个曲线所反映的正是很多人

认为大象曲线所显示的：它阐明了1988年每个国家的每个收入阶层之后20年的进展。就形状而言，这一曲线看起来也像大象。但最顶端1%的富裕程度在修正图中明显比不上那幅更著名的大象曲线，而且即便是收入增长最差的群体（现在位于第90百分位）在20年中也有20%乃至更多的收入增长。

两幅图都表明中国的中产阶级和全球的富人在全球化时代都获益颇丰。富裕国家下层中产阶级的发展不尽人意，这也是事实。大象形状仍然存在，尽管大小有所不同。决议基金会的批评对原本的学术论文几乎毫无补益（除了让人们有理由回头再读读这篇文章）。但是它澄清了许多为这张狂暴的图表吵吵闹闹的权威人士和媒体人士共同的误解。正如乔治·奥威尔（George Orwell）记述他在缅甸任殖民地警察时经历的名篇中的大象一样，这头大象要被射杀，主要是为了平息众口。■



Driving forces

Why giants thrive

The power of technology, globalisation and regulation

ACROSS NORTHERN CALIFORNIA the world's best-known tech companies are engaged in a construction contest. Facebook got off to an early start with a building of 430,000 square feet (40,000 square metres) that looks like a giant warehouse. It is said to be the largest open-plan office building in the world. Google is hard at work on a new headquarters to replace its Googleplex: a collection of movable glass buildings that can expand or contract as business requires. Samsung and Uber, too, are in construction mode. But the most ambitious builder is Apple, which is spending \$5 billion on something that looks like a giant spaceship.

Silicon Valley is a very different place from what it was in the 1990s. Back then it was seen as the breeding ground of a new kind of capitalism—open-ended and freewheeling—and a new kind of business organisation—small, nimble and fluid. Companies popped up to solve specific problems and then disappeared. Nomadic professionals hopped from one company to another, knowing that their value lay in their skills rather than their willingness to wear the company collar. Today the valley has been thoroughly corporatised: a handful of winner-takes-most companies have taken over the world's most vibrant innovation centre, while the region's (admittedly numerous) startups compete to provide the big league with services or, if they are lucky, with their next acquisition.

| *Tech aristocracy*

The most successful tech companies have achieved massive scale in just a couple of decades. Google processes 4 billion searches a day. The number of people who go on Facebook every month is much larger than the

population of China. These companies have translated vast scale into market dominance and soaring revenues. The infrastructure of the information economy is increasingly controlled by a handful of companies: Amazon has almost one-third of the market for cloud computing, and its cloud-services division has grown by more than half over the past year. The world's three most valuable companies at present are all tech companies, and Amazon and Facebook come in at number six and seven (see chart).

In the industrial era companies used economies of scale to become giants: the more a steel company could produce, the more it could cut its unit costs, driving its smaller competitors to the wall, and the more money it had to invest in research, marketing and distribution. The same applied to any other physical product. Tech companies have reinvented this principle for the virtual age by shifting their attention from the supply side (production efficiencies) to the demand side (network effects). Just as the old industrial giants used technological innovations to reduce their costs, the new tech giants use technological innovations to expand their networks.

| *Powerful connections*

Network effects have always been powerful engines of growth: not only is success self-reinforcing but it follows the law of increasing returns. Some network companies even pay people to become customers in order to achieve scale. And those effects become even more powerful if networks connect with each other to produce multi-sided versions. Most of the new tech firms are “platforms” that connect different groups of people and allow them to engage in mutually beneficial exchanges. Older tech companies too are putting increasing emphasis on the platform side of their business. Everyone wants to sit at the heart of a web of connected users and devices that are constantly opening up further opportunities for

growth.

In some ways these tech giants look not so much like overgrown startups but more like traditional corporations. The open-plan offices and informal dress codes are still there, but their spirit is changing. They are investing more in traditional corporate functions such as sales and branding. This corporatisation is one reason for the companies' success. Startups are increasingly willing to sell themselves to established companies, which can provide everything from legal services to quality control. Whereas most startups are happy to get things right 90% of the time, customers demand perfect products.

The most powerful force behind the rise of the new giants is technology. But two other forces are pushing in the same direction: globalisation and regulation.

The biggest beneficiaries from the liberalisation of the global economy from 1980 onwards have been large multinational companies. An annual list of the world's top multinationals produced by the United Nations Conference on Trade and Development (UNCTAD) shows that, judged by measures such as sales and employment, such companies have all become substantially bigger since the mid-1990s. They have also become more and more complex. UNCTAD points out that the top 100 multinationals have an average of 20 holding companies each, often domiciled in low-tax jurisdictions, and more than 500 affiliates, operating in more than 50 countries.

Big companies have reaped enormous efficiencies by creating supply chains that stretch around the world and involve hundreds of partners, ranging from wholly owned subsidiaries to outside contractors. Companies are chopping their businesses into ever smaller chunks and placing those chunks in the most cost-effective locations. They are also forming ever

more complicated alliances. Pankaj Ghemawat, of the Stern School of Business at New York University and the IESE Business School at Navarra, Spain, calculates that America's top 1,000 public companies now derive 40% of their revenue from alliances, compared with just 1% in 1980.

Multinationals are increasingly focusing on building up knowledge networks as well as production networks. Strategy&, the consulting arm of PwC, an accountancy giant, produces an annual survey of the world's 1,000 most innovative companies. It found that last year those that deployed 60% or more of their R&D spending abroad enjoyed significantly higher operating margins and return on assets, as well as faster growth in operating income, than their more domestically oriented competitors. Global companies can buy more innovation for their money by doing their R&D in cheaper places. They can also tap into local innovation resources. General Electric develops more than a quarter of its new health-care products in India to take advantage of the country's frugal innovation. Its revenues outside America have risen from \$4.8 billion in 1980 to \$65 billion in 2015.

Such companies are starting to be challenged by non-Western competitors. *Fortune* magazine's annual list of the world's 500 biggest companies now features 156 emerging-market firms, compared with 18 in 1995. McKinsey predicts that by 2025 some 45% of the *Fortune* Global 500 will be based in emerging economies, which are now producing world-class companies with huge domestic markets and a determination to invest in innovation. China's Tencent rolled out its mobile text and messaging service, WeChat, to 700m customers in just a few years. At China's Huawei, which makes networking and telecommunications equipment, half the staff of 150,000 works in the research department. If Western companies are to survive against such competition, they have to become even bigger and more innovative.

The growth in regulation has also played into the hands of powerful incumbents. The collapse of Enron in 2001 arguably marked the end of the age of deregulation, which began in the late 1970s, and the beginning of re-regulation. The financial crisis of 2008 served to reinforce that trend. The 2002 Sarbanes-Oxley legislation that followed Enron's demise the previous year reshaped general corporate governance; the 2010 Affordable Care act re-engineered the health-care industry, which accounts for nearly a fifth of the American economy; and in the same year the Dodd-Frank act rejiggered the financial-services industry.

Regulatory bodies have got bigger. Between 1995 and 2016 the budget of America's Securities and Exchange Commission increased from \$300m to \$1.6 billion. They have also become much more active. America's Department of Justice has used the Foreign Corrupt Practices act of 1977 to challenge companies that have engaged in questionable behaviour abroad. The average cost of a resolution under this act rose from \$7.2m in 2005 to \$157m in 2014.

Regulation inevitably imposes a disproportionate burden on smaller companies because compliance has a high fixed cost. Nicole and Mark Crain, of Lafayette College, calculate that the cost per employee of federal regulatory compliance is \$10,585 for businesses with 19 or fewer employees but only \$7,755 for companies with 500 or more. Younger companies also suffer more from regulation because they have less experience of dealing with it. Sarbanes-Oxley imposed a particularly heavy burden on smaller public companies. The share of non-executive directors' pay at smaller firms increased from \$5.91 out of every \$1,000 in sales before the legislation to \$9.76 afterwards. The JOBS act of 2012 exempted small businesses from some of the more onerous requirements of the legislation, but the number of startups and IPOs in America remains at disappointingly low levels.

| *Too much to read*

The complexity of the American system also serves to penalise small firms. The country's tax code runs to more than 3.4m words. The Dodd-Frank bill was 2,319 pages long. Big organisations can afford to employ experts who can work their way through these mountains of legislation; indeed, Dodd-Frank was quickly dubbed the “Lawyers’ and Consultants’ Full-Employment act”. General Electric has 900 people working in its tax division. In 2010 it paid hardly any tax. Smaller companies have to spend money on outside lawyers and constantly worry about falling foul of one of the Inland Revenue Service's often contradictory rules.

Both Sarbanes-Oxley and Dodd-Frank set the tone for legislation in Britain and mainland Europe. China has also become more zealous about regulation, partly in order to pursue nationalist and political goals and partly because of worries about conflicts of interest. But different regions have adopted different approaches to regulation, exacerbating the problem of complexity. As a result, in many markets all but the most sophisticated companies can find it impossible to do business.

An additional problem that companies have to face today is disappointing economic growth, particularly in the West, at a time of widespread technological disruption. This paradox is easier for big companies to deal with. Martin Reeves, of BCG, a consultancy, argues that such companies are good at “buffering”. They have enough spare resources to absorb external shocks or ride out temporary downturns, and they can move operations from one part of the world to another if the political climate turns against them. Mr Reeves points out that the mortality rate for all American listed companies over a five-year period is as high as 36%, but for companies worth more than \$1 billion it is only half that.

Slow growth also plays into the hands of incumbents. Joseph Gruber and Steven Kamin, two economists at the Federal Reserve, find that big

companies are increasingly saving more than they spend. Apple, for instance, holds about a quarter of its market capitalisation in cash. These huge cash piles allow leading companies to consolidate their position by buying startups and hoovering up the most talented employees.

The superstar companies, then, seem to have all the advantages. But two arguments are being advanced to suggest that their success may not last. One is that the forces speeding up creation, which currently work in their favour, could also speed up destruction. The other, more fundamental one is that these companies are merely holdouts against a general trend towards a more fluid economy. ■



驱动力

巨人何以茁壮成长

技术、全球化和监管的力量

在整个北加州，世界上最知名的一批科技公司正在进行一场建筑竞赛。Facebook动手最早，建设了一座面积达40000平方米、看起来像一个巨大仓库的建筑物，据称是世界上最大的开放式办公楼。谷歌则在奋力建设一个新的总部以取代其现有的Googleplex。这组可移动的玻璃建筑可根据业务需要扩展或收缩。三星和优步也不甘落后。但最雄心勃勃的要属苹果了，它投入50亿美元来建造一个看似巨大飞船的总部。

硅谷与20世纪90年代时已完全不可同日而语。当时它被视为培育开放、自由的新型资本主义以及小型、灵活和多变的新型企业组织的土壤。公司为了解决具体问题而迅速出现，随后消失。专业人士像游牧民族般在公司间跳来跳去，深知自己的价值在于技能而不愿戴上某家公司的项圈。然而今天，硅谷已经彻底企业化了：极少数赢家通吃的公司接管了世界上最具活力的创新中心，而该地区的创业公司（固然有很多）则竞相为巨头提供服务，或者幸运的话，成为其下一个收购目标。

| 科技贵族

最成功的高科技公司已经在短短几十年内达到了庞大的规模。谷歌每日要处理40亿次搜索。每月登录Facebook的人数比中国的人口还要多得多。这些公司已经将其宏大的规模转化为市场霸主地位和飙升的收入。信息经济的基础设施越来越控制在少数几个公司手中：亚马逊几乎占据了云计算市场的近三分之一，其云计算服务部门去年的增长超过50%。世界上目前市值最高的三家公司都是科技公司，亚马逊和Facebook则排在第六和第七位（见图表）。

在工业时代，公司利用规模效益成为巨头：一家钢铁公司的产能越高，就越能削减单位成本，逼死规模较小的竞争对手，并有更多的钱来投入研发、市场和分销。这同样适用于任何其他实体产品。高科技公司则在这个

虚拟时代重塑了这个原则——它们将注意力从供给侧（生产效率）转移到需求侧（网络效应）。就像老工业巨头用技术创新来降低成本，新的科技巨头则是利用技术创新来扩展其网络。

| 强大的连接

网络效应一直是增长的强大引擎：不仅强者愈强，而且还遵循收益递增律。一些网络公司甚至付钱来让人成为客户，以此造就规模。如果网络相互连接，产生多方版本，这些效应就会愈发强大。大多数新的高科技企业都是“平台”，它们连接不同的人群，使其进行互惠互利的交流。较早的高科技公司也越来越重视其业务的平台性质。在这个由相互连接的用户和设备构成的网络中，每家公司都想成为核心，而这些用户和设备会不断创造新的增长机会。

在某种意义上，这些科技巨头看上去并不像是体量过大的创业公司，而更像是传统公司。开放式办公室和非正式的着装规则仍然存在，但其精神正在改变。它们更多投资于销售和品牌推广等传统企业职能。公司化恰是公司成功的原因之一。创业公司越来越愿意把自己卖给成熟公司，因为对方可以提供从法律服务到质量控制的一切所需。虽然大多数创业公司对于在90%的情况下把事情做对已经心满意足，但客户要求的是完美的产品。

新巨头崛起背后最强大的力量是技术。但其他两股力量也在将其推向同一个方向：全球化和监管。

从1980年起，全球经济自由化的最大受益者一直是大型跨国公司。联合国贸易和发展会议（UNCTAD）发布的世界顶级跨国公司年度排行榜显示，按照销售和就业等指标来衡量，此类公司的规模自90年代中期以来迅速扩大，同时也变得越来越复杂。贸发会议指出，排名前100位的跨国公司平均每家有20家控股公司（常位于低税收辖区），有500多个分支机构在50多个国家开展业务。

大公司建立的供应链遍布全世界，涉及从全资子公司到外部承包商等成百上千的合作方，由此收获了巨大的效率提升。公司把自身的业务切割成更

小的块，并把这些小块放在成本最为经济的地方。它们还在组建越来越复杂的联盟。根据纽约大学斯特恩商学院和西班牙纳瓦拉IESE商学院的教授潘卡·格玛沃特（Pankaj Ghemawat）的计算，美国排名前1000的上市公司现在有40%的收入源自联盟，而1980年时只有1%左右。

除了生产网络，跨国公司也越来越注重建立知识网络。会计巨头普华永道的咨询部门Strategy&每年发布对全球1000家最具创新力公司的调查。调查发现，那些在去年将60%以上的研发支出分配到国外的公司，其经营利润率和资产收益率显著高于其侧重本土运营的竞争对手，运营收入增长也更快。通过将研发放在成本较低廉的地方，全球公司可以用同样的钱买到更多的创新，还能借助当地的创新资源。通用电气四分之一以上的新医疗产品在印度开发，以便利用印度的节俭创新优势。其美国以外的收入已经从1980年的48亿美元增长到2015年的650亿美元。

这些公司也开始面临非西方竞争者的挑战。如今有156家来自新兴市场的公司跻身《财富》杂志年度全球500强行列，而1995年时只有18家。麦肯锡预测，到2025年，《财富》全球500强中将有45%总部位于新兴经济体。这些经济体庞大的国内市场和对创新的投资决心正在造就世界一流的公司。中国的腾讯公司在短短的几年内就让其移动文本和消息服务应用“微信”覆盖了七亿客户。而中国的网络和电信设备制造商华为的15万员工有一半在研发部门工作。如果西方公司想要在这样的竞争中求生存，就必须变得更大、创新更多。

监管的加强也正中现有巨头的下怀。放松管制时代始于20世纪70年代末，而2001年安然公司的崩溃也许标志着它的终结和监管时代的重新开始。2008年的金融危机更加强了这一趋势。在安然坍塌后一年，2002年的《萨班斯-奥克斯利法案》重新塑造了公司治理，2010年的合理医疗费用法案改变了占美国经济近五分之一的医疗保健行业，同年的《多德-弗兰克法案》则让金融服务行业大洗牌。

监管机构也变得愈发庞大。1995年至2016年间，美国证券交易委员会的预算从3亿美元增长到16亿美元。它们也变得更加主动。美国司法部已经运

用《1977年外国腐败行为法案》来质询在国外从事可疑行为的公司。该法案下的结案平均成本已从2005年的720万美元上升至2014年的1.57亿美元。

监管不可避免地让小公司背上格外沉重的负担，因为合规的固定成本很高。拉斐特学院（Lafayette College）的妮可·克雷恩（Nicole Crain）和马克·克雷恩（Mark Crain）计算出，联邦监管合规的成本对于19人及以下的公司达到每名员工10585美元，而对于500人及以上的公司则仅为7755美元。新成立的公司受监管之苦也更深，因为它们的应对经验较少。《萨班斯-奥克斯利法案》给小型上市公司造成的负担尤其沉重。小企业非执行董事的薪酬比例已从立法前的每1000美元销售额5.91美元增加到立法后的9.76美元。2012年的《JOBS法案》免除了对小企业的一些更为繁复的法律要求，但美国创业公司和新上市公司的数量之低仍然让人失望。

| 要读的太多

美国体制的复杂性也在使得小公司处于劣势。美国的税法超过340万字。

《多德-弗兰克法案》长达2319页。大企业有钱聘请专家来搞定这些文山书海——事实上，《多德-弗兰克法案》很快就被戏称为“律师和顾问的充分就业法案”。通用电气的税务部门有900人，该公司在2010年几乎没有交税。较小的公司不得不付钱给外部律师，还得不断为不小心触犯美国国税局那些常常自相矛盾的规则而提心吊胆。

《萨班斯-奥克斯利法案》和《多德-弗兰克法案》都为英国和欧洲大陆的立法定下了基调。中国也对监管愈发热衷，部分是出于国家主义和政治目的，部分是担心利益冲突。然而不同地区的监管办法也不同，让复杂性的问题愈发恶化。其结果是在许多市场上，只有最为成熟的企业才能找到办法来做生意。

企业今天不得不面对的另一个问题是在这个技术剧变广泛出现的时代，经济增长却令人失望，特别是在西方。大公司处理这种矛盾要容易一些。波士顿咨询公司的马丁·里维斯（Martin Reeves）认为这样的公司擅长“缓冲”。它们有足够的空闲资源来吸收外部冲击或渡过暂时的低迷，如果政治气候不利，还可将公司从世界的一处搬到另一处。里维斯指出，所有美

国上市公司在五年内的死亡率高达36%，但市值超过十亿美元的公司的死亡率只有这个数字的一半。

缓慢的经济增长也有利于成熟的公司。美联储的经济学家约瑟夫·格鲁伯（Joseph Gruber）和史蒂芬·卡曼（Steven Kaman）发现，大公司存钱比花钱多的情况越来越普遍。例如苹果持有约相当于其市值四分之一的现金。巨大的现金储备使得龙头企业得以通过收购创业公司、扫荡最有才华的员工来巩固自己的位置。

巨星公司似乎占尽天时地利。但人们还提出两种说法，认为其成功也许不能持续。其一是如今对其有利的那种加速构建的力量，也会加速其毁灭。而更根本的原因在于，经济的大趋势是变得更加灵活，这些公司不过是逆流而动的钉子户而已。 ■



Misconceptions

The new Methuselahs

Superstar companies are far more resilient than critics give them credit for

IN SEPTEMBER 2009 *Fast Company* magazine published a long article entitled “Nokia rocks the world”. The Finnish company was the world’s biggest mobile-phone maker, accounting for 40% of the global market and serving 1.1 billion users in 150 countries, the article pointed out. It had big plans to expand into other areas such as digital transactions, music and entertainment. “We will quickly become the world’s biggest entertainment media network,” a Nokia vice-president told the magazine.

It did not quite work out that way. Apple was already beginning to eat into Nokia’s market with its smartphones. Nokia’s digital dreams came to nothing. The company has become a shadow of its former self. Having sold its mobile-phone business to Microsoft, it now makes telecoms network equipment.

There are plenty of examples of corporate heroes becoming zeros: think of BlackBerry, Blockbuster, Borders and Barings, to name just four that begin with a “b”. McKinsey notes that the average company’s tenure on the S&P 500 list has fallen from 61 years in 1958 to just 18 in 2011, and predicts that 75% of current S&P 500 companies will have disappeared by 2027. Ram Charan, a consultant, argues that the balance of power has shifted from defenders to attackers.

Incumbents have always had a tendency to grow fat and complacent. In an era of technological disruption, that can be lethal. New technology allows companies to come from nowhere (as Nokia once did) and turn entire markets upside down. Challengers can achieve scale faster than ever before. According to Bain, a consultancy, successful new companies reach

Fortune 500 scale more than twice as fast as they did two decades ago. They can also take on incumbents in completely new ways: Airbnb is competing with the big hotel chains without buying a single hotel.

Next in line for disruption, some say, are financial services and the car industry. Anthony Jenkins, a former chief executive of Barclays, a bank, worries that banking is about to experience an “Uber moment”. Elon Musk, a founder of Tesla Motors, hopes to dismember the car industry (as well as colonise Mars).

It is perfectly possible that the consolidation described so far in this special report will prove temporary. But two things argue against it. First, a high degree of churn is compatible with winner-takes-most markets. Nokia and Motorola have been replaced by even bigger companies, not dozens of small ones. Venture capitalists are betting on continued consolidation, increasingly focusing on a handful of big companies such as Tesla. Sand Hill Road, the home of Silicon Valley’s venture capitalists, echoes with talk of “decacorns” and “hyperscaling”.

Second, today’s tech giants have a good chance of making it into old age. They have built a formidable array of defences against their rivals. Most obviously, they are making products that complement each other. Apple’s customers usually buy an entire suite of its gadgets because they are designed to work together. The tech giants are also continuously buying up smaller companies. In 2012 Facebook acquired Instagram for \$1 billion, which works out at \$30 for each of the service’s 33m users. In 2014 Facebook bought WhatsApp for \$22 billion, or \$49 for each of the 450m users. This year Microsoft spent \$26.2 billion on LinkedIn, or \$60.5 for each of the 433m users. Companies that a decade ago might have gone public, such as Nest, a company that makes remote-control gadgets for the home, and Waze, a mapping service, are now being gobbled up by established giants.

Buying up smaller companies is usually part of a wider strategy: investing in their proprietary technologies. The tech giants climbed to the top of the pile because they were significantly better than their rivals at what they did. Amazon, for example, offered a choice of millions of books when local booksellers had just thousands. Their success provided them with piles of cash that they could invest in improving their own ideas and protecting them with armies of lawyers, and buying other people's ideas in the market. Google purchased Motorola Mobility for \$12.5 billion in order to acquire the company's portfolio of patents. These tech giants relentlessly extend their businesses into adjacent areas: thus Amazon expanded from books and retailing generally into internet servers, and Google is expanding into everything to do with information.

| *In praise of asymmetries*

Derek Kennedy, of BCG, a consultancy, says that one of the tech companies' most powerful defences in the long term will be their ability to combine "asymmetries of information" with "asymmetries of execution". These companies have unmatched stores of information, as well as an unmatched ability to use that information to reshape their existing businesses or create new ones. Not only do they know what you want before you know yourself but they can also deliver it to you. Companies can use these combined asymmetries to shift into new areas.

The rise of the internet of things (IoT) will give a powerful push to consolidation. Gartner, a research firm, predicts that the number of products connected to the internet will increase from 6.4 billion today to 21 billion by 2020 as companies discover the power of software. The process has already begun. Coca-Cola uses microchips to track the whereabouts of its bottles. Tesla improved its cars' uphill starts by transmitting a software update. General Electric thinks that the IoT will be the biggest revolution of the coming decades.

The increasing convergence of hardware and software lets companies establish much closer relations with their customers. They can gather up-to-the-minute information on the response to their products and use it to make improvements. They can tailor products to the needs of individual customers. Sonos, a maker of music systems, produces speakers that can tune themselves to the acoustic qualities of the room they are placed in. They can sort out problems before they arise. Diebold monitors its cash machines for signs of trouble, either fixing problems remotely by means of a software patch or sending a technician. They can also branch out into delivering services. John Deere, a maker of heavy machinery, is building sensors for tractors that can receive data on weather and soil conditions, enabling farmers to make more informed decisions on the use of their land.

Older companies such as GE and Caterpillar may well have a fight on their hands with born-digital companies such as Google and Amazon that try to extend their empires into the physical world. But the overall effect will be consolidation. Only companies that can afford to make substantial investments in both the physical and virtual worlds will prosper. And once companies have established strong relationships with their customers, they will have a good chance of keeping them regardless of price. The more that things are connected to each other and to the companies in charge of the networks that control them, the harder it will be for insurgents to get a foothold in the market.

| *A symbiotic relationship*

Most management gurus have a Manichean view of the relationship between big companies and startups: the more you have of one, the less you have of the other. They also add an evolutionary twist: the more advanced a society becomes, the better small organisations will do in relation to big ones. Gerald Davis, of the University of Michigan's Ross

School of Business, has just published a new book, “The Vanishing American Corporation”, in which he points out that the classic argument for the existence of corporations—that the cost of doing things through them is lower than through the market—has lost its force because advances in technology (of the sort that Silicon Valley has pioneered) have slashed the cost of doing things through the market.

Likewise, he says, limited-liability companies replaced other corporate forms because firms in capital-intensive industries such as steel needed to raise a lot of capital, but software companies typically do not need to raise much money. Mr Davis argues that in future companies are likely to become much more fluid: entrepreneurs can raise money from Kickstarter, rent employees from Upwork, computer power from Amazon cloud and tools from TechShop, register their companies in Liberia and still reach a global audience thanks to cloud computing. There are also ever more ways of organising co-operation; Wikipedia has already produced the world’s biggest encyclopaedia by using volunteers. “The Web and the smartphone allow pervasive markets and spontaneous collaborations at minimal cost. They make institutions like the modern corporation increasingly unsustainable,” he explains.

RocketSpace, which makes its living by looking after startups, at first sight looks like an example of what Mr Davis had in mind. Its basic business is to sell space in its nine floors of offices in the heart of San Francisco, though it does a lot more than that. Starting a company can be lonely as well as gruelling, and working in RocketSpace provides you with an instant network and access to good advice. The company has been so successful that it turns away 90% of companies that apply for accommodation. As a result, being admitted provides instant cachet (former occupants include Uber and Spotify).

But look again, and a more complicated picture emerges. RocketSpace is

increasingly acting as a middleman between startups and big companies. The IPO market has shrunk into insignificance; about 90% of today's successful startups "exit" by selling themselves to an established company. RocketSpace makes that easier by introducing them to the right partners. Big companies outside the tech industry, in turn, benefit from RocketSpace helping them understand the tech world.

The story of RocketSpace suggests that big and small organisations have a symbiotic relationship. Duncan Logan, RocketSpace's founder, argues that corporations are, in effect, outsourcing some of their tech R&D to the startup world. This is true not only of non-tech companies that do not understand the tech world but also of big tech companies that do some of their R&D in-house but leave some of it to the market to get the best of both worlds. Big companies have much to gain from contracting out their R&D to startups. They can make lots of different bets without involving their corporate bureaucracies. But startups also have a lot to gain by selling themselves to an established company that can provide stability, reliability and predictability, all of which can be hard to come by in the tech world. Big companies have phalanxes of lawyers to protect intellectual property, bureaucrats to make sure that the t's are crossed and the i's dotted, and slick marketing machines.

Mr Davis is right that it is getting easier to put together a company from a variety of components, but he is wrong to conclude that big companies are in retreat. The "virtualisation" of some sectors of the economy and the "corporatisation" of others are going hand in hand. Superstar companies try to keep their costs under control by contracting out any functions they regard as non-core. Startups try to reach global markets with the help of platforms such as eBay and Alibaba. The upshot is the development of a multi-tiered economy. The commanding heights of the global economy may be dominated by familiar companies: a premier league of superstars that constantly jostle to avoid relegation, and a first division of less stellar

performers that struggle to be promoted. But the lower rungs are studded with large numbers of Mr Davis's pop-up companies.

If corporatisation and virtualisation can coexist, two of the basic tenets of modern management theory need to be rethought. The first is that corporate man (and woman) is a thing of the past, and that the only way to succeed in business is to turn yourself into an entrepreneur. The reality is more nuanced. Big companies are certainly cutting back on long-term employees. Dan Kaminsky, chief scientist and a co-founder of White Ops, one of RocketSpace's startups, recalls that, in a previous corporate job, he filled out a form in which a "mid-career worker" was defined as someone who had been in the same post for two or three years. And employment patterns are becoming much more varied. Lawrence Katz, of Harvard, and Alan Krueger, of Princeton, calculate that the proportion of American workers engaged in "alternative work arrangements" (working as freelancers, temporary contractors and the like) increased from 10.1% in 2005 to 15.8% in late 2015.

But big companies nevertheless preserve a core of employees who help maintain a long-term institutional memory and a distinctive culture. Strategy& has been collecting data on the chief executives of the world's top 2,500 public companies for more than 15 years. The consultancy's Per-Ola Karlsson notes that more than 80% of these companies' CEOs are internal appointments. Almost two-thirds of them have spent 12 years or more climbing up the corporate hierarchy. They are drawn from a large cadre of long-term employees who dominate the upper ranks of the organisation and usually outperform external recruits because they have far more company-specific knowledge.

Conversely, entrepreneurship is not necessarily a road to success. Reid Hoffman, the co-founder of LinkedIn, a social-networking company, and author of "The Start-Up of You", may have made \$2.8 billion by selling his

own startup to Microsoft, but the coffee shops of San Francisco are full of middle-aged hopefuls scratching a living without a pension.

The second idea that needs overhauling is the transaction-cost theory of the firm formulated by Ronald Coase 80 years ago: that firms are worth having only if they can do things more cheaply than the market can. Since firms continue to occupy a central place in the modern economy despite the enormous advances of the market in recent years, there must be other factors at work. Companies are not just a way of keeping transaction costs to a minimum. They are proof that when people are trying to solve common problems, they are wiser collectively than they are individually. Such collective wisdom can accumulate over time and be embodied in corporate traditions that cannot be bought in the market. ■



误解

新寿星

巨星公司比批评家所言更为坚挺

2009年9月，《快公司》杂志上发表了题为“诺基亚震撼世界”的长篇文章。文章指出，这家芬兰公司是世界上最大的移动电话制造商，雄霸全球市场的40%，在150个国家服务11亿用户。公司还有扩张到数字交易、音乐和娱乐等领域的宏伟计划。“我们将很快成为世界上最大的娱乐媒体网络。”诺基亚副总裁对该杂志称。

然而事与愿违。苹果公司当时已经开始利用其智能手机蚕食诺基亚的市场。诺基亚的数字梦想化为泡影。该公司如今只剩下昔日的余辉，已将其手机业务出售给微软，转为生产电信网络设备。

英雄企业灰飞烟灭的例子还有很多，随便举四个“B”打头的吧：黑莓（Blackberry）、百视达（Blockbuster）、博德斯（Borders）和巴林银行（Barings）。麦肯锡指出，标准普尔500强公司的平均在榜时间已从1958年时的61年下降到2011年时的区区18年，并预测目前标准普尔500强公司中的75%将在2027年前消失。顾问拉姆·查兰（Ram Charan）认为力量的天平已经从守方转移到攻方一边。

老牌公司一直有变得臃肿和自满的倾向。在技术颠覆的时代，这可能是致命的。新技术可以凭空造就企业（诺基亚就曾如此），让整个市场天翻地覆。挑战者能够比以前更快地实现规模。贝恩咨询公司称，成功的新公司达到《财富》500强规模的速度要比20年前快一倍。它们还可以用全新的方法来对付现有公司：Airbnb没有买一间酒店便可与大型连锁酒店竞争。

有人说，下一个被颠覆的就是金融服务业和汽车业。巴克莱银行的前首席高管安东尼·詹金斯（Anthony Jenkins）担心银行将会经历“优步时刻”。特斯拉汽车的创始人之一伊隆·马斯克（Elon Musk）希望能够解构汽车行业（以及殖民火星）。

我们完全有可能最终发觉，本期特刊中到目前为止所描述的整合不过是昙花一现。但是反对这种说法的原因有二。首先，高下榜率与赢家几乎通吃的市场是吻合的。取代诺基亚和摩托罗拉的是比它们更大的公司，而不是数十家小公司。风险资本家都押注在不断整合上，越来越专注于特斯拉等屈指可数的几个大企业。硅谷风险投资家的聚集地杉迪希尔路回荡着“独角兽”【译注：市值超过百亿美元的创业公司】和“超大规模”的声音。

其次，今天的科技巨头都很有机会长寿。它们建立起了一套令人生畏的防御对手的机制。最明显的是它们会生产互为补充的产品。苹果的客户通常会买下其整套产品线，因为这些产品就是设计成要一起使用的。科技巨头也在不断地收购较小的公司。2012年，Facebook斥资10亿美元收购Instagram，相当于为收购该公司3300万个用户每人付出30美元。2014年Facebook又以220亿美元收购WhatsApp，相当于为吸收其4.5亿用户每人付49美元。今年，微软花费262亿美元收购领英，相当于为收编其4.33亿用户每人付出60.5美元。放在十年前可能会上市的那些公司，比如生产家用遥控小电器的Nest和地图服务Waze，如今都被成熟的巨头吞并。

收购较小的公司通常是更广泛战略的一部分：投资于其专有技术。科技巨头之所以能够爬到塔尖，正是因为它们把自己的事情做得比对手好得多。以亚马逊为例，它在本地书店仅能陈列几千种书的时候就能提供数百万种图书。成功让现金滚滚而来，让它们可以投资于改进自己的想法，配备律师大军保护自己，以及在市场上购买他人的点子。谷歌斥资125亿美元收购摩托罗拉移动，就是为了收购其专利。这些科技巨头无情地将业务一步步拓展到邻近的领域——亚马逊从书本和百货零售业拓展到互联网服务器，而谷歌正扩张到任何和信息有关的东西。

| 不对称之美

波士顿咨询公司的德里克·肯尼迪（Derek Kennedy）表示，长期来看，科技公司最强大的防御之一将是其结合“信息不对称”与“执行不对称”的能力。这些公司拥有的信息无与伦比，利用这些信息来重塑其现有业务或建立新业务的能力更是天下无敌。它们不仅在你自己还没有意识到时就知道你想要什么，更有能力把它送到你面前。公司可以凭借这种双重不对称

来进入新的领域。

物联网的崛起将有力地推动整合。研究公司Gartner预测，随着公司不断发掘软件的力量，连接到互联网的产品数量将从今天的64亿件增长到2020年的210亿件。这个过程已经开始。可口可乐使用微芯片来跟踪饮料瓶的下落。特斯拉通过发送软件更新来改善汽车的上坡起步性能。通用电气认为，物联网将成为未来十年最重要的革命。

硬件和软件的日益融合将让公司与客户建立更为密切的关系。它们可以收集对其产品的最新反馈来作出改进，还可以根据客户的个性化需求定制产品。音乐系统制造商Sonos生产了一种可以根据所在房间的声学品质来自行调整的音箱。公司更可在问题出现前就将其解决。Diebold公司监控其柜员机的风吹草动，或是通过软件补丁来远程解决问题，或是派遣技术人员上门。公司还可以拓展到提供服务。重型机械制造商约翰迪尔（John Deere）正在制造可以接收天气和土壤条件数据的拖拉机传感器，使农民能够对土地利用做出更明智的决策。

在谷歌和亚马逊等原生数字公司尝试将它们的帝国延伸到实体世界时，通用电气和卡特彼勒等更为老牌的公司很有可能要出手一战。但整体效果是整合。只有那些有能力同时对物理和虚拟世界大笔投资的公司才能蓬勃发展。一旦公司与客户建立了良好的关系，那么不论价格如何，它们都有很大的机会能够保持这一关系。事物相互之间连接得越紧密，与掌控它们的网络背后的公司连接得越紧密，“叛乱分子”就越难在市场上立足。

| 共生关系

对于大公司与创业公司之间的关系，多数管理大师都持二元论的观点：一个越多，另一个就越少。他们还添上了类似于进化论的味道：社会越先进，小型组织相对于大公司的优势就越大。密西根大学罗斯商学院的杰拉尔德·戴维斯（Gerald David）在其刚刚出版的新书《正在消失的美国公司》（The Vanishing American Corporation）中指出，公司之所以存在的经典论据——通过它们做事的成本比通过市场来得要低——已经失去了效力，因为由硅谷引领的那种技术进步已经大幅削减了通过市场做事的成

本。

同样道理，他说有限责任公司之所以取代了其他公司形式，是因为钢铁等资本密集型产业的企业需要筹集大量资金，但软件公司通常用不着筹集多少钱。戴维斯认为，未来的公司有可能会变得灵活得多：有了云计算，创业者可以在Kickstarter上筹集资金，用Upwork租用员工，在亚马逊云上租借计算能力，从TechShop租用工具，在利比里亚注册公司却仍然可以覆盖全球受众。组织合作的方式也花样翻新——维基百科已经利用志愿者生产出了世界上最大的百科全书。“网络 and 智能手机可以用最低的成本来覆盖广大市场和进行自发合作，这使得现代企业这样的制度越来越难以为继。”他解释道。

靠照管创业公司来营生的RocketSpace乍看起来就像是戴维斯设想的例子。它的基本业务是销售其位于旧金山市中心的九层办公楼中的空间，不过它做的还远不止这些。创办一家公司可能既孤独又艰苦，而在RocketSpace工作则马上让你有了人际网络，并可获得良好的建议。该公司一直非常成功，申请入驻的公司中有90%都被拒绝了。其结果是，被它接纳本身就能立即为你打上卓越的印记（曾经的入驻公司包括优步和Spotify）。

但是回过头来看，情况还要更为复杂。RocketSpace越来越多地扮演了创业公司和大公司之间的中间人。IPO市场已经缩水到无足轻重；在如今成功的创业公司中，有90%的“退出”方式都是把自己卖给一家成熟的公司。RocketSpace会将小公司介绍给合适的合作伙伴，让这一过程变得更简单。反过来，科技行业以外的大公司则得益于RocketSpace帮助它们了解科技世界。

RocketSpace的故事表明，大小企业之间有一种共生关系。RocketSpace的创始人邓肯·洛根（Duncan Logan）认为，企业实际上是在把一些高技术研发外包给创业界。这不仅适用于那些不了解科技界的非科技公司，也同样适用于那些自己做一部分内部研发，却把另一些留给市场以求兼得两者优势的高科技公司。大公司把研发外包给创业公司有很多好处——可以下

许多不同的赌注，而不用和自己企业的官僚体系打交道。而创业公司把自己卖给成熟公司也有很多好处——后者可以带来稳定性、可靠性和可预测性，而这些在科技界都很难获得。大公司有律师大军来保护知识产权，有官僚体系来确保每个细节都一丝不苟，还有运转娴熟的营销机器。

戴维斯认为由各种零件拼凑一家公司正变得越来越容易，这一判断是正确的，但他得出大公司正在衰退的结论却错了。在经济体中，某些行业的“虚拟化”和另外一些行业的“公司化”是齐头并进的。巨星公司试图将所有其认为非核心的业务外包来控制成本。创业公司则试图借助eBay和阿里巴巴等平台来进入全球市场。其结果是多层次经济得以发展。几家耳熟能详的公司也许雄踞全球经济的制高点：巨星璀璨的超级联赛不断厮杀以避免降级，表现稍逊的第二梯队苦苦拼搏以图升班。然而较低层级上则挤满了大量戴维斯口中的新生公司。

如果公司化和虚拟化可以共存，现代管理理论中的两个基本原理就需要重新思考。首先是认为企业人（男性或女性）已是过去时，在商业上取得成功的唯一途径就是让自己成为一个创业家。现实的情况更为微妙。大公司无疑在削减长期雇员。RocketSpace的创业公司之一White Ops的首席科学家和共同创始人丹·卡明斯基（Dan Kaminsky）回忆说，在之前的公司工作时，他填了一张表，上面将“处于职业生涯中期的员工”定义为在同一职位上工作了两到三年的人。就业模式也变得远为多元化。哈佛大学的劳伦斯·卡茨（Lawrence Katz）和普林斯顿大学的艾伦·克鲁格（Alan Krueger）计算出，从事“另类工作安排”（自由职业者、临时合同工等）的美国工人比例已从2005年的10.1%上升到2015底的15.8%。

但大公司仍保留着一些核心员工，来帮助维持机构的长期记忆和独特文化。Strategy&收集世界前2500家上市公司的首席高管数据已逾15年。该咨询公司的佩-奥拉·卡尔松（Per-Ola Karlsson）指出，这些公司的CEO中有80%以上是内部任命，其中几乎三分之二的人花了12年以上的时间来攀登公司的等级阶梯。他们是从一大批占据了组织上层的长期员工中挑选出来，由于对公司的了解远非外人所能及，其业绩常常能够胜过外部招募者。

相反，创业却未必是通向成功之路。社交网络公司领英的联合创始人、《我的成长》（The Start-Up of You）一书的作者雷德·霍夫曼（Reid Hoffman）也许可以通过把自己的创业公司卖给微软来狂赚28亿美元，但旧金山的咖啡厅里却挤满了没有养老金、艰难谋生却充满希望的中年人。

需要彻底反思的第二个想法，是80年前由罗纳德·科斯（Ronald Coase）构建的企业交易成本理论：只有在企业做事比市场更便宜时，才值得拥有企业。近年来市场虽有长足进步，企业却仍然占据现代经济中的核心位置，这背后必然有其他因素在起作用。公司不只是将交易成本保持在最低的手段，它们还证明了一点：如果人们试图解决共有的问题，集体的智慧就能胜过个人。这种集体智慧随时间而积累，体现在市场上买不到的企业传统中。■



Key attributes

The alphabet of success

Superstars need a dazzling range of qualities

GENERAL ELECTRIC, THE product of an alliance between Thomas Edison, America's greatest inventor, and J.P. Morgan, its greatest banker, was the technology superstar of the early 20th century. Edison's patents have long since expired and electricity has become a commodity, but GE remains a commercial empire, the only intact survivor of the companies that made up the original Dow Jones index. GE employs 330,000 people in 180 countries, owns \$493 billion-worth of assets and earned \$117 billion in 2015. It has survived where other technology stocks have faded because it has fully mastered the art of management. Its slogan, "Imagination at work", could just as easily be "Management at work".

Every superstar company is a superstar in its own way. Great companies have distinctive cultures and traditions that are all their own and inhabit well-defined market niches. But they also share a set of common characteristics. The first is an obsession with talent. The only way to remain on top for any length of time is to hire the right people and turn them into loyal corporate warriors. GE spends a billion dollars a year on training. Its success has been such that between 2003 and 2011 about 40 GE vice-presidents have become CEOs of other major companies. Google, which is doing for information what GE once did for electricity, is similarly obsessed with training.

Superstar companies tend to be unashamedly elitist. GE fast-tracks its most promising employees. Hindustan Unilever compiles a list of people who show innate leadership qualities (and refers to them throughout their careers as "listers"). Laszlo Bock, Google's head of human resources, argues that a top-notch engineer "is worth 300 times more than an average

engineer”.

Such companies keep a watchful eye on their high-flyers throughout their careers. Jeff Immelt, GE’s boss, prides himself on his detailed knowledge of the 600 people at the top of his company, including their family circumstances and personal ambitions. Hindustan Unilever’s managers constantly test potential leaders by moving them from one division to another and subjecting them to “stretch assignments”. Procter & Gamble talks about “accelerator experiences” and “crucible roles”.

The second obsession superstar firms share is with investing in their core skills. Corning, the company that made the glass for Edison’s first light bulb, started life producing the raw material for bottles and windows. It now manufactures the glass used in the majority of the world’s electronic devices. Its fibre optics carry information around the world. Its “Gorilla” glass helps prevent your iPhone from shattering when you drop it, and is starting to be used in cars. Next will be huge glass screens that cover entire walls, flexible ones that can be rolled up like scrolls and windows that operate like giant sunglasses for the office. The company’s R&D centre in upstate New York resembles a university campus. Its best scientists have the equivalent of academic tenure (some stay around into their 90s), publishing academic papers and notching up scientific breakthroughs.

The same obsession can be found in all successful tech companies. Amazon sacrificed dividends for years in order to establish its mastery of online shopping. Today it is taking an equally long-term view of the computer cloud by pouring money into servers. Google is putting the riches generated by its search engines into more adventurous technologies. BMW is investing in new materials such as carbon fibre and enhancements such as parking assistance.

Remaining focused on the long term is difficult in a world where public

companies are answerable to the stockmarket every quarter, and it turns out that a remarkable number of superstar companies have dominant owners who can resist the pressure for short-term results. According to one study, more than one in ten of tech companies that went to the market between January 2010 and March 2012 had dual voting structures giving their founders extra rights. Both Facebook and Google explicitly justify such structures by the need to pursue long-term projects.

Family companies frequently punch above their weight because their dominant owners are free to think about the long term. Companies in emerging countries typically put more emphasis on long-term growth than on short-term results. The best widely held companies have developed formidable skills at managing the financial markets and making the case for long-term goals.

But investors cannot be expected to be patient for ever; they need a mechanism to tell them when they are pouring money down the drain. Striking the right balance between the long and the short term is the first on a long list of balancing acts that superstar companies have to perform in order to earn their laurels.

All of them set themselves extravagant goals. Coca-Cola does not just want to sell a lot of fizzy drinks, it wants to put a can of Coke within easy reach of everyone on the planet. And when they have achieved those goals, they move the goalposts. Google has expanded its vision from “just” wanting to organise the world’s information to wanting to use that information to reinvent transport, beside a host of other things. Amazon, having become the world’s biggest bookstore, now wants to be the world’s biggest everything store.

At the same time they all pay endless attention to detail. When Steve Jobs was in charge of Apple, he agonised over every tiny detail, down to the

exact shade of grey to be used for the signs in its stores' lavatories. Ingvar Kamprad, the founder of IKEA, a homeware giant, continually toured his stores until well into his 80s (he is now 90). Superstar companies are particularly good at establishing a link between their strategic vision and their everyday operations. Disney, for instance, is utterly committed to projecting wholesomeness.

Great companies combine a strong sense of identity with a fierce hostility to groupthink. Andy Grove, a CEO of Intel, advised CEOs to balance the sycophants they inevitably attract by cultivating "Cassandras" who are "quick to recognise impending change and cry out an early warning". These Cassandras are often middle managers who "usually know more about upcoming change than the senior management because they spend so much time 'outdoors' where the winds of the real world blow in their faces". GE insists that its high-flying executives, most of whom are engineers by training, take courses in painting in order to "loosen them up" a little.

Such companies also regularly reassess their investment decisions in the light of changing markets. McKinsey measured the agility of more than 1,600 companies by looking at how much of their capital they reallocated every year, and found a strong positive correlation between the companies' willingness to move their capital around and the total return to shareholders.

| *How to stay lithe*

Superstars do everything they can to remain agile despite their size. They fight a constant war against bureaucratic bloat, unnecessary complexity and overlong meetings. They often locate themselves in the latest tech hotspot in order to absorb its ideas and energy. In 2014 Pfizer opened an R&D facility with 1,000 employees near MIT in Cambridge, Massachusetts. Apple and Intel have set up R&D labs in Carnegie Mellon's Collaborative Innovation Centre in Pittsburgh. Every car company worth its salt has

opened an office in Silicon Valley. They also form close relationships with startups. In 2012 GE launched GE Garages, a lab incubator, to provide startups with access to its experts and to equipment such as 3D printers and laser cutters.

Successful big companies strike a balance between global scale and local roots to become “rooted cosmopolitans”. LG, a South Korean conglomerate, can tailor its products for specific markets: microwave ovens destined for east India, for example, have an autocook option for Bengali fish curry. Kraft has re-engineered the Oreo biscuit for Chinese taste buds, using less sugar and more familiar flavours such as green tea.

Such companies also understand that they need to keep undergoing radical changes in order to survive, as companies such as Google and Facebook have done on several occasions. They are even willing to disrupt their own core businesses before someone else does. Netflix disrupted its video-delivery business by embracing streaming. China’s Tencent disrupted its own social-media business by introducing WeChat, a platform that allows users to book taxis, order food and so on. Again, GE was a trailblazer. In the 1980s and 1990s its then boss, Jack Welch, decreed that it should be among the world’s top three in all the businesses it was involved in, or get out. Now Mr Immelt is restructuring the company for the digital age, selling off GE appliances, buying France’s Alstom, investing heavily in the internet of things and moving the company’s headquarters to Boston to be closer to the heart of high-tech.

Thanks to all these changes, even the classic companies are becoming more asset- and employment-light. In 1962 Exxon, one of the world’s most durable and financially successful corporations, had 150,000 employees; today it has half as many. As for the new breed of tech firms, they typically employ as few people as they possibly can.

But for all their virtues, superstar companies, both old and new, have their dark sides. ■



关键特征

成功之道ABC

成为超级巨星需要令人眼花缭乱的各种特质

通用电气（GE）是20世纪初的技术超级巨星。它是美国最伟大的发明家爱迪生和最杰出的银行家J·P·摩根结盟的产物。如今，爱迪生的专利早已过期，电已经走入寻常百姓家，而通用电气依然是屹立不倒的商业帝国。它是最先登上道琼斯工业指数榜的公司中唯一目前仍然在榜的公司。通用电气在180个国家雇有33万人，在2015年拥有价值4930亿美元的资产，收入达1170亿美元。在其他技术股消逝的地方，它却留存了下来，因其完全掌握了管理的艺术。公司的口号“梦想启动未来”（Imagination at work）完全可以改成“管理启动未来”。

超级巨星公司各有各的“超级”之处。伟大的公司具有完全自有的独特文化和传统，并占据界定清晰的利基市场。但它们也有一些共通的特点。首先是对人才的执着。请到对的人，把他们变成公司忠诚的战士，这是企业保持领先的唯一途径——即便只是短暂的领先。通用电气每年花费十亿美元用于培训。它获得了巨大的成功：2003至2011年间，约40位通用电气副总裁成为了其他大企业的CEO。今天的谷歌之于信息正如当年的通用电气之于电，这家公司也同样地痴迷于培训。

超级巨星们往往肆无忌惮地追求精英化。通用电气加速晋升最具潜力的员工。印度联合利华（Hindustan Unilever）对那些显现出领导力天赋的员工编有一本名册（并在这些人的整个职业生涯中都称其为“名单上的人”）。谷歌的人事主管拉兹罗·博克（Laszlo Bock）认为，一位一流的工程师“比普通工程师值钱300倍”。

对于有抱负又有能耐的员工，这些公司会密切关注他们的整个职业生涯。通用电气的老板杰夫·伊梅尔特（Jeff Immelt）很自豪自己对公司600名高管都了然于心，包括其家庭状况和个人抱负。印度联合利华的主管们不断考验那些可能成为领袖的员工，把他们从一个部门换到另一个部门，让他

们承担“拓展性任务”。宝洁（Procter & Gamble）也探讨着“加速器经验”和“熔炉训练”。

超级巨星们共同执着的另一点是投资于自己的核心技能。康宁（Corning）制造了爱迪生的第一个灯泡使用的玻璃。这家公司最初生产瓶子和玻璃的原材料，如今制造了全球大部分电子设备使用的玻璃。它生产的光纤将信息运载到世界各地。它的“大猩猩”玻璃防止你的iPhone摔碎，并已开始在汽车中使用。接下来，这家公司将生产覆盖整面墙的巨大玻璃屏幕、可以像卷轴那样卷起来的柔性玻璃、为办公室打造功能类似“巨型太阳镜”的窗户。该公司位于纽约上州的研发中心就像一个大学校园。这里最优秀的科学家的职位等同于终身教职（一些人一直待到90多岁），他们发表学术论文，取得科学上的突破。

在所有成功的科技企业中都可以看到这种执着。亚马逊为了在网络购物领域里建立起霸权，牺牲了多年的分红。如今它又把钱投入到服务器中，为云计算铺设同样长久的发展之路。谷歌正把它在搜索引擎上获得的现金投入到更多开拓性的技术中。宝马则在投资碳纤维等新材料以及辅助泊车等功能升级。

上市公司每个季度都要对外公布财报，因而很难保持对长期目标的专注，但实际上却有相当一批超级巨星企业的绝对大股东能够抵抗住短期业绩的压力。一则调查显示，2010年1月至2012年3月间上市的科技企业中，超过一成的公司设有双重投票机制，给予其创始人额外的权利。Facebook和谷歌明言这种结构是出于开展长期项目的需要。

家族企业常有超常表现，因为它们绝对大股东可以自由地设想长期计划。新兴国家的企业通常专注长期发展更甚于短期业绩。那些股票被广泛持有的企业中的佼佼者已经发展出强大的技能，擅长管理金融市场，并为长期目标提出了令人信服的理由。

然而你不能奢望投资者会永远耐心等待。他们需要一个机制来告诉他们，何时自己的钱打了水漂。要赢得光环，超级巨星们需要做出大量平衡动

作，而在长期和短期目标上取得恰当的平衡是重中之重。

所有这些公司都树立了宏大的目标。可口可乐不止想卖出大量苏打饮料，它想让可乐成为地球上所有人都触手可及的东西。当这些公司达成目标后，它们还会设立更远大的目标。谷歌的目标已经从“仅仅”想要组织全球的信息扩展到利用这些信息完成一系列事业，比如重塑交通。亚马逊已经成为全球最大的书店，如今它想要成为全球最大的无所不包百货店。

与此同时它们都极其关注细节。乔布斯掌管苹果时，为每一个微小的细节殚精竭虑，包括苹果门店卫生间的标识该使用多深的灰色。居家用品巨头宜家的创始人英格瓦·坎普拉德（Ingvar Kamprad）在80多岁时（他现年90岁）还常常跑去自己的门店。超级巨星们尤其擅长把战略规划和日常运作联系起来，比如迪士尼就极其重视展现自己健康的形象。

伟大的企业既有鲜明的特色，同时又坚决唾弃人云亦云。英特尔前CEO安迪·葛洛夫（Andy Grove）忠告CEO们，他们会不可避免地引来马屁精，要取得平衡，他们要培养出“能迅速感知变化将至并及早喊出预警”的“灾祸预言家”。这些预言家通常是中层主管，“往往比资深管理者更了解即将发生的变化，这是因为他们在‘户外’度过了大量时间，在那里吹着真实世界的风。”通用电气坚持让最有能耐的主管们（大部分人是通过培训的工程师）参加绘画课程，以求让他们能稍微“松弛”些。

这类公司也会定期根据变化的市场重新评估自己的投资决策。麦肯锡调查了1600多家企业每年重新配置的资金比例来衡量它们的灵活度。它发现在企业调配资金的意愿和对股东的总体回报之间存在很强的正向关系。

| 如何保持灵活

尽管规模庞大，超级巨星们仍竭力保持灵活。它们要不断防范机构臃肿、程序繁冗、会议过长。它们常把公司开在最新的科技热点，以吸纳那里的创意和能量。2014年，辉瑞制药（Pfizer）在麻省剑桥市的麻省理工学院附近开设了一个雇员千人的研发中心。苹果和英特尔在位于匹兹堡的卡耐基梅隆大学协同创新中心（Collaborative Innovation Centre）成立了研发

实验室。每家名副其实的汽车企业都在硅谷设立了办公室。它们还和创业公司建立了紧密的关系。2012年，通用电气启动了一个孵化器实验室“GE技库”（GE Garages），让创业公司可以接触到GE的专家，并使用其3D打印机和激光切割机等设备。

成功的大企业在全球化规模和地方根基间取得平衡，以成为“有根的世界人”。韩国企业集团LG能为特定的市场量身定制产品，例如，销往东印度的微波炉带有自动制作香料鱼咖喱（Bengali fish curry）的功能。卡夫食品（Kraft）针对中国人的味蕾重新配制了奥利奥饼干：减少用糖，并提供更多如绿茶等中国人熟悉的口味。

这类公司也很清楚，它们需要不断施行激进的变革以维持生存，就像谷歌和Facebook等公司已经这样做很多次了。它们甚至愿意赶在其他人前面颠覆自己的核心业务。Netflix推出流媒体服务，颠覆了自己邮寄出租DVD的业务。中国的腾讯推出了微信这一可供预订出租车和叫餐等的平台，颠覆了自己的社交媒体业务。在这方面，通用电气还是开路先锋。上世纪八九十年代，公司当时的老板杰克·韦尔奇（Jack Welch）下令，公司须在其涉足的所有业务领域都跻身全球前三，否则就不做。如今，伊梅尔特正在为数字时代改造公司，他卖掉了通用的家电部门，收购了法国的阿尔斯通（Alstom），大力投资物联网，并将公司总部搬到波士顿，以靠近高科技中心。

得益于所有这些变革，如今即便是传统的老企业也在变得资产更轻、雇员更少。全球历史最悠久也最赚钱的公司之一埃克森美孚（Exxon）在1962年雇有15万名员工，如今减少了一半。而新一代科技公司通常都尽可能地精简人员。

不过，尽管有这样那样的优点，超级巨星企业无论新旧，都有其黑暗面。





Joining the ranks

Do you blitzscale?

How superstars are made

SUPERSTAR COMPANIES CAN create powerful barriers to entry. Their success allows them to generate huge piles of cash, and that cash allows them to attract talent and buy up competitors. So how do aspiring companies break into the magic circle? The answer depends very much on the industry.

High-tech companies rely on discovering niche markets and scaling up as fast as possible. Peter Thiel, the co-founder of PayPal, points out that almost all successful startups begin by dominating a niche market. Facebook dominated social networking at Harvard University before branching out to other universities and then to social networking in general. Reid Hoffman, who at one time was PayPal's COO, has coined the phrase "blitzscaling" to describe the road to success. The term refers to the Blitzkrieg (lightning war) that Germany pioneered in the second world war. Software allows companies to advance rapidly because the marginal costs of adding new customers is more or less zero. Globalisation has a similar effect because it lowers the barriers to entry across countries. Facebook's old motto, "Move fast and break things", captures the spirit of the Blitzkrieg perfectly.

Blitzscaling is necessary for both offensive and defensive reasons. Offensively, software businesses become valuable only once they have acquired lots of customers. Markets like eBay are not useful until they have both buyers and sellers. Defensively, businesses have to scale faster than their customers because the first to reach those customers often end up owning them.

Blitzscaling initially burns through a lot of cash quickly without producing much revenue. To attract people to a firm with an uncertain future, you have to generate a buzz in the tech world and offer your staff generous stock options. You also have to subordinate everything to immediate problem-solving. Mr Hoffman says that every blitzscaling organisation he has worked in seemed close to collapsing in chaos. “The thing that keeps these companies together—whether it’s PayPal, Google, eBay, Facebook, LinkedIn or Twitter—is the sense of excitement about what’s happening and the vision of a great future.”

The dangers of blitzscaling will become much clearer as technology transforms wider areas of the economy. Theranos, a company that claimed to have invented a new way of testing blood, expanded at breakneck speed before the *Wall Street Journal* revealed that its tests were unreliable.

There are some echoes of this strategy in the emerging world. Emerging-market companies establish a fortress in their domestic markets before invading foreign markets. Grupo Bimbo, which started out as Mexico’s biggest baked-goods company, has since become the biggest baker in the United States as well, through a combination of exporting its goods and buying bits of famous American brands such as Weston Foods and Sara Lee. Such emerging-market champions frequently advance at great speed, often buying in more sophisticated skills like branding and R&D by acquiring Western companies. For example, Lenovo, a Chinese computer company, bought IBM’s ThinkPad division in order to break into foreign markets.

Some of the brightest rising stars are emerging-market tech companies. China’s Alibaba, an e-commerce firm, raised \$25 billion when it went public on the New York Stock Exchange in 2014, the largest IPO in history. Didi Chuxing, a Chinese taxi service, this summer merged with Uber, which took a 20% stake in the combined company, valued at \$35 billion, after a prolonged battle.

Outside the tech industry and away from emerging markets, rising stars often sparkle by consolidating existing markets and squeezing out costs. A prime example is 3G Capital, a Brazilian-rooted company that specialises in taking over mature companies and bringing in its own managers to streamline them. It forces firms in its portfolio to justify their spending afresh every year, consolidate their product lines and trim excess brands. 3G is exceptionally stingy with its managers, making them share rooms on business trips, but also motivates them by giving them stock options. Having started off small in Brazil, it has taken over a succession of beer giants, including Anheuser Busch and SABMiller. Its acquisitions have given it control of a third of the world's beer market and several large food companies, including Heinz, Burger King and Kraft.

Some of the world's most successful family companies practise a gentler version of consolidation, buying up smaller family companies to add scale but allowing them to keep their names and identities. The luxury and drinks sectors excel at this. LVMH, a French luxury-goods company, has acquired a succession of other family companies such as Bulgari, Dior, Krug and Dom Perignon, as has Estée Lauder with Tommy Hilfiger, Bumble and Bumble and Jo Malone. ■



加入强者军团

来场闪电战？

超级巨星是怎样炼成的

超级巨星企业能够筑起强大的准入门槛。它们的成功带来了大量现金，有了这些钱，它们能吸引到人才，买下竞争对手。满怀抱负的企业要如何破门闯入这个魔圈？答案很大程度上取决于其所在的行业。

高科技企业需要发现利基市场并尽快扩张。PayPal的联合创始人彼得·蒂尔（Peter Thiel）指出，几乎所有成功的创业公司都是从占领某个利基市场起步。Facebook最初占领的是哈佛大学的社交网络，然后延伸到其他高校，再扩张到广泛的社交网络。曾任PayPal首席运营官的里德·霍夫曼（Reid Hoffman）发明了“闪电式扩张”（blitzscaling）一词来形容科技企业的成功之路。这个词源自德国在二战中率先发起的“闪电战”（Blitzkrieg）。软件让企业能够迅速推进，因为增加新客户的边际成本几近为零。全球化也有类似的效果，因为它在世界各地都降低了准入门槛。Facebook曾经的格言“快速行动，打破常规”（Move fast and break things）恰恰展现了闪电战的精髓。

于攻于守，闪电战都有必要。在进攻的环节，软件企业唯有在获得大量客户后才会变得有价值。像eBay这类市场要等到同时拥有买家和卖家后才有用处。而从防守的需要出发，企业的扩张必须快过其客户的增长，因为最先触及那些客户的企业往往会赢得他们。

闪电式扩展的伊始会迅速烧掉大量现金，收入却乏善可陈。要把人才吸引到一家未来并不明朗的公司里，你必须在科技界制造一些轰动效应，并向员工提供丰厚的股票期权。你还必须把即刻解决问题放在首要位置。霍夫曼说，自己就职过的每家闪电扩张的公司看上去都在混乱中摇摇欲坠。“无论PayPal、谷歌、eBay、Facebook、领英还是推特，这些公司之所以能维持下去，是因为它们为正在发生的事感到兴奋，对美好的未来满怀憧憬。”

当技术重塑更广泛的经济领域时，闪电式扩张的危险变得格外清晰起来。Theranos公司声称发明了血液检测的新方式。在《华尔街日报》揭露其测试并不可靠之前，其扩张之快令人瞠目。

在新兴世界也可以看到对这种战略的运用。新兴市场的企业在进军国外市场前会先在国内市场建立起堡垒。宾堡集团（Grupo Bimbo）起初是墨西哥最大的烘焙食品公司，它出口产品到海外，并收购了卫斯顿食品（Weston Foods）和萨莉（Sara Lee）等几个知名美国品牌下属部门，从而也一跃成为美国最大的烘焙食品商。这类新兴市场的龙头企业常以惊人的速度发展，往往通过收购西方企业来获得品牌塑造和研发等更为复杂的技能。例如，中国的计算机企业联想就买下了IBM的ThinkPad部门以打开国外市场。

一些最夺目的明日之星是新兴市场的高科技企业。中国的电子商务公司阿里巴巴2014年在纽约证交所上市时募得250亿美元，创下全球IPO融资记录。在经历了旷日持久的对抗后，中国的打车服务商滴滴出行今夏与优步合并，成立了一家估值350亿美元的新公司，优步在其中占股20%。

在科技行业和新兴市场以外的领域，明日之星们通常靠整合既有市场及压缩成本而做得风生水起。巴西公司3GCapital就是个典型的例子。该公司专门接手成熟企业，并派自己的主管去精简这些公司。它强迫其投资组合中的公司每年都要重新证明开支的合理性，合并它们的生产线，裁汰冗余的品牌。该集团对其主管格外吝啬，比如让他们在出差时合住房间，但同时也给予他们股票期权作为激励措施。它在巴西起步时还是家小企业，后来接管了安海斯-布希（Anheuser Busch）和南非米勒（SABMiller）等一系列啤酒巨头。通过这些收购，它已经控制了全球三分之一的啤酒市场以及几家大型食品企业，包括亨氏（Heinz）、汉堡王（Burger King）和卡夫（Kraft）。

全球一些最成功的家族企业在并购时的做派更为温和。它们买下较小的家族企业来扩大规模，但允许这些公司沿用原有的品牌和身份。奢侈品业和酒业尤其精于此道。法国奢侈品企业酩悦·轩尼诗一路易·威登集团

(LVMH) 已经买下了一系列其他家族企业，如宝格丽 (Bulgari)、迪奥 (Dior)、库克 (Krug) 和唐培里侬 (Dom Perignon)；雅诗兰黛 (Estée Lauder) 收购了汤米·希尔费格 (Tommy Hilfiger)、Bumble and Bumble，以及祖马龙 (Jo Malone)。■



Schumpeter

Leaving for the city

Lots of prominent American companies are moving downtown

FIFTY years ago American companies started to move their headquarters away from city centres to the suburbs. Some critics blamed the exodus on “white flight”, as businesses followed their employees out of increasingly crime-ridden cities. The firms themselves ascribed it to corporate responsibility. They provided offices in safe neighbourhoods and near good schools—one academic, Louise Mozingo, of the University of California, Berkeley, calls it “pastoral capitalism”. Whatever the reason, it created a new type of HQ: not an office tower in the pumping heart of a metropolis but a leafy campus in the middle of nowhere.

Now a growing number of companies are moving back again. The most prominent example is General Electric, which abandoned New York City for a 68-acre campus in Fairfield, Connecticut, in 1974, but is now swapping its bucolic site for a collection of warehouses on the Boston waterfront. There are legions more. Chicago’s downtown has attracted an impressive collection of HQs, from both the surrounding suburbs and from farther afield, including McDonald’s, Kraft Heinz, Motorola Solutions, Boeing, and Archer Daniels Midland, a food-commodities giant. Zappos, an online retailer, has moved from an office park outside Las Vegas into the city’s old downtown. Biogen moved from Cambridge, Massachusetts, to the Boston suburbs in 2011 only to return a year later. Many tech companies were born urban and couldn’t be any other way. Twitter and Salesforce are in downtown San Francisco, and Jeff Bezos is building a huge campus for Amazon in downtown Seattle.

City boosters are delighted. “This is better than hosting the Olympics,” says Shirley Leung, a columnist with the *Boston Globe*, of GE’s move. Corporate

executives sound like graduate students after their first reading of “The Rise of the Creative Class” by Richard Florida, an urbanophile intellectual. Jeff Immelt, GE’s chief executive, says that “we want to be at the centre of an ecosystem that shares our aspiration”, and notes that Boston attracts “a diverse, technologically fluent workforce”. Ann Klee, who is helping to oversee GE’s move to Boston, says that the new headquarters will do without a car park, in order to encourage workers to use public transport. It will dispense with security gates and wants the public to come in. Greg Brown, the CEO of Motorola Solutions, commends downtown Chicago for its “energy, vibrancy and diversity”.

Is the new urbanism all it is cracked up to be? It is easy to find counter-trends, given America’s size and variety: many CEOs continue to see a future in the suburbs of the sunbelt. ExxonMobil is building a headquarters for 10,000 people in the outskirts of Houston. Toyota is moving its North American headquarters from Torrance, California, to suburban Dallas. There is also tax-and-benefits arbitrage going on: over the past decades, the suburbs have become complacent and downtowns have got hungrier. GE’s affection for its old home in Connecticut was no doubt weakened by the state’s decision in 2015 to raise business taxes by \$750m. Boston provided an estimated \$145m in incentives to secure the deal.

Still, something is clearly changing in America’s older cities. They are much less crime-ridden than before, thanks to a combination of better policing and demographic change. The homicide rate fell by 16.8% from 2000 to 2010 in big cities. Now these urban centres are magnets for millennials fresh from university and with few responsibilities. Young professionals are reconquering former no-go areas and shifting the problem of urban blight into the suburbs. Hiring such people in Boston, GE reckons, will help it shift its focus from hardware to software and from selling things to offering services over the internet.

Yet the new downtown headquarters are very different from the old ones, and not just because they are open-plan and trendy. They are far smaller. Often, firms are moving their senior managers to the city along with a few hundred digital workers. Moving back to Chicago's centre has usually involved downsizing: Motorola Solutions' HQ shrank from 2,900 to 1,100, and that of Archer Daniels Midland from 4,400 to 70. Many companies are deconstructing their headquarters and scattering different units and functions across the landscape, leaving most middle managers in the old buildings, or else moving them to cheaper places in the southern states. Aaron Renn of the Manhattan Institute, a think-tank, reckons that head offices are splitting into two types: old-fashioned "mass" headquarters in the sunbelt cities, and new-style "executive headquarters" of senior managers and wired workers in elite cities such as San Francisco, Chicago and Boston.

That suggests there will be no return to the broad-based urban prosperity of America's golden age. San Francisco could be the template of the future. Its centre is divided between affluent young people who frequent vegan cafés and homeless people who smoke crack and urinate in the streets. Long-standing San Franciscans resent the way that the urban professionals have driven up property prices. And those young workers may fall out of love with the city centre when they have children and start worrying about the quality of schools and the safety of streets.

| *To the top of the pyramid*

The best book to read if you want to understand corporate America's migration patterns is not Mr Florida's but a more recent study, Bill Bishop's "The Big Sort". It argues that Americans are increasingly clustering in distinct areas on the basis of their jobs and social values. The headquarters revolution is yet another iteration of the sorting process that the book describes, as companies allocate elite jobs to the cities and routine jobs to

the provinces. Corporate disaggregation is no doubt a sensible use of resources. But it will also add to the tensions that are tearing America apart as many bosses choose to work in very different worlds from the vast majority of Americans, including their own employees. ■



熊彼特

奔向城市

众多知名美国企业正搬往市中心

50年前，美国企业开始把总部从市中心转移至郊区。一些评论家将这种出走归咎于“白人迁移潮”——由于员工搬离犯罪愈加猖獗的城市，企业也随之迁往郊外。企业则自称是出于企业责任的缘故。他们在安全且靠近好学校的地方提供办公场地——美国加州大学伯克利分校的学者路易斯·莫辛格（Louise Mozingo）称之为“田园资本主义”。无论是什么原因，这都催生了一种新型公司总部：不是在矗立在大都市黄金地段的办公大楼，而是郊野上的绿荫园区。

现在，越来越多公司正搬回城市，其中最突出的例子便是通用电气。该公司于1974年搬出纽约市，在康涅狄格州的费尔菲尔德（Fairfield）打造了一个68英亩的办公园区，但如今又舍弃这田园办公地，搬至波士顿海滨由一排仓库改建的办公区。还有众多企业也是如此。芝加哥市中心吸引了数量惊人的企业从附近郊区或更远的地方来此设立总部，包括麦当劳、卡夫亨氏、摩托罗拉解决方案公司、波音公司，还有粮食巨头阿彻丹尼尔斯米德兰公司（Archer Daniels Midland）。网上零售商Zappos也从拉斯维加斯郊外的一座办公园区搬回老城中心。生物科技公司Biogen在2011年从马萨诸塞州剑桥市搬到波士顿郊外，一年后便搬回城里。许多科技公司都诞生于城市，舍此之外别无它途。推特和Salesforce公司总部均在旧金山市中心，杰夫·贝索斯（Jeff Bezos）则正为亚马逊在西雅图市中心建立一个偌大的办公园区。

支持城市的人们欣喜不已。“这好过举办奥运会。”《波士顿环球报》的专栏作家梁雪莉（Shirley Leung，音译）谈到通用电气回迁时说道。企业高管的口吻就像第一次读完理查德·佛罗里达（Richard Florida，一位热爱城市生活的知识分子）所著的《创意阶层的崛起》（The Rise of the Creative Class）的研究生一般。通用电气的首席执行官杰夫·伊梅尔特（Jeff Immelt）表示，“我们希望在这个大家有着同样抱负的生态系统里占

据中心位置。”他还指出，波士顿吸引着“一批多元化、精通科技的劳动者”。安·克利（Ann Klee）正参与指挥通用电气到波士顿的搬迁工作，她表示，新的总部将不设停车场，为的是鼓励员工们使用公共交通工具。总部也没有安全门，鼓励公众走进园区。摩托罗拉解决方案的CEO雷格·布朗（Greg Brown）称赞芝加哥市中心“充满能量、活力，多元纷呈”。

这股都市主义新浪潮真如被吹捧的那样吗？以美国之广大多元，不难找到反例：许多CEO依然看好美国南部郊区的前景。埃克森美孚公司正在休斯敦的郊区建造能容纳一万人的公司总部。丰田正将其北美总部从加州托兰斯（Torrance）迁至达拉斯郊区。这里面还包含获取税收和福利优惠的因素：在过去十年，郊区变得飘飘然，城中心变得更渴求。2015年康涅狄格州决定加征7.5亿美元的营业税，无疑削弱了通用电气留在康涅狄格州旧址的意愿。后来波士顿提供了估计为1.45亿美元的激励补贴，敲定了通用电气的迁入。

不过，美国老城市的某些方面显然在改变。得益于警力的增强及人口结构的变化，这些老城的犯罪情况较以往大有改观。2000年至2010年间，大城市的凶杀率下降了16.8%。如今，这些城市中心像磁铁般吸引着刚从大学毕业、还无甚负担的千禧一代。年轻专业人士再次夺回了从前犯罪横生的禁地，把“城市枯萎病”转移至郊区。通用电气认为，在波士顿聘用这些人士将有助公司把重点从硬件转移至软件，从卖产品转变为通过互联网提供服务。

但新的市区总部与旧总部大不相同，不单在于其开放式布局和时尚设计。新总部要小得多。企业往往让高级管理人员连同几百名数字技术员工搬到市区办公新址。搬回芝加哥城中心通常意味着精简规模：摩托罗拉解决方案的总部员工从2900人缩减至1100人，阿彻丹尼尔斯米德兰公司从4400人缩至仅70人。许多公司把总部分拆成不同的单元及职能部门，将其分布于各地，让大部分中层管理人员留在旧办公地，或者把他们迁至南部各州租金更便宜的地方。智库曼哈顿研究所（Manhattan Institute）的亚伦·雷恩（Aaron Renn）认为企业总部正分为两类：美国南部城市的老式“大块头”总部，以及在旧金山、芝加哥、波士顿这类精英城市中只有高管和

数字精英的新型“行政总部”。

这表明，一切并非重现美国黄金时代那种广泛的城市繁荣景象。旧金山可能是未来的模版。其中心地区分为两类人的领地，一边是光顾素食咖啡馆的富裕年轻人，另一边是吸食霹雳可卡因、随地小便的流浪汉。老旧金山人因为城里的专业人士推高了房价而愤慨。而这些年轻专才生儿育女后也许又会开始担心学校质量和街区治安而不再钟爱市中心。

| 登上金字塔顶

如果想了解美国企业的迁徙模式，最佳读物并非上文提到的佛罗里达的著作，而是近期的一项研究——比尔·毕肖普（Bill Bishop）的《大归类》（The Big Sort）。该书认为，美国人逐渐按自己的职业及社会价值而聚居至不同区域。企业把精英职位分配到城市、将常规性职位分配在郊区的“总部革命”只是书中描述的归类过程的又一体现。企业的分解运作无疑是对资源的合理运用。但随着许多企业老板选择与广大美国人（包括他们自己的雇员）大不相同的办公地，分裂美国的那股拉力又进一步增强了。





Voice computing

Prick up your ears

Wireless headphones and smart speakers herald a new class of devices

WHEN Apple in early September introduced a new iPhone without a jack for headphones, together with pricey wireless earbuds that you speak into, it did not take long for mocking videos to appear online. In one, an enterprising soul reveals a “secret hack” to get back the jack: he drills a hole into a new iPhone. In another video, a fake commercial, the AirPods, as the untethered headphones are called, keep popping out of users’ ears and are eaten by a dog (pictured).

Whatever one thinks of Apple’s AirPods, which cost \$159 a pair and are expected to go on sale in late October, they stand not just for one, but two emerging markets in personal technology. One is called “hearables”—meaning “smart” ear devices. The other is “smart speakers”, like Amazon’s popular Echo product, which sits in people’s homes and can respond to voice commands. Both gadgets herald a world in which people communicate with machines by speaking, much like in the movie “2001: A Space Odyssey”, in which the crew talked to HAL, a chillingly sentient computer.

Untethered headphones have been around for some time, although they are often a disappointment because the wireless connection with a smartphone is not stable enough. Hearables not only solve this problem, says George Jijiashvili of CCS Insight, a market-research outfit, but come with all manner of other components: processors, microphones and sensors, including accelerometers, a heart-rate monitor and a GPS receiver.

The added intelligence enables all kinds of features. Smart earbuds can store music. They can monitor the user’s physical activity, for instance

counting the number of push-ups he is supposed to perform. They can read his gestures, such as nodding. And they can, much like noise-cancelling headsets, suppress distracting background babble—or amplify sounds users want to hear, a bit like hearing aids.

Apple's AirPods will do well in the category of smart earbuds, but the market will be small—CCS Insight expects around 9m pairs to be sold each year by 2020—and it isn't the pioneer in the field. Nikolaj Hviid, the boss of Bragi, a German firm, says that since its headphones went on sale six months ago, more than 100,000 have sold. Doppler Labs is on a similar path. If Microsoft put a computer on every desk and Apple one into every pocket, Doppler wants to put one "into everyone's ears", says Noah Kraft, the firm's boss. One feature is "layered listening", the audio equivalent of augmented reality. The firm's new smart buds, due out in November, will be able to filter out specific sounds, such as a baby's cry, and insert others, such as a football-match commentary.

Such ambitions point to what is perhaps the most intriguing feature of smart buds: they are a convenient conduit to intelligent digital assistants, such as Apple's Siri and Microsoft's Cortana. Currently, these services, which can process natural speech and are powered by artificial intelligence in the computing clouds, reach users mostly through smartphones, where they help them search the internet or send texts without having to type or tap.

People will not just talk to such digital assistants via hearables but also through the other new category of devices: smart speakers such as Amazon's Echo. When the e-commerce conglomerate introduced it, many thought it was just another, possibly unnecessary gadget. For \$180 a pop, owners of the cylinder-shaped device can use voice commands to play music, call a taxi and, of course, order stuff from Amazon. But the Echo has been surprisingly successful, with more than 3m units expected to be sold

this year and 10m in 2017.

One reason for the rapid adoption is that Amazon has turned Alexa, its digital assistant, into a “platform”: a set of services that other developers can combine to build a “skill”, the equivalent of an app on a smartphone. More than 3,000 such skills—some created by Amazon, many more by a growing number of third parties—are already available, ranging from simple tasks such as setting an alarm to more complicated ones such as managing a share portfolio. Lots of children have come to treat Alexa, in combination with Echo, as a sort of family member at home, market researchers say.

Competitors are trying to catch up. When Google introduces a number of new products on October 4th, it is expected to unveil Google Home, which will probably offer much the same features as the Echo. Rumours have it that Apple, too, is working on a device in time for next year. Other firms, including China’s Baidu and South Korea’s Samsung, are expected to come out with smart speakers. Qualcomm, a big American chip designer, has already developed a circuit board that makes it easy to build such devices. As the hardware becomes a commodity, firms that offer the best voice service will win, predicts Martin Garner, also of CCS Insight. And quality, he argues, will mostly depend on access to data. Since Google, for instance, knows what people search for, it also knows how they ask questions, which will help make its digital assistant (creatively called “Assistant”) work well in different languages.

“As accuracy of speech recognition goes from 95% to 99%, all of us...will go from barely using it to using it all the time,” said Andrew Ng, Baidu’s chief scientist, recently. But hearables and smart speakers have a drawback. When they get hacked, either by criminals or by intelligence services, they could become a bit like George Orwell’s “telescreens”. “Any sound that Winston made, above the level of a very low whisper,” Orwell wrote in his

novel "Nineteen Eighty-Four", would be picked up. ■



语音计算力

竖起你的耳朵来

无线耳机和智能扬声器宣告新一类设备的到来

苹果在9月初推出了没有耳机插孔的新iPhone，同时还发布了价格高昂的无线通话耳机。网上很快就出现了很多恶搞视频：在其中一则视频中，一位魄力非凡之士炫耀了一项“黑技”：为了找回传统的耳机插孔，他在一部新iPhone上钻了一个洞。在另一段恶搞视频广告中，这款名为AirPods的无线耳机总是从使用者的耳朵里掉出来，被一只狗吞进肚子里（如图）。

一副AirPods售价159美元，预计10月底上市。不管人们对AirPods看法如何，它都代表了个人技术的新兴市场，且不是一个、而是两个。一个叫“可听设备”市场——意为“智能”耳机设备。另一个是“智能扬声器”市场，就像亚马逊备受欢迎的Echo智能音箱，摆在家里可以回应语音指令。这两种配件宣告了一个新世界的到来——人通过语言与机器交流，就像在电影《2001：太空漫游》中宇航员与感知能力令人胆寒的电脑HAL直接对话那样。

无线耳机的出现已有一段时间，不过由于跟智能手机的连接不够稳定，经常令人失望。市场研究公司CCS Insight分析师乔治·吉加什威利（George Jijashvili）说，可听设备不仅解决了这个问题，还配备了其他各种元件：处理器、麦克风和传感器，包括加速度传感器、心率监控器和GPS接收器。

这些附加的智能赋予设备各种各样的功能。智能耳机可以存储音乐；可以监控用户的运动情况，比如记录用户做了多少次俯卧撑；可以识别用户的动作，比如点头；而且可以像降噪耳机一样抑制令人分心的背景噪音——或者有点像助听器那样放大用户想听的声音。

苹果的AirPods在智能耳机类别中将会表现不俗，但市场会很小——CCS Insight 预计到2020年每年能卖出约900万副——而且苹果并不是这一领域

的先锋。德国公司Bragi的老板尼古拉·赫维德（Nikolaj Hviid）称，他们的耳机上市六个月已售出10万副。Doppler Labs发展的情况也差不多。Doppler的老板诺亚·卡夫（Noah Kraft）说，如果说微软把计算机摆在了每个人的桌上，苹果把计算机放进了每个人的衣袋，那么Doppler要做的就是将计算机“塞进每个人的耳朵里”。他们耳机的一个功能是“分层听觉”，相当于声音的增强现实。Doppler的新耳机会在11月上市，将可以过滤掉特定的声音，比如婴儿的哭声；还可以插入其他声音，如足球赛评论。

这样的雄心指向的可能是智能耳机最有意思的功能：通过耳机可以方便地启用智能数字助手，比如苹果的Siri或微软小娜（Cortana）。这些智能助手由计算云的人工智能支持，可以处理自然语音，目前主要通过智能手机为用户所使用，让用户无需打字或点击屏幕就可以搜寻网络或发送信息。

未来人们不仅可以通过可听设备与此类数字助手交流，还能通过其他新型设备：智能扬声器（如亚马逊的Echo音箱）。电商巨擘亚马逊推出Echo的时候，很多人以为这只不过是另一个可有可无的配件而已。圆柱形的Echo音箱单价180美元，用户可以使用语音指令播放音乐、叫出租车，当然还可以从亚马逊网站订购商品。尽管当初并不被看好，但Echo音箱却出人意料地获得了成功，今年的销售量预计为300万台，2017年可达1000万。

Echo为市场快速接纳的一个原因是亚马逊将其数字助手Alexa转变成为一个“平台”：即一组其他开发者可加以整合的功能，可用以打造一项“技能”，相当于智能手机上的应用。目前已有超过3000项此类技能可供用户使用，有些是亚马逊自己创造的，更多的则是来自越来越多第三方。这些技能简单的可以设定闹钟，复杂的可以管理股票组合。市场分析师认为很多孩子都已经把Alexa和Echo一道视为家庭的一份子。

竞争对手也在力争赶上。谷歌在10月4日推出数个新产品，预计会正式发布Google Home，提供的功能大概与Echo相差无几。传闻苹果也在研发类似设备赶在明年推出。包括中国百度和韩国三星在内的其他公司预计也会

推出各自的智能扬声器。美国芯片设计公司高通已经研发出一个线路板，可方便地用来打造此类设备。同样来自CCS Insight的马丁·加纳（Martin Garner）预言，随着硬件渐趋同质化，提供最佳语音服务的公司将会胜出。加纳认为成功的关键要素之一在于数据的获取。比如说，因为谷歌知道人们搜索什么，也就知道他们会如何提问，这有助于谷歌的数字助理（富有创意地被称为“助理”）在不同语言环境下都表现良好。

百度首席科学家吴恩达最近表示：“语音识别的准确度已从95%升至99%，所有人.....都会从‘不怎么用’，转变成‘随时都会用’。”但可听设备和智能扬声器也有个缺点。一旦被犯罪分子或情报机构侵入，就有可能沦为类似乔治·奥威尔（George Orwell，英国小说家）笔下的“电屏”（小说《1984》中的监控工具）。奥威尔在小说《1984》中写道：“温斯顿发出的任何声音，只要比极低声的细语大一点，它就可以接收到。”■



Asian markets

Chinese sneezes

Financial contagion from China now rivals that from America

INVESTORS have long been wary of America's sneezes, knowing they can give the world a cold. In Asia they now also fret about Chinese rhinitis, which is proving just as contagious. For financial epidemiologists, this is something of a puzzle. It is to be expected that germs can spread from China, Asia's biggest economy, to others in the region. But it is surprising quite how infectious they are proving. Unlike America, enmeshed in global markets, China's economy is in self-imposed quarantine, protected by capital controls that limit its interactions with others.

Yet China's impact on Asian stockmarkets is now nearly as potent as America's. Two recent papers, one from the IMF and one from the Bank for International Settlements (BIS), a forum for central banks, reveal the extent of the change over the past decade. The IMF estimates that the correlation between the Chinese stockmarket and those in other Asian countries has risen to more than 0.3 since June last year (1 is a "perfect" correlation), double the level before the global financial crisis. That is still below the 0.4 correlation between America and Asia, but the gap is closing fast (see chart). According to the BIS, Asian equities track swings in the Chinese market about 60% more closely since the crisis.

Investors already knew that China's problems can ripple through Asian and, indeed, global markets. When Chinese shares crashed last summer and early this year, so did shares almost everywhere else. And when China let the yuan fall by 2% in August 2015, the currencies of other emerging markets tumbled. (The IMF found that the correlation between Asian currencies and the yuan is now more than 0.2, twice the pre-2008 level.)

Both reports cite the sheer heft of China's economy as the main driver of the rising correlations. The data show that Asian countries with the strongest China trade ties are most affected by its market moves. Investors there are more likely to hold shares in companies that sell lots of widgets to China. They are understandably alarmed when stockmarket falls suggest that the Chinese economy is in trouble. And depreciation of the yuan, along with signalling economic weakness, makes it more expensive for those in China to buy things from abroad.

Trade, however, is not the only means of transmission. Financial linkages now account for about two-fifths of the correlations between China and other Asian markets, up from virtually nothing before 2008. Despite capital controls, China has opened channels that allow investors to buy its shares or lend to its companies. These foreign investments may be tiny relative to the size of China's economy, but China's wealth is now so great that they are still big in absolute terms. Foreign holdings of Chinese shares and bonds are worth about \$2 trillion, more than for any other emerging market.

Asian investors have been particularly bold: claims on China and Hong Kong are worth more than 10% of GDP for South Korea, Taiwan and Singapore. As capital controls are relaxed, these financial connections will only deepen. For now, China's bond market exists in a universe of its own. When the yuan becomes a funding currency for others, Chinese interest rates will affect those around Asia.

A tightening of correlations in Asia could, as the BIS notes, be welcome. In recent years markets across the globe have tended to move in the same direction, making it harder for investors to diversify. As cross-holdings proliferate in Asia, with China as a focal point, there is a real possibility that Asia's financial cycles will find their own rhythm, pulling apart from other bits of the world. China and America will still suffer sneezing fits. With any luck, they will catch their colds at different times. ■



亚洲市场

中国的喷嚏

蔓延自中国的金融震荡，如今影响堪比美国

很长时间以来，美国一打喷嚏，投资者们就会很警惕，因为他们知道整个世界都会跟着感冒。如今在亚洲，他们还紧张起中国的鼻炎来——看下来，其传染性并不亚于美国的喷嚏。对于金融流行病学家们来说，这很是令人费解。病菌会从中国这个亚洲最大的经济体传染至该地区的其他经济体，这是可以预料的；结果其传染性竟如此之强，令人始料未及。与深陷全球市场的美国不同，中国经济处于自我强加的隔离状态，在资本管制的保护下，与其他经济的来往颇为有限。

然而，中国现今对亚洲股票市场的影响却几乎同美国一样重大。近期，国际货币基金组织（IMF）以及由多家央行组成的国际清算银行（BIS）分别发布论文，揭示了过去十年来这一变化的程度。IMF估计，自去年六月以来，中国股票市场与亚洲其他国家股市之间的相关系数已超过0.3（“完美”的相关系数是1），为全球金融危机前数字的两倍。这仍低于美国股市与亚洲股市0.4的相关系数，但两者的差距正快速缩小（见图表）。而根据BIS，自金融危机以来，亚洲股市跟随中国市场起伏的相关程度已增加了60%。

投资者们已经明白，中国的问题能够波及整个亚洲市场——确切说来，还会波及全球市场。去年夏天及今年初，中国股价暴跌，其他地方几乎都发生了同样的状况。2015年8月，中国令人民币贬值2%，其他新兴市场的货币跟着暴跌。（IMF研究发现，亚洲各国货币与人民币的相关系数现已超过0.2，是2008年之前数字的两倍。）

两份报告都认为，中国经济的规模是推高上述相关系数的主要因素。数据显示，与中国贸易关系最为密切的亚洲国家最易受其市场动向的影响。那里的投资者更有可能持有向中国出售大量零部件的公司的股份。如果股市下跌意味着中国经济陷入不利境地，那么投资者们的警觉就可以理解了。

而人民币贬值除了显示出经济的疲软外，也会造成中国进口产品成本的上升。

然而，贸易并不是唯一的传播途径。金融联动如今已构成中国与其他亚洲市场间相关系数的五分之二，而2008年之前还几近于无。即便并没放弃金融管控，中国仍已开放一些渠道，准许投资者购买国内股票或向国内公司提供贷款。相对于中国经济的规模，这些外来投资也许无足轻重，但鉴于中国如今庞大的财富积累，其绝对数值依旧很大。由国外投资人持有的中国股票及债券价值达两万亿美元，比其他任何新兴市场都要多。

亚洲投资者尤为大胆：韩国、台湾以及新加坡所持中国及香港证券的价值超过其GDP的10%。由于金融管控的放松，这些金融联系只会越发深入。眼下，中国的债券市场还自成一个宇宙，一旦人民币成为其他国家的融资货币，整个亚洲都将受到中国利率水平的影响。

BIS注意到，加强亚洲国家彼此间的金融关联度也许是人所乐见的。近年来全球市场似乎都有趋同之势，加大了投资者投资多样化的难度。随着亚洲交叉持股激增，尤其中国日益成为投资的焦点，亚洲的金融周期将会找到自己的节奏，日渐脱离世界其他金融板块。中国和美国仍将时不时地打个喷嚏，运气好的话，它们两个应该不会赶在一块儿感冒。■



Buttonwood

Taking it to 11

How central banks are distorting the corporate-bond and equity markets

IN THE spoof “rockumentary”, “This is Spinal Tap”, Nigel Tufnel, the band’s guitarist, displays his amplifiers with pride. The dials range not from one to ten, but up to 11. On a normal amp, he explains, when you reach ten, there is nowhere to go, but “these go to 11.”

Three of the world’s most important central banks—the Bank of England, Bank of Japan (BoJ) and the European Central Bank (ECB)—have dialled monetary policy up to 11, expanding their asset purchases from government bonds to embrace corporate debt and even equities. With government bonds and short-term interest rates already at historically low (and in some instances, negative) levels, such asset purchases were seen as the next logical step.

The expanded policy has several justifications. It is not clear that driving government-bond yields or short-term interest rates any lower will do a lot to help the economy; negative rates may dent bank profits, for example, making them more reluctant to lend. And if the aim is to get companies to borrow more, then buying their bonds will reduce the cost of that borrowing via lower yields.

But there are many more types of private-sector assets than there are government bonds. (The ECB’s government bond-purchase programme is linked to the size of each euro-zone economy, so it cannot be accused of favouring one nation over another.) Central banks simply cannot buy all corporate bonds or equities in equal measure.

Naturally, they choose the most liquid and the least risky. But the bonds

and equities they buy are likely to perform better than others. Since the ECB announced its bond-buying programme on March 10th, the spread (or excess interest rate over government bonds) on corporate bonds that it deems eligible has fallen by over half, from 100 basis points (one-hundredths of a percentage point) to 44 basis points, reckons Citigroup. The spread on ineligible bonds has also fallen but by only a third, from 154 to 104 basis points.

When companies seek to issue new bonds, the prices and yields of their existing bonds are an important benchmark. To the extent that central-bank actions lower the cost of capital of businesses within the programme, it must give them a competitive advantage over their rivals. The Bank of England, for example, is buying bonds issued by Walmart (which owns the Asda chain in Britain) but not bonds issued by Tesco or Morrisons, two rival supermarkets. The effect may be small, but it is still a questionable thing for a central bank to do.

Moreover, the British corporate-bond market is not as deep as the American equivalent so the Bank of England is limited in the bonds it can buy. This leads to some odd-looking inclusions. Will the purchase of sterling bonds issued by Apple, Daimler or PepsiCo really lower the cost of capital for British finance?

Investors will adjust their behaviour to allow for the actions of central banks. "It almost feels as if our role shifts from analysing the bonds' fundamentals to advising clients on the eligibility criteria," says Matt King, a bond strategist at Citigroup.

The BoJ has already been forced to adjust its equity-buying programme after it seemed to distort the market. The bank might have thought it was playing safe by purchasing an equity index. But a lot of its money was going into the Nikkei-225 average, a benchmark weighted by share price rather

than market value (see chart). So its investments were having a disproportionate effect on the share prices of some small companies. In the case of Fast Retailing, the BoJ already owns half of the free float (the shares available to outside investors). Future purchases will be weighted to the more sensibly constructed Topix index.

Another issue is how the central banks will eventually dispose of their holdings. Although, when they started in 2009, government-bond purchase schemes were seen as short-term measures, central banks have yet to reduce their bond piles. The Federal Reserve is slowly tightening monetary policy by pushing up short-term interest rates, not by selling bonds.

Corporate bonds are less liquid than government bonds, particularly since post-crisis rules have made banks less willing to hold inventories. A likely consequence of this is that central banks will be big owners of private-sector assets for a while, with all the distortions that implies. They will not want to risk a big shock by selling billions of bonds into an illiquid market. If that day comes, traders might be quoting Mr Tufnel again: “How much more black could this be? And the answer is none. None more black.” ■



梧桐

调到极致？

中央银行正如何扭曲企业债券和股票市场

在恶搞摇滚纪录片《摇滚万万岁》中，乐队的吉他手奈吉尔·图夫纳（Nigel Tufnel）骄傲地展示他的放大器。那上面旋钮的刻度不是从一到十，而是到11。他解释说一般的放大器到十级就到头了，但“这些钮能调到11”。

在世界上最重要的央行里，英国央行、日本央行和欧洲央行这三家已将货币政策“调高到了11”，将资产购置从政府债券扩展到了企业债券甚至股票。目前政府债券和短期利率已处于历史低位（有些情况下甚至为负），这样的资产购置被视为顺理成章。

政策范围如此扩大有几个正当理由。进一步压低政府债券收益率或短期利率是否会对经济大有益处尚不明晰；比如，负利率可能会削减银行利润，这样一来它们就更不愿意放贷。如果目的是鼓励企业增加借款，那么购买企业的债券就能降低企业借款的成本，因为会拉低收益率。

但是私营部门的资产类型要比政府债券的类别多很多。（欧洲央行的政府债券购买计划与每个欧元区经济体的规模挂钩，因此不能指责它更偏向哪个国家。）中央银行根本无法以同样的比例购买所有企业债券或股票。

因此它们自然会选择那些流动性最强、风险最小的。但是它们购买的债券和股票，其表现可能比其他的更好。花旗集团估算，自从欧洲央行3月10日宣布其债券购买计划以来，它认为表现合格的企业债券与政府债券之间的利差已经缩小过半，从100个基点（一个百分点的1%）收窄至44个基点。未被选中债券的价差也有所收窄，但只收窄了三分之一，从154个基点缩至104个基点。

当公司想要发行新债券时，其已发行债券的价格和收益率是一个重要的指

标。央行的举措降低了购买计划内公司的资本成本，就这一意义上说，它让这些公司在和对手的竞争中获得了优势。例如英国央行正着手购买沃尔玛（在英国拥有阿斯达连锁超市）发行的债券，而非其另外两家竞争对手超市乐购（Tesco）或莫里森（Morrisons）的债券。此举可能影响很小，但作为一家中央银行，这么做仍然值得商榷。

而且，英国的企业债券市场并不像美国那么深厚，因此英国央行能买的债券也很有限。这导致一些看起来很怪的债券入选。购买苹果、戴姆勒（Daimler）或百事可乐发行的英镑债券真的能为英国财政降低资本成本吗？

考虑到中央银行的举措，投资者也会做相应的调整。“好像觉得我们的角色从分析债券的基本面转成了向客户提供（央行筛选）入选资格标准的咨询。”花旗集团的债券策略师马特·金（Matt King）说道。

在似乎扭曲了市场之后，日本央行已经被迫调整了它的股票购买计划。日本央行可能原本以为购买股票指数是安全的。但其大量资金都流向了日经225指数，而这个基准指数是由股价而不是市值（见图表）加权计算的。因此，它的投资对一些小公司股价的影响比例过大。以迅销公司为例，日本央行已经持有其流通股（可供外部投资者购买的股份）的一半。未来的购买将偏重于指数构建逻辑更合理的东证指数。

另一个问题是央行最终将如何处理其持有的股份。尽管政府债券购买计划在2009年开始的时候被视为短期措施，但央行目前仍没有降低其债券持有量。美联储正通过推高短期利率而不是出售债券缓慢地收紧货币政策。

企业债券比政府债券流动性差，金融危机后出台的法规尤其令银行不太愿意持有它们。一个可能的后果是，央行将在一段时间内持有大量私营部门的资产，这会产生各种各样扭曲的影响。它们不会想要冒着引发巨大冲击的危险而将几十亿美元的债券卖到一个没有流动性的市场。如果那一天到来，交易员们可能会再次引用图夫纳的话：“还能怎么更黑呢？答案是没有。没有什么更黑的了。”■



The Federal Reserve

Man in the dock

Was Alan Greenspan to blame for the financial crisis?

THE former chairman of the Federal Reserve was once a hero. Now he is being called a villain. Yet it is too soon to be sure what history will say about him. In a superb new book, the product of more than five years' research, Sebastian Mallaby helps history make up its mind about Alan Greenspan, the man hailed in 2000 by Phil Gramm, a former senator, as "the best central banker we have ever had", but now blamed for the financial crisis of 2007-08. Even today, Mr Greenspan, who famously once told Congress that "If I seem unduly clear to you, you must have misunderstood what I said", remains a paradoxical figure.

Mr Greenspan was a partisan Republican, who worked more closely with the Democrats under Bill Clinton than with either of the Bush administrations. He was a disciple of Ayn Rand's libertarian ideology, but his forte was the mastering of data. He was a believer in the gold standard, but became the foremost exponent of discretionary monetary policy.

The former central banker condemned the creation of the Fed as a disaster, but he became its most dominant chairman. He was a believer in free markets, but participated enthusiastically in bail-outs of failed institutions and crisis-hit countries. He knew the dangers of moral hazard, yet offered the support for markets labelled the "Greenspan put".

Mr Mallaby, formerly a journalist at *The Economist* and now a senior fellow at the Council on Foreign Relations in New York, takes readers on a long journey from Mr Greenspan's childhood as the adored and awkward son of a single Jewish mother in New York, through his period as a "sideman" in a jazz band, his professional life as a data-obsessed forecaster, his

engagement in Republican politics, his 18 years as chairman of the Federal Reserve and, finally, the post-crisis collapse of his reputation. Through the lens of this stellar career, the book also throws a sharp light on American policy and policymaking over four decades.

Of his time as Fed chairman, Mr Mallaby argues convincingly that: “The tragedy of Greenspan’s tenure is that he did not pursue his fear of finance far enough: he decided that targeting inflation was seductively easy, whereas targeting asset prices was hard; he did not like to confront the climate of opinion, which was willing to grant that central banks had a duty to fight inflation, but not that they should vaporise citizens’ savings by forcing down asset prices. It was a tragedy that grew out of the mix of qualities that had defined Greenspan throughout his public life—intellectual honesty on the one hand, a reluctance to act forcefully on the other.”

Many will contrast Mr Greenspan’s malleability with the obduracy of his predecessor, Paul Volcker, who crushed inflation in the 1980s. Mr Greenspan lacked Mr Volcker’s moral courage. Yet one of the reasons why Mr Greenspan became Fed chairman was that the Reagan administration wanted to get rid of Mr Volcker, who “continued to believe that the alleged advantages of financial modernisation paled next to the risks of financial hubris.”

Mr Volcker was right. But Mr Greenspan survived so long because he knew which battles he could not win. Without this flexibility, he would not have kept his position. The independence of central bankers is always qualified. Nevertheless, Mr Greenspan had the intellectual and moral authority to do more. He admitted to Congress in 2008 that: “I made a mistake in presuming that the self-interests of organisations, specifically banks and others, were such that they were best capable of protecting their own shareholders and their equity in the firms.” This “flaw” in his reasoning had

long been evident. He knew the government and the Fed had put a safety net under the financial system. He could not assume financiers would be prudent.

Yet Mr Greenspan also held a fear and a hope. His fear was that participants in the financial game would always be too far ahead of the government's referees and that the regulators would always fail. His hope was that "when risk management did fail, the Fed would clean up afterwards."

Unfortunately, after the big crisis, in 2007-08, this no longer proved true.

If Mr Mallaby faults Mr Greenspan for inertia on regulation, he is no less critical of the inflation-targeting that Mr Greenspan ultimately adopted, albeit without proclaiming this objective at all clearly. The advantage of inflation-targeting was that it provided an anchor for monetary policy, which had been lost with the collapse of the dollar's link to gold in 1971 followed by that of monetary targeting. Yet experience has since shown that monetary policy is as likely to lead to instability with such an anchor as without one. Stable inflation does not guarantee economic stability and, quite possibly, the opposite.

Perhaps the biggest lesson of Mr Greenspan's slide from being the "maestro" of the 1990s to the scapegoat of today is that the forces generating monetary and financial instability are immensely powerful. That is partly because we do not really know how to control them. It is also because we do not really want to control them. Readers of this book will surely conclude that it is only a matter of time before similar mistakes occur.

MARTIN WOLF*

*Our policy is to identify the reviewer of any book by or about someone closely connected with *The Economist*. Sebastian Mallaby is married to

Zanny Minton Beddoes, our editor-in-chief. This review, by Martin Wolf, chief economics commentator of the *Financial Times*, has been edited for length only ■



美联储

放在火上烤的人

金融危机该怪艾伦·格林斯潘吗？

这位美联储前主席曾是位英雄，如今却被称为恶人。然而，若要确知历史将对他做出怎样的评价，目前尚为时过早。塞巴斯蒂安·马拉比（Sebastian Mallaby）精彩的新书集逾五年研究之功，可帮助历史对艾伦·格林斯潘做出判断。2000年，他曾被前参议院菲尔·格拉姆（Phil Gramm）称赞为“我们有史以来最棒的央行行长”，但现在却因2007到08年的金融危机而备受指责。即使在今天，对国会说出“如果我表达的意思对你而言清楚无误，那你肯定是误解我的话了”这句名言的格林斯潘仍旧是位充满矛盾的人物。

格林斯潘是共和党的追随者，但要论合作，他与比尔·克林顿治下的民主党合作更为密切，程度超过老布什或者小布什政府。他是安·兰德（Ayn Rand）自由主义意识形态的信徒，但其强项却是对数据的掌握。他曾信奉金本位制，却成为权衡性货币政策最重要的倡导者。

这位前央行行长将美联储的创立斥责为一场灾难，但却成为其最具主导性的主席。他坚信自由市场，却热火朝天地参与对破产机构及遭受危机国家的纾困。他清楚“道德风险”会带来何种危机，却仍向市场提供被称为“格林斯潘看跌期权”的托市举措。

马拉比早前是《经济学人》的记者，现为纽约外交关系协会的高级研究员。他带领读者踏上一段长长的旅程：从格林斯潘的童年时光——纽约一位犹太单亲妈妈笨拙而又深受喜爱的儿子，到他在一只爵士乐队的“伴奏者”时期，再到他作为一个沉迷于数字的预测者的职业生涯、对共和党政治的参与以及担任美联储主席的18年光阴，直至金融危机后其名望的坍塌。透过对格林斯潘卓越事业的描述，这本书还清晰地展现了过去四十多年来美国的政策及政策的制定。

当讲述到他担任美联储主席的阶段，马拉比令人信服地写道：“格林斯潘任期内的悲剧就是将自己对金融的担忧贯彻得还不够。他认定（货币政策）盯住通胀诱人地简单，而要盯住资产价格就难了；他不愿意挑战主流观点——这种观点认为，央行有抗击通货膨胀的责任，却不应刺破资产泡沫导致公民储蓄蒸发。格林斯潘性格特质的组合——一方面是睿智的诚实，另一方面却是不愿采取强有力的行动——定义了其担任公职期间的作为，也导致了悲剧的发生。”

很多人会将格林斯潘的灵活变通与其前任，即于上世纪80年代击退通胀的保罗·沃尔克的执拗做对比。格林斯潘缺乏沃尔克所具备的道义勇气。然而，格林斯潘之所以成为美联储主席，原因之一是里根政府想摆脱沃尔克，因其“仍旧相信，与金融业的傲慢隐含的风险相比，金融现代化所谓的优势黯淡无光”。

沃尔克所言非虚。但格林斯潘之所以能挺过那么长时间，就是因为他明白哪些仗自己是打不赢的。如果没有这种灵活性，他可能就不会在主席位子上坐那么久。央行行长向来都享有保持独立性的资格，但格林斯潘在智识和道德上的权威还赋予他更多的能量。2008年，他向国会承认：“我犯了一个错误。我推测各个组织，确切地说银行和其他机构，都会相当关注自身利益，因而最有能力保护自己的股东，以及他们所持有的公司股份。”他说理中的“瑕疵”早已不言自明。他明明知道政府及美联储已在金融体系之下设置了一张安全网，就不应该假设金融家们还会很谨慎。

然而格林斯潘还是怀有一丝忧虑以及一线希望。他的担忧是，金融竞赛中的参与者一直都会遥遥领先于政府的裁判者，且监管者永远都会是输家。他的希望则是，“如果风险管控真的失败了，美联储会去收拾残局。”然而很不幸，2007到08年的大危机之后，这已不再是事实。

如果说马拉比对格林斯潘的监管不力大加鞭挞，他对格林斯潘最终采取的盯住通胀目标的货币政策同样批评犀利，尽管没有明说。1971年美元与黄金脱钩，货币政策失去锚点。盯住通胀的政策优势就是提供了这一锚点。但这之后的经验表明，不管有没有这样一个锚点，货币政策都同样有可能

引发不稳定。通胀水平稳定也并不能保证经济稳定，而且很有可能恰恰相反。

这位上世纪90年代的“大师”沦落为今天的替罪羊——也许我们从格林斯潘身上学到的最重要一课就是导致货币及金融不稳定的力量何其强大。这种状况的部分原因是我们其实并不知道该怎么控制它们，还有一个原因是我们并不真的想去控制。这本书的读者必定会得出这样的结论：类似错误的仍会再次上演，这只是个时间问题。

马丁·沃尔夫（Martin Wolf）*

*与《经济学人》有关联的人所著的书，或是关于这类人士的书，我们都会指明该书书评作者的身份。这是我们的一项政策。塞巴斯蒂安·马拉比与《经济学人》主编詹妮·明顿·贝多伊斯（Zanny Minton Beddoes）系夫妻关系。本评论由《金融时报》首席经济评论员马丁·沃尔夫撰写，在此仅就篇幅作了修改■



China's property market

Rotten foundations

In real estate as elsewhere in its economy, China's short-term fixes mask deep structural problems

JUST over a year ago, policymakers were having conniptions about China's tumbling stockmarkets. Now it is China's frothy property market that is causing worries at home and abroad. Because the property sector accounts for about a quarter of demand in the world's second-largest economy, a market collapse would have far more than a local impact. In fact, for now, China can probably avoid a disastrous crash. But it shows little sign of being able to implement the fundamental reforms needed to fix the distortions that make the market so volatile and, in the long run, dangerous.

One reason for optimism that a crisis can be averted is that the risk has been identified. With property prices in many big cities soaring—by more than 30% a year in Shanghai, Shenzhen and Nanjing—even the central bank's chief economist has warned of a “bubble”. Wang Jianlin, China's richest man (and a property developer), last month went further, calling it “the biggest bubble in history”. Foreign-bank economists, local brokers and state-run think-thanks have all joined in. Fears have been stoked by a steep rise in mortgages this year. In July and August, they accounted for nearly 80% of new bank loans.

The government is clearly heeding the warning signs: in the past two weeks rules on property purchases have been tightened in some two dozen places, suggesting a central-government push to tell municipalities to curb their local excesses. Tightening measures (typically raising the percentage of a purchase price to be paid as a cash down-payment) can be effective. And despite the recent mortgage boom, Chinese households still have strong

balance-sheets. When shadow banks began to lend to homebuyers to cover their down-payments earlier this year, regulators quickly snuffed out the practice—a telling contrast with the authorities' inaction last year when hidden borrowing helped inflate the stockmarket bubble.

The upturn has also been a powerful reminder of just how insatiable demand for property remains in China. Fitch, a ratings agency, calculates that it will need about 800m square metres of new housing—roughly the size of Singapore—every year between now and 2030 to meet demand from people moving to cities and buying nicer homes. That is in fact less than the billion or so square metres that China has recently completed every year, but still remarkable.

The market for all those homes, however, remains subject to serious distortions, thanks to government policy. The most fundamental is that the government does not make it possible to build homes where people want to live. Because it wants to contain the growth of the big cities, little urban land is made available. Scarcity drives prices up; builders and homebuyers alike pay a steep premium to be there. Smaller cities still have a vast inventory of unsold homes. The current rally has done little to chip into it. Matching supply and demand is often not the main consideration: land sales are an important source of local-government revenue. Nor may everybody live where they want, as residence permits can still be used to block outsiders.

| *My home is my nest egg*

A further distortion lies in a repressed financial system that restricts investment opportunities. Capital controls hamper legal investment abroad; state banks keep deposit rates low; the stockmarket has been a rollercoaster. So property looks a very attractive destination for surplus cash. Surveys suggest that, of those buying homes in China these days, perhaps one-fifth are doing so as investors rather than owner-occupiers.

State-owned enterprises, limping in their core businesses but resisting break-up and reform, have turned to property development to make up for flagging profits.

The cooling measures in so many Chinese cities do nothing to tackle these structural issues. No wonder. They are at the heart of the Communist Party's abiding dilemmas: how to maintain rapid economic growth without increasing the risks of an abrupt "hard landing", and how to let markets flourish while maintaining the party's control. At least when it comes to property, solutions are at hand. China must press on with opening its financial system and, most crucially, overhaul its land policy. If not, property mania will sweep its big cities again and again, and those booms will one day end in a bust. ■



中国房地产市场

朽烂的地基

与其他经济部门一样，中国房地产市场的短期修复掩盖了深层的结构问题

就在一年多以前，政策制定者们还在为中国摇摇欲坠的股票市场而惊惶。如今在国内外都引发忧虑的，则是中国的楼市泡沫。对于这个全球第二大经济体而言，房地产行业占其需求的四分之一，市场一旦崩溃，影响或将远不止于国内范畴。实际上，中国目前也许还可以避免一场灾难性的崩溃。然而，几乎并没有迹象显示中国能够实施根本性的改革，以修正令市场如此波动、且长远来看还会对市场造成危险的扭曲状况。

危机仍可避免——对此尚可保持乐观的一个原因是已经确知风险的性质。随着许多大城市房价飙升（上海、深圳及南京一年的涨幅超过30%），连央行的首席经济学家都发出了“泡沫”的警告。中国首富（同时也是位房地产开发商）王健林上个月的说法更为激进，称中国楼市泡沫为“史上最大”。外国银行的经济学家、本土的经纪人以及国营智库也发出了同样的警告。今年，抵押贷款急剧上升，加深了人们的担忧。7月和8月，抵押贷款几乎占银行新增贷款的80%。

政府现也清楚地注意到这些警示信号：在过去的两周，约二十多地都收紧了房地产购买规则，这表明中央政府已敦促各地方政府抑制本地楼市的过热。紧缩手段（通常都是提高现金首付的百分比）是可以奏效的。同时，尽管近期抵押贷款激增，中国家庭仍然有着健康的资产负债表。今年早些时候，影子银行开始向购房者提供贷款供其支付首付款，监管部门迅速叫停了这种做法——这与去年影子借贷促发股市泡沫、而当局却并未采取行动形成鲜明对照。

楼市的复苏也强有力地提醒着人们，在中国对房地产的需求是多么旺盛。据评级机构惠誉（Fitch）估算，从现在到2030年，中国每年需新建大约八亿平方米（大致相当于新加坡的国土面积）的住宅才能满足人们对移居城市以及改善住房的需求。这一数字实际上低于近年中国每年建成的、大

约十亿平方米的面积，但仍非同一般。

然而，由于政府的政策，所有这些住房所处的市场仍被严重扭曲。最主要的一个问题就是政府并不准许在人们想要居住的地方建房。由于政府要控制大型城市的增长，只有很少的城市土地可供利用。稀缺便推高了价格。建筑商和购房者都需要支付高昂的溢价才能在城市中找到立足之地。较小城市的未售出房屋却仍有大量库存，而眼下楼市的反弹也并未消化掉多少。匹配供给通常并不是主要考虑因素：土地出售是地方政府财政收入的一个重要来源。此外，也并不是每个人都能居住在自己想住的地方，因为户口仍旧会将外来人员拒之门外。

| 我的房子就是我的储蓄金

金融体系受到抑制并因此限制了投资机会，这进一步扭曲了市场。资本控制阻碍了合法的国外投资，国有银行存款利率持续低迷，股票市场更是犹如过山车。因此，房地产看起来便成了一个非常有吸引力的盈余现金的去处。调查显示，如今中国的购房者中大概有五分之一买房都是为了投资，而非用于自住。国有企业核心业务低迷却抗拒拆分和改革，也都已转向房地产开发，以弥补持续下滑的利润。

中国许多城市的降温措施对解决这些结构性问题毫无助益。这并不奇怪。它们是党长久以来面临的两难困境中的核心问题：如何在不增加骤然“硬着陆”风险的前提下保持经济快速发展，以及如何令市场蓬勃发展，同时又保持党的控制。起码在房地产这个问题上，解决方法就在手边。中国必须加紧开放金融体系，最关键的是，要全面改革土地政策。如若不然，房地产引发的狂热将一次又一次横扫其各大城市，而这种火爆景象终有一日会以崩盘而告终。■



Sterling

Taking a pounding

The fall in sterling hints at how painful a “hard” Brexit would be

RARELY do people compare the British pound to the Nigerian naira, Azerbaijani manat or Malawian kwacha. But on a measure of year-to-date change against the American dollar, sterling is near the bottom of the 154 currencies tracked by Bloomberg. The pound is down by 15% on a trade-weighted basis since the Brexit vote, and is plumbing the depths it reached in the 2008-09 financial crisis (see Buttonwood).

The cause of sterling’s fall is the realisation that Theresa May’s government is moving towards a “hard” Brexit, which involves Britain leaving the European Union’s customs union and its single market. It is also driven by the fear that Britain is turning into a xenophobic, interventionist and unpredictable place, with calls to clamp down on foreign workers and foreign capital. For a country that is used to attracting swathes of investment from abroad because of its membership of the single market and stable political climate, this is a huge shift.

With Britain’s current-account deficit (a measure of what it borrows from abroad) equal to a gigantic 6% of GDP, it is also a dangerous one. True, Britain is not heading for a balance-of-payments crisis. Its debts are issued in its own currency, so the cost of meeting its obligations will not soar as the currency falls. And Britain’s net capital flows tend to come in the form of foreign direct investment (FDI), as opposed to deposits or short-term debt. FDI will not disappear overnight in the way that deposits could. But it can be hard to recover from a loss of confidence. If foreign investment dries up, and the pound stays weak, Britons will be left permanently poorer.

| *The penny needs to drop, too*

Unfortunately, far too many in Mrs May's government are complacent about this. Many Brexiteers wrongly conclude that the pound's slump is nothing but good news. Their argument is that a weaker pound will send exports soaring, herald a manufacturing renaissance and "rebalance" the economy away from services. Yet recent experience suggests that British exports do not respond quickly or strongly to a cheaper currency. The volume of exported goods is actually lower than it was before the Brexit vote. Exporting requires importing of supplies and other materials, and these are now more expensive. Within just a few weeks the year-on-year change in producer prices has neared 10%, the highest since 2011.

The Brexiteers also fail to acknowledge the immediate hit to living standards that the pound's slump has caused. Britons enjoy consuming things from abroad. Some 5% of household spending goes on foreign holidays. Domestic prices are affected, too: the pressures surfaced last week in a dispute between Tesco, a supermarket, and Unilever, a consumer-goods firm, which wants to increase the price of brands such as Marmite, a yeasty spread. Inflation may jump from its current level of 0.6% to 3% by next year, well above the Bank of England's 2% target. This will be bitter medicine for the average Briton, whose real weekly pay is already about 4% lower than in 2007. Nominal wage growth fell to a measly 2% in the run-up to the referendum, and bosses are in no mood to offer pay rises now. Real wages will soon be falling once again.

The combination of a slowing economy, rising inflation and shaky confidence constrains fiscal and monetary policy. The Bank of England is unlikely to raise interest rates in response to the temporary spurt of inflation caused by sterling's fall. Yet gone are expectations that the bank will soon reduce the base rate of interest from 0.25% to 0.1%; a cut would prompt still more foreign capital to leave the country.

The government may have a little room for manoeuvre. In its autumn statement, it is likely to change course from aggressive fiscal consolidation to mild expansion. But it, too, must be careful. Gilt yields have crept upwards as investors reassess the British economy, and could go a lot higher if the nasty rhetoric coming from ministers continues.

The most sensible course, then, would be to heed markets' concerns. The overwhelming weight of evidence shows that leaving the customs union and single market would exact a heavy toll on Britain's economy. Remaining within them would require political courage, but has clear economic benefits. It is not too late to change course. ■



英镑

梆梆地跌

英镑下跌让人一窥“硬”脱欧之痛

人们很少把英镑与尼日利亚的奈拉、阿塞拜疆的马纳特或马拉维的克瓦查来作比较。但如果看一下各货币年初至今兑美元汇率的变动，根据彭博的数据，英镑在154个货币中排名接近末位。脱欧公投以来，按贸易加权计算，英镑已贬值15%，即将跌至2008至2009年金融危机期间的最低点。

英镑下跌的原因是市场认识到特雷莎·梅（Theresa May）政府开始准备“硬”脱欧，这意味着英国将脱离欧盟的关税同盟和单一市场。英镑下跌的另一个原因是市场担忧扬言削减外籍劳工和外资进入的英国将变成一个排外、难以预测和奉行干涉主义的国家。对于一个惯于以单一市场成员身份和稳定的政治环境吸引大量外资的国家来说，这无异于一场巨变。

由于英国的经常项目赤字（衡量一国向外借贷的水平）高达GDP的6%，这种变化也危险重重。诚然，英国并不会陷入国际收支平衡危机。它的债务以本国货币发行，因此其履行债务的成本并不会随货币贬值而飙升。而且英国净资本流入的方式一般是外国直接投资，而不是存款或短期债务。外国直接投资不会像存款那样一夜之间就消失不见。但要恢复市场信心实属不易。如果外国投资干涸，英镑持续疲弱，英国人就永远缓不过来了。

| 也需认清现实

不幸的是，梅政府中有太多人信心满满。很多脱欧派人士错误地认为英镑下跌其实是好事。他们的看法是英镑贬值可以拉高出口，带来制造业的复兴和经济的“再平衡”，而不再过多倚重服务业。然而近期的情况表明英国的出口并没有对英镑下跌有快速或强烈的反应，出口货物量事实上比脱欧公投之前还要低。出口需要进口物资和其他原材料，而进口价格更高了。仅仅几周之内，生产价格同比增加了近10%，为2011年以来的最高。

同时，脱欧派人士也未承认英镑大幅贬值对国民生活水平造成的直接冲

击。英国人喜欢消费外国货。英国家庭开支约有5%用于海外度假。英镑贬值也影响了国内物价：上周，因乐购超市和消费品公司联合利华之间的一场纷争，由贬值带来的压力浮出水面（联合利华想要提高如马麦酵母酱等某些品牌产品的价格）。到明年通货膨胀水平有可能从现在的0.6%升至3%，远高于英格兰银行2%的目标。这对普通英国人来说将是一剂苦药，他们目前的实际周薪已较2007年低了约4%。名义工资涨幅在公投之前跌至可怜的2%，企业老板如今也无心加薪。实际工资水平很快还会下降。

经济放缓、通胀上升和市场信心动摇共同限制了财政和货币政策。面对因英镑下跌而导致的短暂通胀激增，英格兰银行不太可能加息。然而，市场也不再期望英格兰银行近期内会将基准利率从0.25%降至0.1%，因为这样的下调将促使更多外资撤离英国。

政府可能还有一点回旋的余地。其秋季预算报告指出，政府有可能将改变政策方向，由积极的财政整顿转为温和扩张。但政府也必须谨慎小心。投资者对英国经济重新评估，已推动了英国国债收益率小幅攀升，如果部长们继续发表负面言论影响市场信心的话，就有可能引发大幅上升。

那么最明智的前进方向应该是关注市场的担忧。压倒性的证据显示脱离欧洲关税同盟和单一市场可能会让英国经济付出沉重代价。继续留下来可能需要政治上的勇气，但也会有明显的经济利益。现在改变前进方向还为时不晚。■



Cyber-security

The internet of stings

An electronic tsunami crashes down on a solitary journalist

TO A layman, the phrase “Internet of Things” (IoT) probably conjures up a half-fantastic future in which refrigerators monitor their own contents and send orders direct to the grocer when the butter is running out, while tired commuters order baths to be drawn automatically using their smartphones as they approach their houses in their self-driving cars. Actually, though, a version of the IoT is already here. Wi-Fi hubs, smart televisions, digital video-recorders and the like are all part of a network of devices run by microprocessors that, just as much as desktop, laptop and tablet computers, form part of the internet—but with one crucial distinction. Unlike things immediately recognisable as computers, these devices are often designed with poor security, or even none at all. They are wide open to malicious hackers who might wish to misuse them. And there are already around 5 billion of them, according to Cisco, the world’s largest computer-networking company, with billions more to come in the years ahead.

One favourite trick of such hackers is the distributed denial of service attack, or DDoS. This temporarily enslaves a number of internet-enabled devices into an arrangement known as a botnet, and then directs this net to send simultaneous requests for attention to a single machine or cluster of machines, thus overwhelming it and making it unusable. Such attacks may be carried out by organised criminals, to hold a firm to ransom; by cyber-savvy countries, as a tool of low-level warfare—or, as in the case of one of the latest attacks, for revenge.

The victim is Brian Krebs (pictured), an American journalist who often reports on internet criminals, including those who run DDoS-for-hire

services, and also those involved in the “dark” markets that trade in stolen identities and credit-card details. In the past, some of the people he has annoyed have sent heroin to his home while alerting the police to the fact they might find the drug there. This time, the very internet itself was turned against him. On September 20th Mr Krebs’s web server became the target of one of the largest DDoS attacks ever recorded—between 600 billion and 700 billion bits per second, or almost half a percent of the internet’s entire capacity, for hours at a time.

At first, his “network mitigation provider”, a firm called Akamai that was supplying its services to him free, for the general good of the field, was able to ward off these attacks. Eventually, though, it had to surrender. On September 23rd, with his agreement, it cut him loose and he had to shut down until he could make alternative arrangements.

Though Mr Krebs’s case is extreme by current standards, there is a risk it will soon become typical. Matthew Prince, the boss of CloudFlare, a firm that helps websites manage heavy traffic and deal with assaults of this sort, says his firm has already seen a sustained ten-day trillion-bits-per-second DDoS attack—though that was launched by a country (he declined to say which) rather than by a private criminal organisation. Other firms, such as OVH, a French web-hosting service, have also reported attacks of this magnitude.

On September 17th analysts at Flashpoint, Intel’s business-security division, announced that they had found a botnet composed of 1m devices, mostly digital video-recorders. And on October 1st the source code for “Mirai”, the botnet that attacked Mr Krebs’s computer, was released to an internet hackers’ forum by a pseudonymous individual. Mirai scans the internet for devices protected by factory-default usernames and passwords (which is often the case for machines that are part of the internet of things, since their owners rarely bother to change these defaults). It then recruits

them into the network.

For the perpetrators, DDoS attacks are a perfect example of asymmetrical warfare—cheap to carry out and expensive to prevent. The cost to Mr Krebs's attackers, whoever they were (he has his suspicions, but no proof), would have been negligible even before Mirai's source code was released; a few thousand dollars at most. Now, it is, in effect, zero. Defending against such attacks, though, is by no means cheap. Mr Krebs says he has been quoted rates of \$150,000 to \$200,000 a year for full-time protection. That is a lot of money for a freelance to fork out.

One way around this is to sign up for Project Shield, a programme (free to those accepted for enrolment into it) run by Google and designed to keep independent news organisations online. Google says Project Shield already protects both individual journalists and editorial organisations, including Rafael Marques de Morais, who reports on corruption and politics in Angola, and *El Ciudadano*, a Chilean periodical that promotes social and political reform. Since September 25th it has been protecting Mr Krebs, too—though attacks on his web server continue. CloudFlare offers a similar service, Project Galileo, which protects the American Civil Liberties Union, the Committee to Protect Journalists and others.

Ultimately, however, the answer to DDoS attacks like that perpetrated by Mirai is to build better security into both devices and the networks they are attached to. Edith Ramirez, chairwoman of America's Federal Trade Commission, said as much in January 2015 when she delivered a polite but blistering speech about privacy and security practices at one of the electronic industry's main trade meetings, the Consumer Electronics Show, in Las Vegas. Equally politely, deaf ears were turned. Andy Ellis, Akamai's chief security officer, says network operators could introduce filters that would prevent common illegitimate traffic from reaching its destination, but the costs and complexities involved mean they do not want

to—particularly if their competitors are not forced to bear similar costs.

One answer might be government action, in the form of required security standards, to level the playing-field by making all firms bear the same burden. There is no immediate sign of that happening, but if DDoS attacks in the trillions of bits per second range proliferate, that may change. In the meantime, though, people like Mr Krebs will continue to suffer from what Bruce Schneier, an internet-security guru at IBM, aptly describes as “the democratisation of censorship”. ■



网络安全

物联网之痛

数据海啸席卷孤军记者

对外行人来说，“物联网”（IoT）一词大概会使人联想到一个半梦幻的未来：电冰箱能监控其中存储的食品，在黄油差不多用完时会直接向杂货商发送订单；乘坐自动驾驶汽车的疲惫上班族快到家门时用智能手机发出命令，家中浴缸便自动放水备用。而在现实中，物联网的一个版本已然存在。WiFi集线器、智能电视、数字录像机等已构成了一个由微处理器运行的设备网络，道理就跟台式电脑、笔记本和平板电脑是互联网的部分组件一样。但两者存在一个关键区别。不像被明确界定为计算机的电脑，物联网设备本身设计的安全性较差，甚至毫无安全性可言。对有心利用漏洞的恶意黑客来说，这些设备简直是大开方便之门。据全球最大的计算机网络公司思科估算，现在已有约50亿此类设备，未来几年还会数以十亿地增长。

黑客最惯用的一个伎俩是分布式拒绝服务攻击（简称DDoS），即入侵多个联网设备使之暂时成为“僵尸网络”，然后操纵该网络向目标单机或计算机集群发送同步请求，使其不胜负荷以致瘫痪。这类攻击可能是有组织犯罪分子为勒索赎金而向某公司发起的，也可能是精于网络战的国家发动的低级别战争，或者像最近一次的攻击那样，只是为了报复。

受害人是美国记者布莱恩·克雷布斯（Brian Krebs，见图）。他经常报道互联网不法分子的恶行，包括那些有偿提供DDoS攻击的黑客，还有买卖被盗身份信息及信用卡资料的“黑市”交易者。过去，他惹怒的人就曾往他家里寄送海洛因，同时报警说他家里可能有毒品。这一次则是使用互联网来对付他。9月20日，克雷布斯的网站服务器成为有记录以来最大规模的DDoS攻击之一的目标，在数小时的攻击中，流量一度高达每秒六七千亿比特，几乎等于互联网整体负荷的0.5%。

其“网络攻击防护服务商”（一家名为Akamai的公司，为该领域的整体利益

而向他提供免费服务)起初还能抵御这些攻击,但最终还是没有招架住。9月23日,在得到他的同意后,服务商将其网站下线。他也不得不停止营运网站直至可作另行安排。

虽然按现有标准看,克雷布斯遭遇的是极端个案,但确有很快成为普遍现象的风险。CloudFlare公司帮助网站管理大量数据流量及应对这类攻击,其老板马修·普林斯(Matthew Prince)表示,他的公司已发现一个国家(他拒绝透露是哪国)而非私人犯罪团伙持续十天发起每秒万亿比特的DDoS攻击。其他公司,比如法国的网络托管服务公司OVH,也透露已发现类似的大规模攻击。

9月17日,英特尔的企业安全部门Flashpoint的分析师宣布,他们发现了一个由一百万台设备构成的僵尸网络,其中主要是数字录像机。10月1日,一位使用假名的用户在某网络黑客论坛上发布了攻击克雷布斯服务器的僵尸网络Mirai的源代码。Mirai会在互联网上扫描使用出厂默认用户名和密码的设备(物联网中的设备往往存在这种问题,因为用户大多懒得更改默认设置),然后将它们加入到僵尸网络中。

在恶意攻击者眼中,DDoS正是非对称战争的绝佳例子——攻击成本低廉,防御费用昂贵。无论克雷布斯的攻击者是谁(他有怀疑的对象,但没有确切证据),就算是在Mirai源代码被公开前,其成本也是微乎其微,最多就几千美元。现在,成本基本为零。然而要抵御这类攻击却费用不菲。克雷布斯说,就一年的全时网络保护服务,他收到的报价在15万美元至20万美元之间。这对一个自由职业者来说可是一大笔开销。

解决此问题的一个办法是加入谷歌的“护盾”项目(Project Shield,对允许注册者免费),其目标是要让独立新闻机构保持在线。谷歌表示“护盾”已对记者个人及编辑机构发挥了保护作用,包括报道安哥拉腐败现象及政治丑闻的拉斐尔·马奎斯·德莫拉斯(Rafael Marques de Morais),以及促进社会和政治改革的智利杂志《公民》(El Ciudadano)。从9月25日起,克雷布斯也开始受到该项目的保护,不过其网络服务器仍在持续受到攻击。CloudFlare也有类似服务——“伽利略计划”(Project Galileo),为美

国公民自由联盟（American Civil Liberties Union）、保护记者委员会（Committee to Protect Journalists）等机构提供保护。

然而，应对诸如Mirai这类恶意软件造成的DDoS攻击，归根结底是要对设备本身及其接入的网络建立更加有效的安全系统。2015年1月，美国联邦贸易委员会（America's Federal Trade Commission）主席伊迪丝·拉米雷斯（Edith Ramirez）在拉斯维加斯消费电子展（CES，电子业界的一大展会）上就个人隐私和安全措施发表了礼貌但尖锐的演说，强调的正是这一点。但人们同样礼貌地对此置若罔闻。Akamai的首席安全官安迪·埃利斯（Andy Ellis）表示，网络运营商可以加装阻挡常见非法流量的过滤设置，但成本和其中的复杂程度让它们不愿行动，尤其当它们的竞争对手并未被要求承担类似的成本。

政府层面的行动也是解决办法之一，比如建立网络安全标准，让所有企业承担相同的责任，公平竞争。没有迹象显示这样的手段会被立即采用，但如果每秒万亿比特规模的DDoS攻击持续扩散，情况也许会改变。但与此同时，克雷布斯这类人士还将继续忍受这一苦楚——IBM的互联网安全专家布鲁斯·施奈尔（Bruce Schneier）将之贴切地描述为“审查的民主化”。





The world economy

An open and shut case

The consensus in favour of open economies is cracking, says John O'Sullivan. Is globalisation no longer a good thing?

THERE IS NOTHING dark, still less satanic, about the Revolution Mill in Greensboro, North Carolina. The tall yellow-brick chimney stack, with red bricks spelling “Revolution” down its length, was built a few years after the mill was established in 1900. It was a booming time for local enterprise. America’s cotton industry was moving south from New England to take advantage of lower wages. The number of mills in the South more than doubled between 1890 and 1900, to 542. By 1938 Revolution Mill was the world’s largest factory exclusively making flannel, producing 50m yards of cloth a year.

The main mill building still has the springy hardwood floors and original wooden joists installed in its heyday, but no clacking of looms has been heard here for over three decades. The mill ceased production in 1982, an early warning of another revolution on a global scale. The textile industry was starting a fresh migration in search of cheaper labour, this time in Latin America and Asia. Revolution Mill is a monument to an industry that lost out to globalisation.

In nearby Thomasville, there is another landmark to past industrial glory: a 30-foot (9-metre) replica of an upholstered chair. The Big Chair was erected in 1950 to mark the town’s prowess in furniture-making, in which North Carolina was once America’s leading state. But the success did not last. “In the 2000s half of Thomasville went to China,” says T.J. Stout, boss of Carsons Hospitality, a local furniture-maker. Local makers of cabinets, dressers and the like lost sales to Asia, where labour-intensive production was cheaper.

The state is now finding new ways to do well. An hour's drive east from Greensboro is Durham, a city that is bursting with new firms. One is Bright View Technologies, with a modern headquarters on the city's outskirts, which makes film and reflectors to vary the pattern and diffusion of LED lights. The Liggett and Myers building in the city centre was once the home of the Chesterfield cigarette. The handsome building is now filling up with newer businesses, says Ted Conner of the Durham Chamber of Commerce. Duke University, the centre of much of the city's innovation, is taking some of the space for labs.

North Carolina exemplifies both the promise and the casualties of today's open economy. Yet even thriving local businesses there grumble that America gets the raw end of trade deals, and that foreign rivals benefit from unfair subsidies and lax regulation. In places that have found it harder to adapt to changing times, the rumblings tend to be louder. Across the Western world there is growing unease about globalisation and the lopsided, unstable sort of capitalism it is believed to have wrought.

A backlash against freer trade is reshaping politics. Donald Trump has clinched an unlikely nomination as the Republican Party's candidate in November's presidential elections with the support of blue-collar men in America's South and its rustbelt. These are places that lost lots of manufacturing jobs in the decade after 2001, when America was hit by a surge of imports from China (which Mr Trump says he will keep out with punitive tariffs). Free trade now causes so much hostility that Hillary Clinton, the Democratic Party's presidential candidate, was forced to disown the Trans-Pacific Partnership (TPP), a trade deal with Asia that she herself helped to negotiate. Talks on a new trade deal with the European Union, the Transatlantic Trade and Investment Partnership (TTIP), have stalled. Senior politicians in Germany and France have turned against it in response to popular opposition to the pact, which is meant to lower investment and regulatory barriers between Europe and America.

| *Keep-out signs*

The commitment to free movement of people within the EU has also come under strain. In June Britain, one of Europe's stronger economies, voted in a referendum to leave the EU after 43 years as a member. Support for Brexit was strong in the north of England and Wales, where much of Britain's manufacturing used to be; but it was firmest in places that had seen big increases in migrant populations in recent years. Since Britain's vote to leave, anti-establishment parties in France, the Netherlands, Germany, Italy and Austria have called for referendums on EU membership in their countries too. Such parties favour closed borders, caps on migration and barriers to trade. They are gaining in popularity and now hold sway in governments in eight EU countries. Mr Trump, for his part, has promised to build a wall along the border with Mexico to keep out immigrants.

There is growing disquiet, too, about the unfettered movement of capital. More of the value created by companies is intangible, and businesses that rely on selling ideas find it easier to set up shop where taxes are low. America has clamped down on so-called tax inversions, in which a big company moves to a low-tax country after agreeing to be bought by a smaller firm based there. Europeans grumble that American firms engage in too many clever tricks to avoid tax. In August the European Commission told Ireland to recoup up to €13 billion (\$14.5 billion) in unpaid taxes from Apple, ruling that the company's low tax bill was a source of unfair competition.

Free movement of debt capital has meant that trouble in one part of the world (say, America's subprime crisis) quickly spreads to other parts. The fickleness of capital flows is one reason why the EU's most ambitious cross-border initiative, the euro, which has joined 19 of its 28 members in a currency union, is in trouble. In the euro's early years, countries such as Greece, Italy, Ireland, Portugal and Spain enjoyed ample credit and low borrowing costs, thanks to floods of private short-term capital from other

EU countries. When crisis struck, that credit dried up and had to be replaced with massive official loans, from the ECB and from bail-out funds. The conditions attached to such support have caused relations between creditor countries such as Germany and debtors such as Greece to sour.

Some claim that the growing discontent in the rich world is not really about economics. After all, Britain and America, at least, have enjoyed reasonable GDP growth recently, and unemployment in both countries has dropped to around 5%. Instead, the argument goes, the revolt against economic openness reflects deeper anxieties about lost relative status. Some arise from the emergence of China as a global power; others are rooted within individual societies. For example, in parts of Europe opposition to migrants was prompted by the Syrian refugee crisis. It stems less from worries about the effect of immigration on wages or jobs than from a perceived threat to social cohesion.

But there is a material basis for discontent nevertheless, because a sluggish economic recovery has bypassed large groups of people. In America one in six working-age men without a college degree is not part of the workforce, according to an analysis by the Council of Economic Advisers, a White House think-tank. In Britain, though more people than ever are in work, wage rises have not kept up with inflation. Only in London and its hinterland in the south-east has real income per person risen above its level before the 2007-08 financial crisis. Most other rich countries are in the same boat. A report by the McKinsey Global Institute, a think-tank, found that the real incomes of two-thirds of households in 25 advanced economies were flat or fell between 2005 and 2014, compared with 2% in the previous decade. The few gains in a sluggish economy have gone to a salaried gentry.

This has fed a widespread sense that an open economy is good for a small elite but does nothing for the broad mass of people. Even academics and

policymakers who used to welcome openness unreservedly are having second thoughts. They had always understood that free trade creates losers as well as winners, but thought that the disruption was transitory and the gains were big enough to compensate those who lose out. However, a body of new research suggests that China's integration into global trade caused more lasting damage than expected to some rich-world workers. Those displaced by a surge in imports from China were concentrated in pockets of distress where alternative jobs were hard to come by.

It is not easy to establish a direct link between openness and wage inequality, but recent studies suggest that trade plays a bigger role than previously thought. Large-scale migration is increasingly understood to conflict with the welfare policy needed to shield workers from the disruptions of trade and technology.

The consensus in favour of unfettered capital mobility began to weaken after the East Asian crises of 1997-98. As the scale of capital flows grew, the doubts increased. A recent article by economists at the IMF entitled "Neoliberalism: Oversold?" argued that in certain cases the costs to economies of opening up to capital flows exceed the benefits.

| *Multiple hits*

This special report will ask how far globalisation, defined as the freer flow of trade, people and capital around the world, is responsible for the world's economic ills and whether it is still, on balance, a good thing. A true reckoning is trickier than it might appear, and not just because the main elements of economic openness have different repercussions. Several other big upheavals have hit the world economy in recent decades, and the effects are hard to disentangle.

First, jobs and pay have been greatly affected by technological change. Much of the increase in wage inequality in rich countries stems from new

technologies that make college-educated workers more valuable. At the same time companies' profitability has increasingly diverged. Online platforms such as Amazon, Google and Uber that act as matchmakers between consumers and producers or advertisers rely on network effects: the more users they have, the more useful they become. The firms that come to dominate such markets make spectacular returns compared with the also-rans. That has sometimes produced windfalls at the very top of the income distribution. At the same time the rapid decline in the cost of automation has left the low- and mid-skilled at risk of losing their jobs. All these changes have been amplified by globalisation, but would have been highly disruptive in any event.

The second source of turmoil was the financial crisis and the long, slow recovery that typically follows banking blow-ups. The credit boom before the crisis had helped to mask the problem of income inequality by boosting the price of homes and increasing the spending power of the low-paid. The subsequent bust destroyed both jobs and wealth, but the college-educated bounced back more quickly than others. The free flow of debt capital played a role in the build-up to the crisis, but much of the blame for it lies with lax bank regulation. Banking busts happened long before globalisation.

Superimposed on all this was a unique event: the rapid emergence of China as an economic power. Export-led growth has transformed China from a poor to a middle-income country, taking hundreds of millions of people out of poverty. This achievement is probably unrepeatable. As the price of capital goods continues to fall sharply, places with large pools of cheap labour, such as India or Africa, will find it harder to break into global supply chains, as China did so speedily and successfully.

This special report will disentangle these myriad influences to assess the impact of the free movement of goods, capital and people. It will conclude that some of the concerns about economic openness are valid. The strains

inflicted by a more integrated global economy were underestimated, and too little effort went into helping those who lost out. But much of the criticism of openness is misguided, underplaying its benefits and blaming it for problems that have other causes. Rolling it back would leave everyone worse off. ■



世界经济

开关盒

约翰·奥沙利文说，赞同开放经济的共识正在破裂。全球化不再是桩好事了吗？

位于北卡罗来纳州格林斯博罗（Greensboro）的革命纺织厂（Revolution Mill）并没有什么黑暗的东西，更不用说邪恶了。在一座由黄砖砌成的高大烟囱上镶嵌着一些红砖，自上而下拼出“Revolution”（革命）一词。该厂落成于1900年，这座烟囱在几年后建成。那是当地企业蓬勃发展的时期——为了利用低工资的优势，美国的棉花产业从新英格兰向南迁移。1890年至1900年间，南方的钢厂数量翻了不止一番，达到542家。1938年，革命纺织厂是当时世界上最大的专制绒布的工厂，每年生产5000万码布料。

主厂房中仍然可见在鼎盛时期安装的富有弹性的硬木地板和最初的木托梁，但这里不闻机杼声已经有30多年了。该厂于1982年停产，早早就预示了另一场全球级别的革命正在发生。当时纺织行业已开始一次全新的迁移，以寻找更廉价的劳动力，这一次是在拉丁美洲和亚洲。革命纺织厂是一座纪念碑，记载了一个因全球化而衰落的行业。

在附近的托马斯维尔（Thomasville）还有另外一座地标，承载着昔日的工业辉煌：一个高达9米的软垫座椅雕塑。这把大椅子建于1950年，是该镇家具制造实力的象征。在这个行业，北卡罗莱纳州曾一度领跑全美国。然而好景不长。“到了2000年代，托马斯维尔一半的厂商都去了中国。”当地家具制造商Carsons Hospitality的老板T·J·司道特（T.J. Stout）说。当地橱柜类制造商的销量被亚洲抢去了——亚洲的劳动力密集型生产更便宜。

如今，北卡罗来纳州正在寻找新的出路。从格林斯伯勒向东一小时车程就到了达勒姆（Durham），新兴企业正在这座城市爆发。其中之一是“新视野技术”（Bright View Technologies），它在城市的郊区设立了现代化的总部，生产薄膜和反射器来改变LED灯的图样和散射。位于市中心的利格特和迈尔斯大楼（Liggett and Miles）曾是吉时香烟（Chesterfield）的总

部所在地。达勒姆商会的特德·康纳（Ted Conner）说，这座漂亮的大楼如今驻满了较新的公司。该市的主要创新中心杜克大学也在其中占据了一些空间用作实验室。

北卡罗来纳州同时体现了如今开放型经济的希望与代价。然而，即使是蓬勃发展的当地企业也抱怨贸易协议对美国不利，却让外国竞争对手利用不公平补贴和松懈的监管从中渔利。在那些较难适应时代变化的地方，此种声音往往更为强烈。对于全球化以及被认为由之造成的那种既不平等也不稳定的资本主义，整个西方世界日益弥漫着一种不安的情绪。

反对自由贸易的反弹正在重塑政治。在美国南部和铁锈地带的蓝领男性的支持下，唐纳德·特朗普出人意料地锁定了11月总统大选共和党候选人席位。在2001年后的十年中，美国在来自中国的进口激增（对此特朗普说他将实施惩罚性关税来阻止进口）的冲击下，这些地方失去了大量的制造业工作岗位。自由贸易面临的敌意如此之大，以至于民主党总统候选人希拉里·克林顿也被迫和跨太平洋伙伴关系（TPP）这一她曾经协助谈判的对亚洲贸易协议撇清关系。与欧盟之间的新贸易协议——跨大西洋贸易和投资伙伴关系（TTIP）的谈判一直停滞不前。这一协定旨在降低欧洲和美国之间的投资和监管壁垒，但在民众的反对声浪中，德国和法国的资深政客已经转而反对它。

| 禁入标志

欧盟内部人员自由流动的承诺也面临压力。六月，欧洲较强的经济体之一英国举行公投，决定在作为欧盟成员国43年后脱离欧盟。英格兰和威尔士都全力支持脱欧——这些地方曾是英国很多制造业的所在地，但最坚定的支持来自于那些近年来移民人口大幅增加的地方。自英国公投脱欧后，法国、荷兰、德国、意大利和奥地利的反建制政党也呼吁本国举办决定去留欧盟的公投。这些政党倡导封闭的边界、移民限额和贸易壁垒。它们越来越受欢迎，如今在八个欧盟国家政府中势力强大。而特朗普则已经承诺沿墨西哥边境筑墙以阻挡移民。

对资本流动不受约束的担忧也日益加剧。公司创造的价值中无形的部分越

来越多，依赖于销售创意的企业能更容易地把公司开设在税率低的地方。美国已经取缔了所谓的税负倒置，即大公司同意被低税率国家的小公司收购，从而将注册地迁往该国。欧洲人抱怨说，美国企业搞了太多花招来避税。今年八月，欧盟委员会下令爱尔兰对苹果公司征收高达145亿美元的未缴税款，裁定该公司的低税率是不公平竞争的一个来源。

债务资本的自由流动意味着世界某一部分的麻烦（比如美国的次贷危机）会迅速蔓延到其他地区。资本流动变化无常，这是欧盟最雄心勃勃的跨边界计划——欧元面临麻烦的原因之一。欧盟28个成员国中有19个加入了欧元区。在最初几年，由于其他欧盟国家的短期私人资本大量涌入，希腊、意大利、爱尔兰，葡萄牙和西班牙等国享受了充足的信贷和低借贷成本。而当危机来袭时，此类信贷枯竭，不得不用欧洲央行和纾困资金的大规模官方贷款来替代。这种支持背后附带的条件已经造成德国等债权国和希腊等债务国之间的关系恶化。

有些人认为，富裕国家日益增长的不满情绪跟经济状况其实没多大关系。毕竟，至少英国和美国最近还有不错的GDP增长，这两国的失业率也降到了5%左右。相反，这种观点认为，对经济开放的反抗，反映了对于相对地位下降的深层次焦虑。这一部分由于中国崛起为世界强国，其他则是源自各个社会中根深蒂固的思想。例如，在欧洲某些地方，叙利亚难民危机引发了反对移民的声浪。相比于移民对工资或工作的影响，人们更担心其对社会凝聚力的潜在威胁。

但种种不满还是有其物质基础的，因为低迷的经济复苏并未让大多数人受益。根据白宫智囊经济顾问委员会（Council of Economic Advisers）的分析，在美国，每六个没有大学文凭的劳动年龄男性中，就有一个人没有工作。在英国，虽然就业人数达到了历史新高，但工资增长却没有跟上通胀。只有伦敦和其东南部内陆地区的人均实际收入超过了2007年到2008年经济危机前的水平。大多数富裕国家的情况都与此类似。智囊麦肯锡全球研究院的一份报告发现，在25个发达经济体中，三分之二的家庭2014年的实际收入与2005年持平或下降，而上一个十年间这种情况只有2%。低迷经济中即使有一点增长也被高薪者拿走了。

这让许多人感觉到，开放型经济对于少数精英很好，但并未能惠及广大群众。甚至连惯于毫无保留地欢迎开放经济的学者和政策制定者们也开始重新考虑。他们一直都明白，自由贸易既会带来赢家也会带来输家，但总觉得破坏是暂时性的，而收益之大则足以补偿那些受损的人。然而，一些新的研究认为，中国融入全球贸易对富裕国家的一些工人造成的伤害要比预期的更为持久。那些因从中国进口激增而失去工作的人集中在几块凋敝的区域，很难找到其他的工作。

将开放与工资不平等直接联系起来并不容易，但最近的研究表明，贸易所起的作用比人们从前认为的更大。人们愈发意识到，大规模移民与避免工人受到贸易和技术变革影响所需的福利政策是相冲突的。

自1997年到1998年东亚危机之后，倡导不受约束的资本流动的共识开始削弱。随着资本流动规模的增长，人们的疑虑也越来越重。国际货币基金组织的经济学家最近发表了一篇题为《新自由主义：吹嘘过分？》的文章，认为在某些情况下，经济体放开资本流动的代价会超过收益。

| 多重打击

本期特刊会讨论全球化——即贸易、人员和资本在全世界更自由地流动——在多大程度上导致了世界经济的弊病，以及总体看来它是否依然是桩好事。这个问题细究起来要比乍看上去麻烦得多，这还不仅仅是因为经济开放的几个要素有各种各样的副作用。近几十年来，世界经济还遭受了另外几次大动荡，我们很难把它们的影响孤立出来。

首先，技术变革极大影响了就业和工资。富裕国家工资的不平等程度上升，大部分源自于新技术使得受过大学教育的工人更有价值。同时，公司的盈利能力差距日益拉大。亚马逊、谷歌和优步等网上平台充当消费者和生产者或广告商之间的媒介，它们依靠网络效应：用户越多，它们就越有用。相比于失败者，主宰这些市场的公司获得了惊人的回报。这有时会让位于收入分布最顶端的那些人获得意外之财。同时，自动化成本的快速下降让中低技术人员面临失去工作的危险。所有这些变化都被全球化放大，但它们无论如何都会是颠覆性的。

动荡的第二个来源是金融危机，以及银行体系崩塌后常出现的漫长而缓慢的复苏。金融危机前的信贷繁荣有助于通过推高房屋价格和提升低收入者的消费能力来掩盖收入不平等的问题。随后的萧条同时摧毁了就业和财富，但受过大学教育的人反弹速度要比其他人快。债务资本的自由流动也为危机推波助澜，但主要责任还是在于银行监管松懈。银行崩溃早在全球化开始前很久就发生过。

在这一切之上还要加上一个独特的事件：中国迅速崛起为一个经济强国。出口主导的增长让中国从一个贫穷国家变成了中等收入国家，让数亿人摆脱了贫困。这一成就可能是空前绝后的。中国当年迅速而顺利地打入了全球供应链，但随着生产资料价格持续大幅下跌，如印度或非洲等拥有庞大廉价劳动力的地区将会发现，如今要再做到这一点已经变得更为困难。

本期特刊将梳理这些庞杂的作用力，讨论商品、资本和人员自由流动的影响。结论会是，某些关于经济开放的担忧是有道理的。人们低估了更为一体化的全球经济所造成的压力，为帮助受损者所做的努力还太少。但是，大部分对于开放的批评都被误导，贬低了其益处，并把另有原因的问题也归咎于它。在全球化的道路上往后退会使所有人都过得更糟糕。 ■



Saving globalisation

The reset button

How to make economic liberalism fairer and more effective

THERE MAY be few better advocates of the benefits to America of an open economy than Pin Ni, boss of Wanxiang America Corporation, part of a private firm based in Hangzhou that his father-in-law started as a bicycle-repair shop. Mr Ni launched the American subsidiary in 1994, suspending his studies at the University of Kentucky. He has been there ever since.

During the car-industry meltdown in 2007-09 the company began buying moribund car-part suppliers and restoring them to health. It pushed its acquisitions to concentrate on their strongest suits, usually the relationship with the car manufacturers and engineering. It helped them to source components more cheaply and to gain a foothold in the Chinese market. Mr Ni is effusive about the prospects for American exporters. America has firms with technology and brands that are coveted around the world, he says.

Such optimism about globalisation is all too rare these days. Neither candidate in America's presidential race is an advocate of free trade. "If Trump is elected, it's a mandate for isolationism," says a seasoned observer at a think-tank in Washington, DC. "If Clinton is elected, the best we can hope for is we don't go back very far." Britain's trading relationships with the rest of the world are up in the air, following the vote in June's referendum to leave the EU. France is hostile to TTIP, a proposed trade agreement between the EU and America. Even in Germany, the self-declared world export champion, politicians are turning against the deal in the face of public opposition. Globalisation is increasingly blamed for job losses, rising wage inequality and sluggish GDP growth.

How should politicians respond? Closing borders to trade, capital and people would cause great harm and do very little to tackle inequities in the economy. In some respects it would increase them. People on low pay spend a far greater proportion of their income on imports than the well-off. A growing body of research links economic maladies to more oligopolistic economies. Blocking imports would only entrench the market power of rent-seeking firms, further harming the prospects for higher productivity and pay.

| *Easing the pain*

As borders have been steadily opened up, policies needed to complement globalisation have not kept pace, particularly in America. They need to catch up. A good place to start is demand management. The stability of the labour market depends on macroeconomic policies, not trade. In Europe the most effective policy would be to use public money to fix the banks. With monetary policy overstretched and bond yields low or negative, it is a shame that countries with room to borrow more, notably Germany, are seemingly addicted to thrift. The case for free trade is undermined when many countries in Europe are free to rack up persistent trade surpluses, which are a drag on global demand.

In America and Britain, a strong case can be made for locking in low-cost long-term funding to finance a programme to fix potholed roads and smarten up public spaces. Private pension funds with expertise in infrastructure have a role to play in such schemes. Rich-country central banks, notably the Federal Reserve, can afford to be more relaxed about the threat of inflation. An economy at full pelt begins to draw people into the workforce who were thought to have opted out for good. “Ex-felons were doing pretty well in 2000,” notes Larry Mishel, of the Economic Policy Institute, a think-tank in Washington, DC. The risks of slamming the brakes on too quickly outweigh those of excessive policy stimulus.

Demand management is (or ought to be) the bread and butter of economic policy. Curing the ills that feed public opposition to globalisation requires efforts to address two other problems. The first is the job churn caused by shifts in trade and technology. Too little effort and money has been expended on taking care of those who have been hurt by the opening up of markets. America in particular makes little attempt to assist people find new jobs to replace lost ones. Extra help need not blunt the incentives to look for work. For instance, more generous jobless benefits could be made conditional on attending a back-to-work programme. A valid criticism of government training schemes is that they cannot keep up with the fast-changing demands of the jobs market. A better option would be a system of wage insurance. That would nudge workers to acquire new skills by taking a less well-paid job when they lose a good one.

Yet there is little point in helping people change careers if a lack of dynamism in the economy means that too few good jobs are being created. So a second prong of reform should be to spur greater competition so that startups can thrive and incumbent firms are kept on their toes. More competition is a hard sell when many people are already anxious about their jobs and income; but without it there is less chance of the dynamism that boosts productivity (and earnings) and creates new job opportunities. Europe has long been notorious for restrictive practices such as occupational licences, but state-level licences in America have proliferated almost unnoticed. Some are necessary, but most are simply a way of keeping prices higher and restricting entry.

Competition policy needs to become more vigorous. In America the startup rate (the share of new firms in the total number) has fallen steadily since 1980. Most industries have become more concentrated. The profits of the leading companies have pulled well ahead of the rest. America's courts have tended to view windfall profits as the rightful reward for innovation. There is much to be said for redrawing the boundaries of intellectual property so

that incumbents can be more readily challenged. The growing habit of big tech firms to swallow startups that might become rivals is worrying. Such deals often suit both sides—the buyer gets the innovation and the startup makes a lucrative exit—but the practice saps dynamism from the economy. Trustbusters might be given more discretion when making judgments about how markets might evolve in future, though this is difficult to do well.

| *Make it a threesome*

A three-pronged agenda of demand management, active labour-market policies and boosting competition would go a long way to tackling the problems that are unfairly laid at the door of globalisation. But a lot of the policies to make globalisation work better need international agreement to be fully effective. For instance, tackling troublesome capital flows requires co-ordination. A country might be able to head off capital inflows by taxing them, but it would only be diverting them to other countries that are more reluctant to impose capital controls. The best course would be to have a global standard on what sorts of controls are permissible and in what circumstances. The goal should be to ensure that individual countries retain control over their monetary policy.

One way to put a speed limit on short-term capital flows is to require asset managers globally to lock in investors in funds specialising in less liquid emerging or frontier markets. Long-term capital flows are generally more beneficial, but they will lose public support if they are seen primarily as a way of avoiding tax. There are few agreed international rules on the taxation of cross-border firms, though the OECD has started to work on this. Dani Rodrik, of Harvard University, argues that a good way to build public support for globalisation would be to link trade pacts with agreements on, for instance, the taxation of multinational companies. Such a deal would give national governments more rather than less policy

autonomy.

Sceptics say that those who stand to lose from globalisation are given little thought when trade deals are signed. That is a fair point. But there is also a risk of the opposite error: that the enormous good that free trade has done for the bulk of humanity in both rich and poor countries over several decades is forgotten at times when people are feeling anxious about it. The benefits of globalisation are widely dispersed, often unseen and thus all too easily taken for granted.

There is a wrong-headed tendency to conflate support for liberal internationalism with pushing the interests of big companies to the detriment of the less well-off. The opposite is true. This newspaper started in 1843 to campaign for free trade in general, and in particular for the repeal of the Corns Laws, which increased the price of imported grain to the advantage of landowners. Richard Cobden, the manufacturer who led the campaign against the Corn Laws, remarked that the main barrier to repeal was the self-interest of the landowning classes, the “bread-taxing oligarchy, unprincipled, unfeeling, rapacious and plundering.”

Cobden argued that free trade would have four benefits. It would underpin the success of British manufacturing by providing access to bigger markets. It would lower the price of imports, notably food, for the poorer classes. It would make English farming more efficient by creating more demand for its products in cities and manufacturing regions. And it would usher in a new era of international peace and amity by fostering trade that would be to the benefit of all countries that took part in it.

In contrast to popular caricature, free-traders are enemies of rent-seekers and those who are trying to protect their economic privileges. James Wilson, the founder of *The Economist*, said of the Corn Laws: “They are, in fact, laws passed by the seller to compel the buyer to give him more for his

article than it is worth. They are laws enacted by the noble shopkeepers who rule us, to compel the nation to deal at their shop alone.”

What Cobden and Wilson argued in the 19th century still holds. The free movement of goods, capital and people across borders is a source of greater choice and opportunity for those on both sides of the trade. What gives these arguments their force and staying power is that they happen to be true. ■



拯救全球化

复位键

如何让经济自由主义更公平有效

若要宣传开放型经济对美国的好处，或许没有谁比万向美国公司的老板倪频更合适了。他的公司从属于总部设在杭州的一家私营企业，从他岳父开的一家修自行车铺发展而来。1994年，倪频暂停在肯塔基大学的学业，创办了美国子公司，从此留在那里。

2007至2009年间汽车业崩盘，万向美国公司开始收购濒死的汽车零件供应商，帮助它们重整旗鼓。它推动这些公司专注于自己的最强项——通常是与汽车制造商及工程公司的关系。它还帮助它们用更低廉的价格采购零部件，以在中国市场站稳脚跟。倪频非常看好美国出口商的前途。他说，美国一些公司拥有为全世界所觊觎的技术和品牌。

对于全球化如此乐观，这在如今实在太过少见。美国两位总统候选人都不是自由贸易的倡导者。“如果特朗普当选，那就意味着孤立主义将会获准推行，”华盛顿一个智库的一名资深观察员这样说道，“如果希拉里当选，我们能期望的最好结果是不要倒退太多。”英国和世界其他地区的贸易关系在6月的脱欧公投后悬而未决。法国强烈反对《跨大西洋贸易与投资伙伴协定》（TTIP）这个欧盟与美国间的贸易协议提案。即使在德国这个自称全球出口冠军的国家，面对公众反对呼声的政客也在背弃这项协议。越来越多声音指责全球化导致了工作机会流失、工资差距拉大以及GDP增长疲软。

政客们应该如何回应呢？禁止商品、资本和人员的跨境流动会造成重大损害，对于解决经济中的不平等却于事无补，在某些方面甚至还会使这些问题更加严重。低收入人群的收入花在进口商品上的比例要远大于富裕阶层。越来越多的研究指出经济弊病和寡头垄断经济间的关联。禁止进口只会巩固寻租企业的市场支配力，进一步损害提高生产力和报酬的前景。

| 缓解疼痛

随着边境稳步开放，应与全球化配套的政策却未能跟上，这在美国尤为突出。它们需要迎头赶上。一个好的起点是需求管理。劳工市场的稳定有赖于宏观经济政策而非贸易。在欧洲，最有效的政策将是使用公共资金来治理银行。如今货币政策实施过度，债券收益率很低或为负数，而一些有增加贷款空间的国家（尤其德国）却似乎沉溺于节俭，着实可惜。许多欧洲国家可以随意积聚起持续的贸易顺差并因此拉低全球需求，这会动摇倡导自由贸易的根基。

美国和英国可以理直气壮地锁定低成本的长期融资，用于修整残破的道路和改善公共空间等项目。熟悉基建领域的私人养老基金可以在这类项目中发挥作用。富裕国家的央行尤其美联储更有不惧通胀威胁的资本。全速运转的经济开始把那些原本被认为已和职场无缘的人重新吸纳到劳动力大军中。“2000年时，有重罪前科的人境遇很不错。”华盛顿智库经济政策研究院（Economic Policy Institute）的拉里·米歇尔（Larry Mishel）说。过快急刹车的风险要大于过度的政策刺激。

需求管理是（或者说应当是）经济政策的核心。要治愈那些触发公众反对全球化的经济弊病，还需努力处理另外两个问题。首先是贸易和技术的变化引发的职场震动。在照顾那些因市场开放而受损的人群上所花的财力和精力都还太少。美国尤其缺乏帮助失业者重新就业的措施。额外的帮助并不一定会削弱人们找工作的动力。比如，更慷慨的失业救助可以根据人们对再就业项目的参与度来有条件地发放。对政府培训项目有一个合理的批评：它们没能跟上劳工市场快速变化的需求。一个更好的方法是工资保险制度，它会使得工人们在丢掉一份好工作时愿意接受薪水较少的新工作来获得新技能。

然而，如果因经济缺乏活力而使得创造出来的好职位太少，那么帮助人们改换职业跑道并无意义。因此，第二方面的改革应当是刺激竞争，令创业公司蓬勃发展，而让既有企业保持警惕。许多人已经在为工作和收入忧虑了，这时倡议更多竞争自然难被接受；但如果没有竞争，经济便很难增加活力继而提高生产力（及收入）并创造新职位。长久以来，欧洲在实施职

业执照这类限制性措施方面已经臭名昭著。而在美国，州级别的执照也已近乎悄无声息地迅速蔓延。其中的一些确实必不可少，但大多数无非是保持更高价格和高门槛的一种手段而已。

竞争政策需要变得更具活力。在美国，创业率（即新公司在所有公司中所占比例）自1980年以来持续下跌。大多数行业已经变得更加集中。龙头企业的利润已将其他企业远远甩在身后。美国的法庭倾向于将暴利视为创新的正当报酬。重新划分知识产权的界限，让既有企业更容易被挑战，这会很大的益处。大型科技公司越来越喜欢吞并那些可能成为对手的创业公司，这种现象令人担忧。这类收购往往对双方都有利——买家将创新成果揽入囊中而创业公司拿到巨额利润风光退场——但这种做法损害了经济的活力。或许可以给予反托拉斯官员们更多的自由度来判断市场未来可能如何演变，虽然要做好这一点颇有难度。

| 三管齐下

需求管理、活跃的劳工市场政策和鼓励竞争这三招共同发力，对于解决那些被不公正地归咎于全球化的问题大有裨益。但是，许多能让全球化更好运作的政策需要国际协议才能发挥完全的效力。比如，要解决棘手的资本流动问题就需要协作。某个国家或许可以通过收税来阻止资本的流入，但这只会把资本导向那些不太愿意进行资本管制的国家。最好的办法是建立全球标准，规定在何种情况下可允许哪类管制。其目标应当是确保个体国家保持对自身货币政策的掌控。

有一种方法可以限制短期资本流动的速度：要求全球的资产经理人把投资者的资金锁定在流动性较差的新兴或前沿市场。长期的资本流动通常更为有益，但如果它们被主要当作逃税的方式则会失去公众支持。对跨国企业的征税办法几乎没有多方协定的国际准则，虽然经合组织已经在着手开展制定。哈佛大学的达尼·罗德里克（Dani Rodrik）认为，为全球化赢得公众支持的一个好方法是把贸易协定和诸如跨国企业课税这类协议结合起来。这样的协议会增加而非减少国家政府的政策自治权。

怀疑论者称，在签署贸易协定时，那些看来将因全球化而受损的人并没有

获得多少关照。此言不虚，但同时这也可能滑向一个相反的谬误：过去二三十年间，无论在富裕还是贫穷的国家，自由贸易都为大部分人带来了巨大的利益，但当人们对自由贸易感到忧虑之时，这些好处被遗忘了。全球化的益处分布很广，往往不被察觉，因而太容易被视为理所当然。

有那么一种错误的倾向，它将对自由派国际主义的支持，和为推动大企业利益而不惜损害不太富裕的阶层这两者混为一谈。但实情恰恰相反。本刊于1843年创刊时即以自由贸易为总体诉求，尤其呼吁废除为保护地主利益而将进口谷物提价的《谷物法》（Corns Laws）。制造商理查德·科布登（Richard Cobden）领导了反对该法案的运动。他表示，废除该法的主要障碍是地主阶级的自我利益、一种“不道德的、无情的、贪婪的、大肆掠夺的、对面包征税的寡头政治”。

科布登指出，自由贸易会带来四方面的好处。它会提供更广大的市场从而巩固英国制造业的成果。它会为贫困阶层降低进口商品尤其食品的价格。它会在城市和制造业地区创造出对英国农产品更多的需求，从而让英国的农业变得更加高效。它还会推动对所有参与国家都有益的贸易，迎来国际和平友好的新时代。

和流行的讽刺漫画相反的是，自由贸易者实际上是寻租客以及那些企图保护自我经济特权者的敌人。创办了《经济学人》的詹姆斯·威尔逊（James Wilson）如此评价《谷物法》：“它们实际上是由卖家制订的法律，强迫买家支付超出商品实际价值的金额。它们是由统治我们的贵族商家制订的法律，来迫使整个国家只在他们自己的店铺里交易。”

科布登和威尔逊于十九世纪提出的主张如今仍站得住脚。商品、资本和人员的跨境自由流动对贸易双方来说都是创造更多选择和机会的源泉。这些观点之所以拥有说服力和持续的影响力，是因为它们恰恰是正确的。■



Trade deals

Hard bargain

Lacking clear American leadership, the global trade agenda is floundering

ROBERTO AZEVEDO, the head of the World Trade Organisation (WTO), is not the architect of grand global trade deals that his title suggests. Sitting in his Geneva headquarters, he remembers only too well how the WTO's Doha round collapsed under the weight of its own ambition. "Let's do the trade deals that are in reach," he says. Overambition is not the only problem. "Anti-trade rhetoric is catchy," sighs Mr Azevedo. So catchy that it has infected deals beyond the WTO. The world's most trumpeted regional trade deals are drifting out of grasp just when pep is most needed: on September 27th the WTO forecast that for the first time in 15 years, global trade growth this year, at just 1.7%, would not keep pace with global GDP.

The Trans-Pacific Partnership (TPP), a deal between America, Japan and ten other countries around the Pacific, was signed in February but is now faltering. On September 26th Hillary Clinton and Donald Trump, the Democratic and Republican nominees for the American presidency, fought to distance themselves from it in their first televised presidential debate. Mr Trump labelled the deal "almost as bad as NAFTA" (the North American Free Trade Agreement, which came into force in 1994 and which he sees as the worst thing ever to happen to American manufacturing).

The TPP is deeply controversial among the minority of Americans who have heard of it (a recent poll found that only 29% had, and most of them were unaware it excludes China). Nevertheless, Barack Obama wants to push it through in the "lame-duck" session of Congress at the end of this year. There he faces a mixture of poisonous partisan politics and genuine concerns over the deal. Many Republicans would relish thwarting an important part of Mr Obama's legacy. Winning the Democratic votes he

needs would be a stretch.

The EU is also choking on its own processes when it comes to trade deals. After a recent bout of energetic protests against the Comprehensive Economic and Trade Agreement (CETA), a trade deal between the EU and Canada, an informal meeting of European trade ministers in Bratislava on September 23rd gave it the green light. But it could yet be undermined by any one EU member that refuses to ratify. The Austrians look particularly reluctant.

If CETA is fragile, the Transatlantic Trade and Investment Partnership (TTIP), a deal still being hammered out between the EU and America, is flailing. Negotiations have proceeded at a snail's pace. Britain's vote to leave weakens the EU's clout and makes the Americans even less amenable to meeting European concerns. Looming French and German elections have made protests against it harder to ignore. In Bratislava the ministers grudgingly agreed to continue talks. If the deal is not done by the time the next president is inaugurated, "there will be a natural pause," says Cecilia Malmstrom, the EU's trade commissioner. A revival would not be imminent.

A nasty brew of opportunistic politicking and sceptical (and often misinformed) electorates is largely to blame for this halting progress. But there are other reasons why trade liberalisation is getting harder. TPP reduces some bilateral tariffs and quotas, such as those covering America's imports of cars and Japan's of beef. But since the deal includes the other NAFTA members (Canada and Mexico) and four other countries with which America already has bilateral free-trade agreements, most of it focuses on "behind the border" non-tariff barriers: ie, on harmonising regulations, removing privileges for state-owned enterprises, protecting intellectual property and so on. Such issues raise even greater hackles than old-style tariff-reduction talks; they inevitably encroach on areas covered by

domestic law.

| *The drugs don't work*

Since tariffs are already on average below 3% between America and the EU, TTIP is even more focused on this sort of deep integration. But, to take just one example, persuading one drug-approval authority to update its regulations along with another is really hard; negotiators underestimated the difficulty of the task at hand.

In both TPP and TTIP, investor-state dispute settlement provisions have provoked particular controversy. These set up a system for foreign investors to sue national governments if they breach standards of fairness. Opponents see them as a way for corporate fat cats to sue elected governments for things they don't like. Christian Odendahl, an economist at the Centre for European Economic Reform, a think-tank, says that including such a controversial provision in TTIP was probably a mistake; legal systems in America and Europe are developed enough for investors not to need the extra legal certainty.

The short-run trade impact of the collapse of TPP and TTIP would not be huge, because of their focus on rule-setting rather than tariff-scrapping. But it would mean an American retreat from its leadership role in global trade liberalisation. Mr Obama has advertised TPP as essential if America, not China, is to set the "rules of the road" for trade in the 21st century.

A trade agenda led by China would be less ambitious than the American-led one. Hopes for global rules covering trade unions, competition from state-owned enterprises and free movement of data would fade, in favour of tariff reduction. Attention would shift to the Regional Comprehensive Economic Partnership (RCEP), a more traditional deal between the ten members of the Association of South-East Asian Nations and six other countries, including China, India and Japan.

RCEP would, however, harvest much more of global trade's low-hanging fruit. Its member countries cover 36% of global goods exports in 2015, compared with 28% for the TPP. Tariff walls protecting emerging markets are much higher than those around developed countries—China still has on average 10% tariffs, compared with 5% in Europe and under 4% in America—so the immediate boost to the economy from lowering them would be higher.

As for the WTO, it will for now push “plurilateral” deals of its own, which embrace enough WTO members to be significant but which avoid the quagmire of having to secure the agreement of all its 164 members. It already boasts some successes: in September, for example, China started cutting tariffs on technology goods as part of the plurilateral Information Technology Agreement.

Indeed, the failure of TPP and TTIP could provide an opportunity for the WTO to re-emerge as the main forum for the trade-liberalisation agenda. A return to the ambitious visions of the past, however, is unlikely. Mr Azevedo can imagine the WTO brokering another global trade deal, but only when expectations have been managed down from Doha. Above all, the politics needs to be fixed. Few political leaders around the world have done much to squash the anti-trade bug. To them Mr Azevedo says: “You have to speak up for trade.” But Mr Trump is speaking up for protectionism; and Mrs Clinton would rather change the subject. ■



贸易协定

艰难谈判

欠缺美国旗帜鲜明的领导，全球贸易自由化陷入困境

从头衔上看，世界贸易组织（以下简称WTO）总干事罗伯托·阿泽维多（Roberto Azevedo）似乎是宏大全球贸易协定的设计师，但实际并非如此。因野心过大，WTO的多哈回合谈判最终破裂，安坐于日内瓦总部办公室的他对当时的情形仍历历在目。他说道，“我们还是谈些力所能及的协议吧。”野心过大并非唯一的问题。“反贸易言论大行其道。”阿泽维多叹息。而这不止影响到WTO的贸易谈判。在最需要鼓舞士气之际，全球各地最大张旗鼓的一些区域贸易协议都没了下文：9月27日，WTO预测今年全球贸易增长率仅为1.7%，15年来首次落后于全球GDP增速。

涉及美国、日本及太平洋地区其他十个国家的《跨太平洋伙伴关系协议》（TPP）于今年二月签署，但如今显得步履蹒跚。9月26日，民主党总统候选人希拉里与共和党候选人特朗普在首场总统竞选电视辩论上竞相与TPP撇清关系。特朗普称它“几乎与《北美自由贸易协定》（NAFTA）一样糟糕”。他认为1994年实施的《北美自由贸易协定》是对美国制造业史上最大的冲击。

在听说过TPP的少数美国人眼中（最近一项民意调查发现只有29%的美国人听说过该协议，而且大部分人不知道中国并不在其内），该协议极具争议。尽管如此，奥巴马还是希望在今年年底国会的“跛脚鸭”会期中促成通过TPP。他面对的既是党派政治恶斗，也有对该协议真切的疑虑。许多共和党人会对奥巴马实现这一大政绩横加阻挠，而他要赢得民主党的赞成票也不容易。

欧盟在推进自己的贸易协议上也阻碍重重。欧盟与加拿大之间的《全面经济与贸易协定》（以下简称CETA）在遭遇一轮激烈反对后，终于有望落实。9月23日，欧盟国家贸易部长们在斯洛伐克首都布拉迪斯拉发（Bratislava）的一次非正式会议上通过了该协定。但只要有欧盟成员国拒

签协议，CETA就依然无法实施。奥地利看似尤其不情愿。

如果说CETA脆弱不堪，欧盟和美国之间仍待敲定的《跨大西洋贸易和投资伙伴关系协议》（TTIP）就是在竭力挣扎。谈判进展有如蜗牛爬行。英国公投脱欧削弱了欧盟的影响力，美国人变得更不愿迁就欧盟的要求。法国和德国大选在即，令反对协议的声音愈发难以忽视。在布拉迪斯拉发，各国部长勉强同意继续会谈。假如在下一任总统就职前该协议还没有敲定，“进程自然会停顿。”欧盟贸易专员塞西莉亚·马姆斯特罗姆（Cecilia Malmström）说道。停顿后的重启则不会很快到来。

贸易谈判停滞不前，主要归咎于投机取巧的政客和深怀疑虑（往往是受到误导）的选民，两者相合甚为棘手。而造成贸易自由化越来越难的还有其他方面的因素。TPP降低了部分双边关税及配额限制，例如美国对进口汽车和日本对进口牛肉的限制。但由于该协议包含了《北美自由贸易协定》的其他成员国（加拿大和墨西哥）及另外四个与美国已签有双边自由贸易协定的国家，TPP主要关注“边界背后”的非关税壁垒，即协调监管法规、去除国有企业的特权、保护知识产权等等。这类问题比以往争取减免关税的谈判更棘手，难免会触及国内法律涵盖的领域。

| 无效之药

由于美国和欧盟之间的关税平均已低于3%，所以TTIP更关注的是上述的深度整合。但这谈何容易。举一个例子，要说服一国药物监管当局跟随协议另一成员国同步调整规定就非常艰难；谈判人员低估了手头这项任务的难度。

TPP和TTIP中有关解决投资者与国家争端的条款尤其引起争议。这些协议条款设立了一套制度让外国投资者可以在国家政府违背公平原则时起诉它们。反对者则把这些制度视为有钱有势的跨国企业一有不如意便起诉民选政府的借口。智库欧洲经济改革中心（Centre for European Economic Reform）的经济学家克里斯蒂安·奥登达尔（Christian Odendahl）表示，TTIP纳入如此备受争议的条款可能是错误之举；美国和欧洲的法律体系已相当成熟，投资者并不需要这样的额外法律保障。

TPP和TTIP的破裂对贸易的短期冲击不会太大，因为它们注重的是制定规则而非取消关税。但这会意味着美国将从全球贸易自由化领导者的位置上退下。奥巴马曾建言，如果美国要带头订立21世纪贸易的“通行规则”，而非由中国来主导，TPP至关重要。

中国主导的贸易协议不会像美国的那么雄心勃勃。在更侧重关税减免的情况下，要缔造出涵盖工会、来自国有企业竞争及数据自由流动事宜的全球性规则——这样的希望变得愈加渺茫。大家会转而聚焦一项更为传统的协定，即东盟十国与包括中国、印度及日本在内其他六个国家之间的《区域全面经济伙伴关系协议》（RCEP）。

但RCEP将会收获更多唾手可得的全球贸易成果。该协议成员国在2015年的全球货物出口占比为36%，而TPP成员国占比为28%。新兴市场的关税壁垒比发达国家的高得多——中国的平均关税仍达10%，欧洲和美国分别为5%和不到4%，所以降低关税对经济的直接推动会更大。

WTO则将推动自己的“多边”协议，为保持影响力，这些协议将包含足够多的成员国，但为免陷入泥沼，也会避免要求全部164个成员国达成共识。目前它已取得一些成绩：比如因加入WTO多边的《信息技术协定》（Information Technology Agreement），中国在九月已开始削减科技产品的关税。

事实上，TPP和TTIP的失败可为WTO提供翻身机会，使其重新成为促进贸易自由化的主要平台。然而，重拾以往的宏伟愿景则不大可能。阿泽维多可以想象WTO促成另一全球性贸易协定，但前提是目标不能像多哈回合谈判那样高远。毕竟，政治态势有待调整。全球鲜有政治领袖在努力压制反贸易势力。阿泽维多对他们说：“你们得大力争取贸易自由化。”但特朗普主张保护主义，而希拉里则干脆转换话题。 ■



Free exchange

How the other tenth lives

The world should be both encouraged and embarrassed by the latest global poverty figures

WHAT is the most important number in global economics? Judging by the volume of commentary it excites, America's monthly payrolls report (released on October 7th) might qualify. Other contenders include the oil price or the dollar's exchange rate against the euro, yen or yuan. These numbers all reflect, and affect, the pace of economic activity, with immediate consequences for bond yields, share prices and global prosperity—which is what economics is ultimately all about.

But if global prosperity is the ruling concern of economics, then perhaps a more significant number was released on October 2nd by the World Bank. It reported that 767m people live in extreme poverty, subsisting on less than \$1.90 a day, calculated at purchasing-power parity and 2011 prices. The figure is not up-to-the-minute: such is the difficulty in gathering the data that it is already over two years out of date. Nor did the announcement move any markets. But the number nonetheless matters. It represents the best attempt to measure gains in prosperity among the people most in need of them.

The latest figures should arouse mixed feelings. They are simultaneously a cause for celebration, pity, scepticism and shame. The poverty headcount is worth cheering because it is so much lower than it was. Over the 20 years from 1993 to 2013, the number of poor people fell by over 1 billion, from roughly one in three to about one in ten. Even the global financial crisis did not interrupt this progress (see left-hand chart).

The biggest declines took place, unsurprisingly, in the world's two biggest

countries. In India, the number of poor people fell by 218m from 2004 to 2013, according to the World Bank. In China, it fell by more than 320m from 2002 to 2012. These grand human achievements are often taken for granted. The governments in power during these periods (led by Hu Jintao and Wen Jiabao in China and by Sonia Gandhi and Manmohan Singh in India) are commonly described as disappointments, even though half a billion people escaped poverty on their watch. If only the rest of the world's governments could disappoint in a similar fashion.

Yet the World Bank's report is cause for pity as well as celebration. After all, 767m is still a lot of people and \$1.90 is not a lot of money. It is hard to imagine how anyone could subsist on so little. The World Bank's yardstick is based on the poverty lines for 15 dirt-poor countries. Their lines typically calculate an amount of money that would allow a person to eat enough calories, given the national diet and other pressures on their budgets. In Zambia, for example, a person on the poverty line can afford a daily diet of two-three plates of *nshima* (a maize staple known as mealie meal), a sweet potato, a few spoonfuls of oil, a couple of teaspoons of sugar, a handful of peanuts and twice a week, a banana or mango and a small serving of meat. Such a person would have just 28% of his budget left over for other things.

As well as pity, the World Bank's global poverty tally should also invite some scepticism. Counting the poor is laborious and treacherous, as the bank freely admits. Fewer than 40 countries actually carried out a new survey of households in 2013, leaving the bank to fill in the gaps with projections. India's last survey was in 2012. China, which replaced separate rural and urban surveys with an integrated survey in 2013, also started including as income the implicit household rent owner-occupiers pay themselves. That switch lowered its poverty count by over 30m.

Even innocuous tweaks in survey questions can make a big difference. An experiment in El Salvador, cited by the World Bank's researchers, managed

to cut measured poverty by over 30% simply by asking more specific questions. Instead of asking how much was spent on fruit, vegetables and legumes, it asked about plantains, mangoes, green chilies, and so on. Owing to a printing error, a Ugandan survey failed to mention public-transport fares as an example of travel expenses. The error seems to have reduced reported transport spending by over 70%.

| *One-thousandth for the tenth*

The global poverty count should also elicit a kind of embarrassment. As the world economy grows ever more prosperous and sophisticated, the problem of extreme poverty looks less like a tragic inevitability and more like a peculiar anachronism. The average person in extreme poverty lives on \$1.33 per day. It would therefore take just \$0.57 per day to rescue them from this plight. That observation invites a thought experiment. If it were somehow possible to transfer without cost the right amount of money into the right hands, how much would it take to end extreme poverty altogether? The answer is just \$159 billion a year, according to the World Bank, or less than 0.2% of global GDP.

That estimate is calculated at purchasing-power parity. If an actual dollar were transferred to a poor country from America, it would stretch much further, because prices in poor countries tend to be lower (a point made years ago by Surjit Bhalla, an Indian economist, now of Observatory Group, a macroeconomic advisory firm). Taking these lower prices into account, the amount needed to bring all the world's poor up to the poverty line drops to \$78 billion a year, or just 0.1% of global GDP (see right-hand chart). In reality, of course, money cannot be directed so precisely to the poor, nor transferred cost-free. In some countries, the infusion of money might also push up prices and currencies, making the endeavour more expensive. Nonetheless, this thought experiment illuminates the diminishing size of the problem. The world can afford to end poverty. Indeed, it might end

poverty before it figures out how to measure it accurately.

If the World Bank's dream of a world free of poverty is ever fulfilled, will the bank then sit back and rest on its laurels? No chance. It has adopted another dream: "shared prosperity", which obliges it to care about the poorest 40% in each country, however rich they may be. Even if extreme poverty is eventually eradicated, the bottom 40% will always be with us. ■



自由交流

世界上另外十分之一的人如何生活

最新的全球贫困数字应该令全世界既受鼓舞又感尴尬

全球经济中什么数字最重要？10月7日发布的美国月度就业报告引发了大量评论，看似应该有资格入选。其他数得上的数字包括油价或美元兑欧元、日元或人民币的汇率。这些数字都反映并影响了经济活动的步伐，对债券收益、股票价格和全球繁荣也都有直接影响——而全球繁荣则是经济学研究的最终目标。

但如果全球繁荣是经济学的首要关注点，那么世界银行（下称世行）10月2日发布的数字可能更为重要。世行报告指出全球有7.67亿人生活在极度贫困之中，按购买力平价和2011年的物价计算，每天仅靠不到1.9美元维持生活。这一数字并不是最新的：由于收集数据非常困难，它已经过时两年之久；而且这一数字的公布也不会引起任何市场波动。但该数字依然重要，它代表了衡量最需要改善生活的贫困人口繁荣进步的最大努力。

最近的数字应该会让人百感交集——值得庆祝，又让人觉得遗憾、质疑和羞愧。总贫困人口数值得庆祝，因为比以前下降了许多。1993至2013年的二十年里，贫困人口数下降了超过10亿，占总人口数从约三分之一下降到约十分之一。即使是全球金融危机也没有中断这一进步（见左图）。

意料之中的是，贫困人口减少最多的是世界上两个人口最多的国家。世行数字显示，2004至2013年间印度贫困人口减少了2.18亿，2002至2012年间中国贫困人口减少了3.2亿多。这些巨大的人类成就往往没被当回事。这期间执政的政府（在中国由胡锦涛和温家宝领导，在印度是索尼娅·甘地和曼莫汉·辛格）一般被形容为令人失望，尽管在他们的领导下，超过5亿人摆脱了贫困。如果全球其他国家的政府也能这样令人失望就好了。

然而除了值得庆祝，世行报告也令人遗憾。毕竟，7.67亿之众的贫困人口仍然太多，1.9美元也太少——很难想象每天靠这么一点钱怎么能活下去。

世行的标准基于15个极度贫困国家的贫困线，这些贫困线一般根据国民饮食情况和其他生活预算的压力而计算出一个人要摄入足够的热量需要多少钱。比如说在赞比亚，一个生活在贫困线以上的人每天可以吃到两到三盘“西玛”（一种用玉米面做成的食物）、一个甘薯、几勺油、一两茶匙糖、一把花生，每两周可以吃到一根香蕉或一个芒果以及少量的肉。扣除吃饭所需，这样一个人的生活预算只剩下28%可用于满足其他需求。

除了遗憾之外，世行的全球贫困报告还应该引起一些质疑。世行坦率承认，计算贫困人口数费时费力且难以保证准确。2013年全球只有不到40个国家实施了新的家庭调查，其他都由世行推测来填补空白。印度上一次进行调查还是在2012年。中国在2013年以城乡一体化调查取代了原来分别调查的做法，并且将居住自有住房的隐含租金也纳入收入，仅这一改变就将其贫困人口减少了三千万以上。

甚至那些对调查问题看似无关紧要的小修改都会对结果造成很大影响。以世行研究员以在萨尔瓦多做的一项实验为例，仅仅把所提问题更加具体化，就把贫困人口减少了30%以上。原先的问题是问购买水果、蔬菜和豆类的支出，现在的问题则会具体到大蕉、芒果、青椒等等。由于一个印刷错误，乌干达的一项调查没有将公共交通费用列为交通支出的例子。这一错误可能将公布的交通支出降低了70%还多。

| 以千分之一造福十分之一

全球贫困人口统计还应引起一丝尴尬。随着全球经济日益繁荣和复杂，极度贫困问题越来越不像一个不可避免的悲剧，而更像是一个奇特的时代错误。这些人口平均每人每日只有1.33美元用以维生，那么每天只需0.57美元就能帮助一个人脱离贫困苦海。这一分析不禁让人设想，如果可以把所需要的资金交到有需要的人手上而不产生任何费用，那么结束极度贫困总共需要多少钱？世行给出的答案是一年只需要1590亿美元，即不到全球GDP的千分之二。

这一结果是基于购买力平价估算的。如果美国向一个穷国转一美元，其实际价值将不止这么多，因为穷国的物价一般要更低一些（现供职于宏观经

济咨询公司Observatory Group的印度经济学家瑟吉特·巴拉很多年前就指出了这一点）。考虑到这些国家物价偏低，帮助全球贫困人口脱贫每年只需要780亿美元，仅占全球GDP的千分之一（见右图）。当然，在现实中钱无法如此准确地直接交给穷人，也必然会有成本。在有些国家，资金输入也可能推高物价和货币汇率，让扶贫工作的成本更高。不过，这一思想实验很好地说明了贫困问题的规模已小了很多。全世界有能力结束贫困。其实，在我们找到准确衡量贫困水平的方法之前也许就已经消除了贫困。

如果世行能够实现世界无贫困的梦想，它会不会就此躺在功劳簿上安逸无忧？不可能。世行已有另一个梦想：“共享繁荣”。这让世行有了新的使命，即改善在每个国家收入最低的40%人群的生活，不管他们本身有多富有。即使极度贫困最终得以根除，每个国家也总会有40%的人相对贫困。





Norway's global fund

How to not spend it

It is tough for a small democracy to run the world's biggest sovereign-wealth fund

TWO decades after Norway's government paid a first deposit into its sovereign-wealth fund, the country is learning how to manage a behemoth. The vehicle, which is used to invest abroad the proceeds of Norway's oil and gas sales, has amassed a bigger fortune than anyone expected, thanks to bumper oil prices. As the direct benefits of oil decline—around 46% of Norway's expected total haul of oil and gas is gone—the relative importance of the fund will grow. The annual revenues it generates now regularly exceed income from oil sales.

In September, the “Pension Fund Global” was worth Nkr7.3 trillion (\$882 billion), more than double national GDP. No sovereign-wealth fund is bigger. It owns more than 2% of all listed shares in Europe and over 1% globally. Its largest holdings are in Alphabet, Apple, Microsoft and Nestlé, among 9,000-odd firms in 78 countries.

In designing the fund, Norway got a lot right. Its independence is not constitutionally guaranteed, but it is protected as a separate unit within the central bank, overseen by the finance ministry and monitored by parliament. It is run frugally and transparently; every investment it makes is detailed online.

Other funds might copy those structures, but would struggle to mimic the Nordic values that underpin them. Yngve Slyngstad, the fund's boss, says growth came “faster than anyone had envisaged”, and that a culture of political trust made it uncontroversial to save as much as possible. A budgetary rule stops the government from drawing down more than the fund's expected annual returns (set at 4% a year). The capital, in theory, is

never touched. Martin Skancke, who used to oversee the fund's operations from the finance ministry, attributes the trust the institution enjoys to relatively high levels of equality and cultural homogeneity. It also helps that many rural areas recall poverty just two generations ago.

Yet expectations of the fund may change as Norway itself does. Tesla-driving Norwegians are now less shy about flaunting their wealth. Those under 50 have known only a world in which the 5.2m Norwegians are among its wealthiest people. Immigration is higher than ever, especially after an influx of Syrian refugees.

Progress, a populist, anti-immigrant party, has long wanted more oil cash spent at home. As a junior coalition partner since 2013, in charge of the finance ministry, it has curbed its urge to splurge. But in the first half of this year the government for the first time took more from the fund than it deposited from its oil revenues: a net withdrawal of Nkr45 billion. Recent low returns meant that the fund's capital fell slightly, too.

It is too early to see any long-term trend, but some are worried. "It is very hard to have a huge sum of money at the bedside and to tighten your belt at the same time," says someone close to the fund. Mr Slyngstad is sanguine but acknowledges that few democracies sustain sovereign-wealth funds: politicians always prefer higher spending and lower taxes. He denies ever feeling political pressure. But others' appetites are evidently growing—if not to spend more, then to use the fund differently. One complaint is that relatively modest dollar returns on investments (5.5% a year since 1998) reflect too much caution among those who guide the fund's strategy.

Sony Kapoor, a leading critic of the fund, argues that it "screwed up" in the past decade by failing to invest in emerging markets that were hungry for capital, and by ignoring unlisted assets, such as infrastructure. He says the fund missed out on "\$100 billion to \$150 billion" as a result. Worse, he says,

its supposed caution in fact exposed it to high risk by concentrating its assets in rich economies.

Defenders of the fund's strategy dismiss this criticism, arguing that poorer countries often offer too few suitable, big investment opportunities. But this is not the only criticism from Mr Kapoor and others. In a democracy, morality counts. The ethics of investment are debated ever more hotly. Politicians, NGOs and others increasingly say moral concerns should outweigh others, and even profits.

The fund refuses to invest in firms with products deemed unethical, such as tobacco or many sorts of weapons. It is also becoming more activist in the approach to its portfolio, divesting from those seen as grossly corrupt and flagging concerns over companies' misuse of water and energy, or any risk that they benefit from child labour.

It is also getting more outspoken on subjects like high executive pay. It has said it will join class-action lawsuits against Volkswagen over the firm's fiddling of fuel-emissions results. The fund has been instructed by parliament to help fight climate change. So 1% of its portfolio is in firms deemed to be green. It has divested from heavy polluters, firms involved in deforestation and, this year, from coal companies.

Such restrictions create dilemmas. The fund still invests in oil, for example: Royal Dutch Shell is one of its biggest holdings. Its ethical advisers argue that it can achieve more by promoting good practices within oil firms. But a former adviser admits the fund's climate-change brief makes such investments a "paradox".

In effect, the fund is exporting Norwegian values as well as capital. In the future it could turn against more products—sugar and fast-food, say, because of obesity. So far the fund's managers see no serious financial cost

from blacklisting 100 or so companies. But they do not deny that some ethical decisions do entail trade-offs. Their own shareholders, the Norwegians themselves, may not always let them do what is right rather than what pays. ■



挪威的全球基金

怎样不花钱

一个民主小国管理全球最大主权财富基金之不易

20年前挪威政府向其主权财富基金存入了第一笔资金，如今挪威正在学习如何管理这个巨型基金。该基金将挪威油气销售收益投资于海外。由于过去油价高企，基金现在所累积的财富超过所有人的预料。现在挪威46%的油气预期收益都已化为乌有，油价下跌的直接益处是基金的相对重要性将会增加。目前基金的年收益经常超过石油销售收入。

九月，挪威主权财富基金“政府全球养老基金”（Pension Fund Global）的规模高达7.3万亿挪威克朗（8820亿美元），是其GDP的两倍还多，没有哪个主权财富基金规模比它更大。它持有超过2%的欧洲上市公司股票，在全球范围内则超过1%。该基金持有9000多家公司的股票，遍及全球78个国家，其中最大的投资当属Alphabet、苹果、微软和雀巢公司。

在设计这一基金的时候，挪威政府在很多方面都做对了。基金的独立性虽然没有宪法保证，但作为央行内部的一个独立单位受到保护，由财政部监管，并受议会监督。基金的运作谨慎而透明，每一笔投资的细节都会在网上公布。

其他基金也许可以照搬上述架构，但很难模仿这些架构背后的北欧价值观。基金首席执行官英韦·斯灵斯塔（Yngve Slyngstad）说基金的增长速度“比任何人设想得都要快”，一种充满政治信任的文化让基金免受争议，得以积累大量财富。基金的预算规则防止政府提款超过基金预期年回报（定为每年4%）。理论上说，基金的本金从未动过。马丁·斯坎克（Martin Skancke）曾经在财政部监管基金运作，他将基金所受的信任归功于相对较高程度的平等和文化同质性。此外，很多农村地区两代人之前才摆脱贫困，这一事实也有所帮助。

然而，随着挪威国情的变化，人们对政府养老基金的期望可能也会随之转

变。开着特斯拉汽车的挪威人如今不再羞于炫耀财富。在50岁以下挪威人的记忆中，拥有520万人口的祖国是世界上最富有的国家之一。如今外来移民人数居历史最高，尤其是在大量叙利亚难民涌入之后。

反移民的民粹主义政党进步党一直都想把更多来自石油的财富用于国内。2013年以来，进步党作为执政联盟中的一个小党主管财政部工作，一直都在克制自己大把花钱的欲望。但在今年上半年，政府从基金中提取的资金首次大于注入的石油收益，净提出额达450亿挪威克朗。近期的低回报也意味着基金的本金有小幅缩水。

现在要看清长远趋势还为时过早，但有人已经开始担忧。一位与基金关系密切的人士说：“床边擦着一大堆钱还要勒紧裤带过活是很痛苦的一件事。”斯灵斯塔态度乐观，但也承认很少有民主国家能长久维持主权财富基金：政客总是喜欢多花钱而少收税。他否认曾感受到任何政治压力，但其他人的胃口明显在变大——如果不能多花钱，那就改变基金投资策略。有一种抱怨认为基金以美元计的投资回报率不高（1998年以来年回报率5.5%），反映出指导基金投资策略的人太过谨慎。

基金的主要批评者索尼·卡普尔（Sony Kapoor）认为，基金在过去十年中没有投资渴望资本的新兴市场，并忽略了未上市资产（如基础设施），因而“大错特错”。他说基金因此而错失了“1000到1500亿美元”。他还讲道，更为糟糕的是，基金出于所谓的谨慎，将资产集中在富裕经济体中，事实上反而将其置于更大的风险之中。

基金策略的捍卫者对此批评予以否定，辩称较穷的国家经常鲜有合适的大型投资机会。但来自卡普尔和其他批评者的意见还不止于此。在一个民主社会中，道德问题意义重大。对投资的道德标准的讨论越来越激烈。政客、非政府组织等越来越多认为投资中道德的考量应该高于一切，甚至是利润。

基金拒绝投资于生产被视为不道德产品（如香烟或各种武器）的公司。同时基金在处理投资组合时表现更为激进——撤离那些被视为极度腐败的国

家，对滥用水和能源、或任何可能使用童工获利的公司提出投资警示。

基金对诸如高管高薪的话题也变得更加直言不讳。基金已经声明要加入针对排放结果造假而对大众提出的集体诉讼。挪威议会还要求基金支持应对气候变化，因此基金1%的资金被用于投资绿色环保企业，并已从重污染企业、涉足森林采伐的企业中撤资，今年又在撤资名单上新增了煤炭企业。

此类限制造成了一些两难困境。基金如今仍然投资石油业，比如荷兰皇家壳牌（Royal Dutch Shell）就是基金持有股份最多的一家石油公司。基金的道德顾问辩称通过在石油企业内部提倡最佳实践，基金可以取得更大成就。但一位前任顾问承认，基金应对气候变化的职责使其此类投资“矛盾重重”。

事实上，政府养老基金在输出资本的同时也在输出挪威的价值观。未来，它可能会回避投资更多产品——例如糖和快餐，因为它们会导致肥胖。目前为止，该基金的经理并不认为将100个左右的公司列入黑名单会带来严重经济损失，但他们也不否认有些道德决策确实需要折中。他们自己的股东，也就是挪威人，不一定总是会让它们去做对的事，而不做有利可图的事。 ■



Aviation and robots

Flight fantastic

Instead of rewiring planes to fly themselves, why not give them android pilots?

THE idea of a drone—an aircraft designed from scratch to be pilotless—is now familiar. But what if you want to make pilotless a plane you already possess? Air forces, particularly America's, sometimes do this with obsolete craft that they wish to fly for target practice. By using servomotors to work the joystick and the control surfaces, and adding new instruments and communications so the whole thing can be flown remotely, a good enough lash-up can be achieved to keep the target airborne until it meets its fiery fate. The desire for pilotlessness, though, now goes way beyond the ability to take pot shots at redundant F-16s. America's air force wants, as far as possible, to robotise cargo, refuelling and reconnaissance missions, leaving the manned stuff mostly to its top-gun fighter pilots. This could be done eventually with new, purpose-built aircraft. But things would happen much faster if existing machines could instantly and efficiently be retrofitted to make their pilots redundant.

Shim Hyunchul and his colleagues at KAIST (formerly the Korea Advanced Institute of Science and Technology) think they can manage just that. They plan to do so by, quite literally, putting a robot in the pilot's seat. As the photograph shows, this robot—called PIBOT (short for pilot robot)—has a human body plan, with a head, torso, arms and legs. The head is packed with cameras, which are thus in the same place as a human being's eyes, and the arms and legs can operate an aircraft's controls, just as a human being would.

| *Call me George*

To design PIBOT, Dr Shim and his colleagues broke the task of piloting

down into three areas—recognition, decision and action. They then developed the machine intelligence and sensory software needed for a robot to carry all three out well enough to fly a plane.

The recognition part was fairly easy. Trainee pilots have to learn to ignore irrelevant stimuli and concentrate on the instruments, which is trivial for a robot. And most recognition tasks during flight involve reading simple text displays and markings, tasks for which modern optical-recognition software is more than adequate. For looking out of the cockpit, meanwhile, PIBOT has edge-detection software that recognises features like the horizon and runway markings.

Decision-making is similarly simple to program in. Here, PIBOT works like a standard autopilot, following the rules set down in the handbook of whichever aviation authority has to approve it. Programming in the actions consequent on these decisions, though, was trickier. Every such action—for example, flicking a particular switch or moving the joystick a prescribed amount—has to be expressed as a combination of arm- or leg-joint movements that have to be calculated precisely and then added to the robot's memory.

The first PIBOT, a scaled-down version based on a commercially available 'bot called BioLoid Premium, was demonstrated in 2014. Though just 40cm tall, this had the same articulation as a full-sized device. When strapped into a cockpit simulator with miniature controls, it was able to go through a complete flight sequence, from turning on the engine and releasing the brakes to taxiing, taking off, flying a predetermined route and landing safely at the destination. Crucially, it was then able to do the same in a real, albeit miniature aircraft—though it needed some human assistance with the tricky procedure of landing.

Now, Dr Shim has unveiled PIBOT2, a full-sized version of his invention.

This flies a simulator as well as its predecessor did, though it has yet to be let loose in a real cockpit. If it can outperform that predecessor in the landing department, then it will fulfil the United States Air Force's requirement for a "drop-in robotic system" that can be installed quickly without modifying an aircraft—and will do so at a unit cost of \$100,000, which is \$900,000 less than the cost of converting an F-16 for a trip to the great shooting gallery in the sky.

From an air force's point of view there is a lot to like. PIBOT's autonomy removes the risks of jamming or loss of a communication link that goes with remote control. The robot is immune to g-forces, fatigue and fear, requires neither oxygen nor sleep, needs only a software download—rather than millions of dollars of flight training—to work out how to pilot an aircraft, and can constantly be upgraded with new skills in the same way.

Moreover, Dr Shim sees the military use of PIBOT as just the beginning. It could also provide an economical replacement for a human co-pilot on commercial flights. It could revolutionise ground transport, too—providing, as an alternative to purpose-built driverless cars, the possibility of a robo-chauffeur. Dr Shim says he is already working on a PIBOT able to drive a car, a task which is, he says, "easier in some parts and more difficult in others" than piloting a plane. If successful, this approach could turn millions of existing vehicles into driverless ones quickly and easily. And the owner could still put the robot in the back seat (or even the boot) whenever he wanted to experience the old-fashioned thrill of taking the wheel himself. ■



航空和机器人

奇幻航班

为何非要改造飞机让它们自己飞，而不为其配备机器人飞行员呢？

无人机从设计之初就是一种无人驾驶的飞机，这一创意如今已为人熟知。但如果你想把现有的飞机变成无人驾驶呢？空军（尤其是美国空军）有时候就会这样改造他们想用做靶机的废弃飞机。他们用伺服电动机控制操纵杆和舵面，并添加新仪器和通信设备让整架飞机能够遥控飞行，如此打造出一套临时装置，足以让靶机保持飞行直至被击毁。不过，对无人驾驶的追求如今已远不止于想要随意扫射废弃F-16战机的那点需求。美国空军想将货运、燃料补给和侦察的任务都尽可能地交给机器人，而把配备人员的飞行任务主要留给精英战斗飞行员们。这种转变最终可由专门打造的新飞机实现，但如果现有的飞机能即刻被高效地改装好，而不再需要飞行员，那么这种转变的发生还会快得多。

沈贤哲（Shim Hyunchul，音译）以及他在韩国科学技术院（曾经名为 Korea Advanced Institute of Science and Technology，后简称KAIST）的同事认为他们恰恰能做成这件事。他们的方案是在飞行员的座位上放上个机器人——这么说毫不夸张。正如照片所显示，这个名叫PIBOT（即“飞行师机器人”的简写）的机器人拥有人体的造型，有脑袋、躯干、手臂和腿。其头部装有摄像头，位置就等同于人眼，它的手臂和腿能操作飞机的控制系统，就像人所做的那样。

| 叫我乔治

在设计PIBOT时，沈博士和同事们把开飞机的任务拆分成三部分——识别、决策和行动。然后他们研发出了所需的机器智能和传感软件，能让一个机器人很好地完成这三部分任务，从而成功驾驶一架飞机。

识别的部分很简单。飞行学员需要学会忽略不相干的刺激因素而专注在仪器上，这对机器人来说是小菜一碟。飞行中大部分的识别任务都涉及读取屏幕上显示的简单文本和标记，现代视觉识别软件的能力已绰绰有余。与

此同时，在望向驾驶舱外时，PIBOT带有的边缘侦测软件能够识别地平线和跑道标志这类特征。

要设计决策能力也同样简单。在这个环节，PIBOT就像标准自动驾驶仪那样工作，遵循无论哪个航空管理部门批准的飞行手册准则。然而，要为根据这些决策而产生的行动编写程序却是更棘手的事。每个这样的行动——比如按下某个开关或以规定的幅度移动操纵杆——都须由手臂或腿的关节联动来实现。这类动作需要经过精确的计算，再添加到机器人的内存中。

第一台PIBOT是一个基于市售BioLoid加强版机器人套件（BioLoid Premium）打造的缩小版本，于2014年演示。虽然仅40厘米高，但它具有和全尺寸设备相同的关节连接。当被拴在带有微型控制系统的驾驶舱模拟器内时，它能开展一整组飞行动作，从启动引擎、释放制动、滑动、起飞、飞行一条预定线路，直到在目的地安全降落。至关重要的是，它后来能在一架虽小型但却是真正的飞机上做同样的事，尽管在复杂的着陆环节需要人给予一些帮助。

如今，沈博士已经推出他这项发明的全尺寸版——PIBOT2。它在模拟器中的表现和其前身一样出色，但尚未在真正的驾驶舱内一显身手。如果它能在降落环节赶超其前身，那么它将达到美国空军对“嵌入式机器人系统”的要求。这样的系统可以被快速安装完毕而无需改造一架飞机，而且使用PIBOT2的单位成本仅为10万美元，比把一架F-16改装成靶机要节省90万美元。

对空军而言这真是好处多多。PIBOT的自主能力消除了遥控飞行所带有的干扰和失联风险。机器人不受重力制约，不会疲劳不会害怕，不需要氧气也不用睡觉，无需花数百万美元给它做飞行培训，只要下载一套软件就能学会怎么开飞机，然后再通过下载软件来不断升级其技能。

此外，沈博士认为PIBOT在军事上的运用只是个开端，它同样可以在商业航空中替代人类副驾驶，从而节约成本。它还可以改革地面运输，有可能带来“机器人司机”，成为无人驾驶汽车这种专门制造的汽车的替代选择。

沈博士说他已经在研发会开车的PIBOT，这项任务相比开飞机“在某些方面更容易，而在另一些方面更难些”。如果能成功，这种方法将能把数百万辆现有车辆简单迅速地变成无人驾驶汽车。而汽车主人若想体验自己把控方向盘这种老式的快感，他仍然可以随时把机器人请到后座甚至后备箱里。 ■



Hybrid cars

At last, the 48 show

Upping the volts will make hybrid cars much cheaper

VOLTAGE is to electricity what pressure is to water: the more you have of it the more oomph you get. That is why electrical power lines work at high voltage. In the 1950s carmakers needed extra oomph of this sort to start the powerful high-compression engines then being introduced, so they increased the voltage of their vehicles' electrical systems from six to 12. Now voltages are going up again—to 48.

One reason is that cars are packed with more and more components, demanding more and more electrical power. A modern vehicle may have as many as 150 electric motors. But there is a second reason for the increase, too. Extra voltage lets engineers design cars in novel ways that boost engine output and efficiency. This can be used to make hybrids on the cheap (some people call them “mild hybrids”). These employ a combination of electric motors and combustion engines to cut both fuel consumption and polluting emissions.

The first production car to use 48 volts is the SQ7, a new luxury sports-utility vehicle made by Audi, a German firm that is part of the Volkswagen Group. It is not a hybrid, but it employs an electrically driven 48-volt turbine to force extra air into the engine when a spurt of power is needed. This provides a faster response than a turbocharger, which is operated by the vehicle's exhaust gases. The car also has a 48-volt active suspension. Again, this improves response time, permitting faster action from the electric motors that control how the vehicle rolls on corners.

The hybrid possibilities of high voltage are shown by an experimental Ford Focus being put through its paces by the Advanced Diesel-Electric

Powertrain (ADEPT) consortium, in Britain. ADEPT, which includes Ford itself, Ricardo, an engineering consultancy, the University of Nottingham and others, uses 48 volts to power components ranging from the water pump to an electric turbine. One of the test vehicle's most important features, though, is its water-cooled starter. Many cars use stop-start technology, which saves fuel by switching the engine off when the vehicle is stationary. To reignite as soon as the driver is ready to move off again requires a powerful, fast-acting starter. Twelve-volt starters can struggle, particularly when attached to heavier diesel engines.

| *Hybrid vigour*

Improving stop-start performance is, however, only part of the picture. During braking the starter can act as a generator to recover a vehicle's kinetic energy—a crucial feature of hybrid technology. Here, 48-volt circuitry's energy-handling oomph helps again. In this case it comes from a lead-carbon battery, which can charge and discharge faster than the lead-acid variety used for standard 12-volt systems. Both the Focus and the SQ7 use 12-volt systems as well, and so require two batteries (the Audi's 48 volts come from a lithium-ion battery). Secondary 12-volt systems are likely to remain for less demanding devices, such as lighting and stereos, until production volumes increase sufficiently for more parts of a car to migrate to 48 volts.

The Focus, though, has one more important trick. It can draw on some of the 48-volt battery's power for "torque-assist", in which the starter acts as a supplementary motor, helping the car accelerate. This not only gives a better ride, it also makes the car less polluting by reducing emissions, including nitrogen oxides.

These gases, known collectively as NOX, are created by the heat-driven reaction together of air's two principal components, nitrogen and oxygen, during combustion. NOX emissions both cause and aggravate respiratory

diseases. Paradoxically, they can be the product of what is normally a good thing, a lean-burning, efficient engine. In demanding driving conditions, such as periods of acceleration, lean-burning engines can burn a bit too lean. That means less fuel than is ideally required is supplied to their combustion chambers. Since one of fuel's side-effects is to cool the engine, this can cause the engine to heat up and thus encourage NOX formation. By helping turn the engine during acceleration, torque-assist stops this over-lean running, thus reducing emissions of NOX.

There are yet more things a higher voltage can provide, says Nick Pascoe, the boss of Controlled Power Technologies, an ADEPT member that makes the Focus's starter. One is coasting. Once a car is cruising at a constant speed, torque-assist alone might be enough to keep it there. Moreover, it allows smaller engines to be used. A turbocharged 1.5-litre engine today can already produce power equivalent to that of an older 2-litre unit. With 48 volts the same power would, according to Mr Pascoe, be available with just a 1-litre engine. On top of this, instead of using an automatic gearbox stuffed with all the gubbins for nine speeds, as some now are, a car could have fewer gears and use torque-assist to fill the gaps. Smaller engines and gearboxes save weight, and would therefore reduce fuel consumption and associated emissions.

Exactly how well ADEPT's Focus performs will be announced soon, but it is expected to cut fuel consumption by 10-12% compared with even the most frugal cars in its class. In volume production the 48-volt systems it runs on would be significantly smaller and cheaper than those needed to build full hybrids, which use large and costly battery packs. When it comes to better fuel economy and lower emissions, some in the car industry reckon mild hybrids could yield 70% of the benefits of a full hybrid (even as those cars switch to 48 volts) at 30% of the cost.

Most carmakers and their suppliers are now working on 48-volt systems.

Delphi, a Michigan-based group that is one of the world's largest suppliers of automotive parts, thinks mild hybrids could cut CO₂ emissions by 15-20%. Delphi expects that, by 2025, one in every ten cars sold around the world will be a 48-volt mild hybrid. Upping the volts, then, will make motoring much greener. ■



混合动力汽车

48伏系统终于出现

提高汽车电力系统电压，混合动力汽车将会更经济

电压之于电就像水压之于水一样，压力越高，最终得到的能量就越多，因而电力线路会采用高电压的输送方式。上世纪五十年代，为了用这种方式获取更多的能量来发动当时新问世的高压缩比发动机，汽车制造商们将自家汽车电力系统的电压由6伏提高到12伏。如今电压再次提升——达到了48伏。

一个原因是现在的汽车配备的组件越来越多，因而需要的电力也在增加。一辆现代汽车的电动机也许会多达150个。然而，提高汽车电力系统的电压还有另外一个原因：额外提升的电压能让工程师们在设计汽车时采用新颖的方法提升发动机输出功率及效率。此外，高电压还可以实现较为经济的混合动力（一些人称其为“轻混合动力”）。这种混合动力方案同时具备电动机和内燃机两种动力来源，既可减少燃料消耗，也能降低污染排放。

大众集团旗下的德国汽车公司奥迪生产出了第一辆采用48伏电力系统的量产车型——豪华运动多用途车SQ7。虽不是混合动力汽车，但SQ7搭载48伏的电动涡轮，在需要迅速提升动力时可压缩更多空气进入发动机中。和车辆废气驱动的涡轮增压器相比，这样可提供更快的响应速度。SQ7还配备了48伏的主动悬架系统，可使控制车辆转弯的电动机更快做出反应，因而同样可提高整体响应速度。

在英国，ADEPT（先进柴油电动动力系统）联盟正在对一辆福特福克斯试验样车进行性能测试。这辆车显示了混合动力汽车采用高电压电力系统的可能性。福特自身便是ADEPT联盟成员，其他成员还包括工程咨询公司里卡多（Richardo）及诺丁汉大学等。该联盟使用48伏驱动从水泵到电动涡轮的多个组件。然而，被测车辆最重要的特色之一是其水冷启动装置。很多车辆都会使用启停技术：启停系统可在车辆停止行进时将发动机熄火以节省燃料。司机要继续行驶时要立刻点火，这就要求启动装置强劲且反

应迅速。12伏的启动装置只能勉强应付，尤其在与更重型的柴油机相连的情况下更是如此。

| 混合动力优势

然而提升汽车启停表现只是高电压电路系统的功效之一。在刹车时启动装置会变作发电机以回收车辆的动能——这是混合动力技术的一项重要特征。在这方面，48伏电路系统的能量处理能力便又能发挥作用了。这种电路系统采用的是铅碳电池，充电及放电的速度比标准的12伏电力系统所使用的铅酸蓄电池要快。福克斯和SQ7都另外配备了12伏的电力系统，因而都需要两组电池（奥迪的48伏电压的电力由锂离子电池提供）。12伏的辅助电力系统很可能会继续为耗电量稍小些的装置供电，如照明和音响；等到生产量有了足够的提升，就会有更多的车辆部件转而使用48伏系统提供的电力。

不过福克斯还有另外一个更为重要的“招数”。它能从48伏电池获取部分能量提供“扭矩辅助”，在此过程中启动装置能够充当补充电动机，帮助车辆加速。这不仅会提高驾乘体验，还可使车辆减少包括氮氧化物在内的排放，从而降低车辆造成污染。

这些氮氧化物气体被统称为NOX。在燃烧过程中，空气的两种主要成分氮和氧在热能的驱动下发生反应就会产生氮氧化物。氮氧化物的排放会引起并加重呼吸系统疾病。燃烧效率高的稀薄燃烧发动机通常都是个好东西，但却也会产生氮氧化物。在需要更多动力的行驶状况下，如加速阶段，稀薄燃烧发动机燃烧得可能会过于稀薄。稀薄燃烧意味着发动机燃烧室中进入的燃料比理想状态所需要的要少。由于燃料的副作用之一是会使发动机冷却，吸入燃料少就会造成发动机升温，从而致使氮氧化物的形成。扭矩辅助在加速时可帮助驱动发动机，终止这种燃烧过度稀薄的运行状态，从而减少氮氧化物的排放。

ADEPT联盟成员Controlled Power Technologies（CPT）负责制造福克斯的启动装置。其老板尼克·帕斯科（Nick Pascoe）说，更高电压的电力系统可辅助实现的事还有很多。其中一项是帮助车辆惯性滑行。若一辆汽车要

以恒定的速度平稳行驶，仅靠辅助扭矩也许就可实现。此外，有了高电压电力系统，车辆就可使用较小些的发动机。如今，1.5升涡轮增压发动机所能产生的动力已经相当于从前2升的发动机。帕斯科认为，有了48伏的电压，或许1升的发动机就能产生同样的动力。除此之外，车辆也无需像现在的某些车那样，为实现9速而在自动变速箱内塞满各种小机件；在48伏电压下，车辆可以减少档位，减掉的部分可由辅助扭矩来补充。更小的发动机和变速箱能够减轻重量，因而也可以减少燃料消耗及相应的排放。

ADEPT联盟所测试的福克斯究竟表现如何，结果将于稍后公布，但预计其耗油量会比同类别中最省油的车还要低10%到12%。到批量生产时，它的48伏电力系统要比全混合动力汽车所需的系统要小得多，也会更便宜；全混合动力方案所需用的电池组体积大且价格贵。至于提升燃油经济性及降低排放量，一些汽车行业的从业人士估计，只需花费全混合动力汽车（它们同时也改用48伏电路系统）30%的成本，轻混合动力汽车就可实现前者70%的功效。

如今大多数汽车制造商及其供应商都在48伏电力系统上下功夫。世界最大的汽车零部件制造公司之一、总部位于密歇根的德尔福（Delphi）认为，轻混合动力可使二氧化碳排放量减少15%到20%。德尔福预计，到2025年，全世界每十辆售出的汽车就有一辆是48伏电压的轻混合动力车。因此，提升汽车电力系统的电压会使驾乘汽车变得更加绿色。■



Aviation safety

Flight response

An artificially intelligent autopilot that learns by example

ON JUNE 1st 2009, an Air France airliner travelling from Rio de Janeiro to Paris flew into a mid-Atlantic storm. Ice began forming in the sensors used by the aircraft to measure its airspeed, depriving the autopilot of that vital data. So, by design, the machine switched itself off and ceded control to the pilots. Without knowing their speed, and with no horizon visible in a storm in the dead of night, the crew struggled to cope. Against all their training, they kept the plane's nose pointed upward, forcing it to lose speed and lift. Shortly afterwards the aeroplane plummeted into the ocean, killing all 228 people on board.

French air-accident investigators concluded that a lack of pilot training played a big part in the tragedy. As cockpits become ever more computerised, pilots need to keep their flying skills up to date. But pilots are also in short supply. In July Airbus predicted that 500,000 more will be needed by 2035 to keep pace with aviation's expected growth. That means there is pressure to keep aircrew in their cockpits, earning money, rather than in the simulators, taking expensive refresher courses.

Help may be at hand, though, from artificial-intelligence (AI) experts at University College London (UCL). Inspired by the Air France tragedy, Haitham Baomar and his colleague Peter Bentley are developing a special kind of autopilot: one that uses a "machine learning" system to cope when the going gets tough, rather than ceding control to the crew.

Today's autopilots cannot be trained, says Mr Baomar, because they are "hard coded" programs in which a limited number of situations activate well-defined, pre-written coping strategies—to maintain a certain speed or

altitude, say. A list of bullet points (which is what such programs amount to) does not handle novelty well: throw a situation at the computer that its programmers have not foreseen, and it has no option but to defer to the humans.

Mr Baomar suspected that a machine-learning algorithm could learn from how human pilots cope with serious emergencies like sudden turbulence, engine failures, or even—as happened to the Air France jet—the loss of critical flight data. That way, he says, the autopilot might not have to cede control as often, and that, in turn, might save lives.

| *AI takes off*

Machine learning is a hot topic in AI research. It is already used for tasks as diverse as decoding human speech, image recognition or deciding which adverts to show web users. The programs work by using artificial neural networks (ANNs), which are loosely inspired by biological brains, to crunch huge quantities of data, looking for patterns and extracting rules that make them more efficient at whatever task they have been set. That allows the computers to teach themselves rules of thumb that human programmers would otherwise have to try to write explicitly in computer code, a notoriously difficult task.

UCL has lots of experience in this area. It was the institution that spawned DeepMind, the company (now owned by Google) whose AlphaGo system this year beat a human grandmaster at Go, a fiendishly complicated board game. The UCL team has written what it calls an Intelligent Autopilot System that uses ten separate ANNs. Each is tasked with learning the best settings for different controls (the throttle, ailerons, elevators and so on) in a variety of different conditions. Hundreds of ANNs would probably be needed to cope with a real aircraft, says Dr Bentley. But ten is enough to check whether the idea is fundamentally a sound one.

To train the autopilot, its ten ANNs observe humans using a flight simulator. As the plane is flown—taking off, cruising, landing and coping with severe weather and aircraft faults that can strike at any point—the networks teach themselves how each specific element of powered flight relates to all the others. When the system is given a simulated aircraft of its own, it will thus know how to alter the plane's controls to keep it flying as straight and level as possible, come what may.

In a demonstration at a UCL lab, the system recovered with aplomb from all sorts of in-flight mishaps, from losing engine power to extreme turbulence or blinding hail. If it were to lose speed data as the Air France flight did, says Mr Baomar, the machine would keep the nose low enough to prevent a stall. The newest version will seek speed data from other sources, like the global positioning system (GPS).

To the team's surprise, the system could also fly aircraft it had not been trained on. Despite learning on a (simulated) Cirrus light aircraft, the machine proved adept with the airliners and fighter jets also available in the database. That is a good example of a machine-learning phenomenon called "generalisation", in which neural networks can handle scenarios that are conceptually similar, but different in the specifics, to the ones they are trained on.

UCL is not the only institution interested in better autopilots. Andrew Anderson of Airbus, a big European maker of jets, says his firm is investigating neural networks, too. But such systems are unlikely to be flying passenger jets just yet. One of the downsides of having a computer train itself is that the result is a black box. Neural networks learn by modifying the strength of the connections between their simulated neurons. The exact strengths they end up with are not programmed by engineers, and it may not be clear to outside observers what function a specific neuron is serving. That means that ANNs cannot yet be validated

by aviation authorities, says Peter Ladkin, a safety expert at Bielefeld University in Germany.

Instead, the new autopilot will probably find its first uses in drones. The system's versatility has already impressed delegates at the 2016 International Conference on Unmanned Aircraft Systems in Virginia, where Mr Baomar presented a paper. The system's ability to keep control in challenging weather might see it used in scientific investigations of things like hurricanes and tornadoes, says Dr Ladkin—some of the most challenging flying there is. ■



航空安全

逃生反应

通过范例学习的人工智能自动驾驶仪

2009年6月1日，法航一架由里约热内卢飞往巴黎的班机在大西洋上空迎头遭遇雷暴。飞机上用于测量空速的传感器开始结冰，导致自动驾驶仪无法获取这一关键数据。因此，自动驾驶仪按照设计自动关闭，将飞机控制权交给驾驶员。身处雷暴之中的飞行员不知道飞行速度，深夜里一片漆黑，也令他们分不清地平线，只能慌忙应对。他们违背了训练常识，一直抬升机头，最终导致飞机失速，失去升力。之后不久飞机径直坠入大海，机上228人全部遇难。

法国飞行事故调查人员做出的结论认为，飞行员训练不足是导致此次悲剧的重要原因。飞机驾驶舱的计算机化程度越来越高，飞行员需要确保其驾驶技能不断更新。但飞行员人才短缺。7月空客公司做出预计，到2035年全球需要增加50万名飞行员以满足航空业的预期增长。这意味着航空公司面临着压力——它们得安排机组人员驾驶飞机、工作赚钱，而不是让他们在模拟飞行舱里上昂贵的进修课程。

不过英国伦敦大学学院（UCL）的人工智能（AI）专家也许能帮上忙。海赛姆·宝玛尔（Haitham Baomar）及其同事彼得·本特利（Peter Bentley）受到法航空难的启发，正在研发一种特殊的自动驾驶仪。这种驾驶仪使用“机器学习”系统来应对突发情况，而不是简单地将飞机控制权移交给机组人员。

宝玛尔说如今的自动驾驶仪不能接受训练，因为它们是“硬编码”的程序，在一定数量的场景下可以启动预先编制好的且清楚明白的应对策略，比如保持一定的速度或高度。然而，一个要点清单（那些程序其实也就是罗列要点）应付不了新状况：如果把电脑置于一个程序员没有预见到的场景中，电脑就会别无选择，只能将控制权交给人类。

宝玛尔认为机器学习算法有可能从人类飞行员那里学习应对各种突发紧急情况，如突然遇到强烈气流、引擎失灵、甚或像法航班机所遭遇的关键飞行数据缺失。宝玛尔认为，这样一来自动驾驶仪也许就不需要经常放弃控制权，转而就有可能挽救生命。

| 人工智能起飞

机器学习是人工智能研究中的热门领域，已被用于完成各种不同的任务，如解码人类语言、图像识别或选择向网页浏览者展示哪些广告。这些程序都利用了人工神经网络（ANN）。ANN在一定程度上是受生物大脑的启发，可用来处理海量数据、寻找模式、提取那些可令其更高效地完成任何任务的规则。这让电脑可以自学经验法则，而如果让人类程序员将这些法则明确编码写成程序，将十分困难。

UCL在这一领域经验丰富，DeepMind公司正是催生于此。该公司（现为谷歌收购）的AlphaGo系统今年击败了一位人类围棋大师（围棋是一种极为复杂的棋类游戏）。UCL团队已经编写出了其称之为“智能自动驾驶系统”（Intelligent Autopilot System）的程序，其中用到了10个独立的ANN，每一个都被设定了任务，学习在各种不同条件下对不同控制装置（节流阀、副翼、升降舵等等）做最佳设置。本特利博士说要控制一架真正的飞机可能需要成百上千个ANN。但要检验这个想法从根本上是否站得住脚，10个ANN就够了。

训练自动驾驶仪时，这10个ANN会观察人类如何使用飞行模拟器。飞机飞行时——包括起飞、巡航、降落和应对恶劣天气及随时可能发生的飞机故障——ANN会自学每一次动力飞行中具体因素之间的关联。将模拟飞行器交给自动驾驶仪系统驾驶后，系统就会知道该如何调整对飞机的控制，确保在任何情况下飞机都尽可能平直飞行。

在UCL实验室的一次展示中，该自动驾驶系统自如地应对了各种飞行中的紧急情况，从引擎失去动力，到极端气流或遮天蔽日的冰雹。宝玛尔说，如果遭遇法航班机所遇到的失去空速数据的情形，系统会降低机头，确保足够的角度以避免飞机失速。系统的最新版本还将从其他来源收集速度数

据，如全球定位系统（GPS）。

令UCL团队意外的是，该系统还能驾驭它没有受训飞行过的机型。尽管系统学习时用的是（模拟）西锐（Cirrus）轻型飞机，但其表现证明它也可熟练应对数据库中的客机和战斗机。这是机器学习中“泛化能力”的一个良好例证。神经网络在遇到与它们受训场景概念上相近、但细节不同的其他场景时，这种能力让它可以应对自如。

对改善自动驾驶仪感兴趣的机构不止UCL一家。欧洲大型飞机制造商空客公司的安德鲁·安德森（Andrew Anderson）说他所在的公司也在研究神经网络，但此类系统暂时还不太可能驾驶真正的客机。电脑自学的一个缺点就是其结果是一个黑盒子。神经网络通过调整其模拟神经元之间的连接强度进行学习。最终确切的连接强度不是由工程师设定的，外部观察者也不太可能清楚地知道某个具体的神经元起什么作用。德国比勒费尔德大学（Bielefeld University）的安全专家彼得·拉金（Peter Ladkin）说，这就意味着ANN暂时还不能得到航空主管部门的批准。

不过，新型自动驾驶仪将很有可能率先在无人飞机上应用。宝玛尔在美国弗吉尼亚州举办的2016年国际无人驾驶飞机系统大会（2016 International Conference on Unmanned Aircraft Systems）上做了演讲，让与会代表对这种自动驾驶仪系统的多功能性印象深刻。拉金博士说，该系统在恶劣天气条件下确保控制的能力可能会让它在对飓风、龙卷风等现象的科学研究中派上用场，而在这些情况下的飞行最具挑战性。■



Autonomous vehicles

Who's self-driving your car?

The battle for driverless cars revs up

WITH its successful test of robo-taxis on the streets of Pittsburgh early September, Uber has dominated recent headlines on autonomous vehicles. But behind the scenes three groups—technology giants such as Uber, carmakers and a whole fleet of autoparts suppliers—are in a tight race. Each is vying to develop the hardware and software that make up the complex guts of a self-driving vehicle.

A couple of years ago tech firms appeared well ahead in this battle. But, Uber aside, they have dabbled the brakes of late. The recent departure from Google of Chris Urmson, the company's figurehead for autonomous vehicles and the man who once promised it would put self-driving cars on the road by 2017, is a significant reversal. The recent slimming of the team at Apple that is devoted to building an autonomous electric car, also shows that tech firms are not having it all their own way (though Apple's possible tie-up with McLaren, a British maker of sports cars and Formula 1 racing team, would be one way to put its carmaking ambitions back on track).

Carmakers, meanwhile, are making more of the running after a slow start. Despite recent safety concerns, Tesla, an electric-car maker, is making progress with its Autopilot system. In 2017 Volvo, which is also working with Uber to get cars to drive themselves, will test self-driving cars by handing them for the first time to a select group of ordinary motorists. And in August, Ford said it would launch a fully-autonomous car, without steering wheel or pedals, for car-sharing schemes by 2021.

All parties recognise that the biggest profits from autonomy will come from producing an “operating system”—something that integrates the software

and algorithms that process and interpret information from sensors and maps and the mechanical parts of the car. Tech firms probably have the edge here. But carmakers and suppliers are not giving up easily. So they are involved in a bout of frenzied activity to keep control of the innards of self-driving cars. In July, for example, BMW, Mobileye, an Israeli supplier that specialises in driverless tech, and Intel, the world's biggest chipmaker, said they were joining forces.

Another strategy for carmakers is to develop autonomous driving in-house. They are hoovering up smaller firms that have useful self-driving technology, notes Andrew Bergbaum of AlixPartners, a consulting firm. Ford has put money into a lidar company (lidar is a type of remote-sensing technology), and into another that sells mapping services. It has also acquired two other firms that specialise in machine-learning and other artificial-intelligence technology.

The losers in this race look likely to be the big parts-makers, whose relationship with their main customers could become strained. Over time carmakers have largely ceded to them the job of developing new technology. If they turn back the clock and reintegrate vertically that may leave less business for the suppliers.

The tech giants still have huge advantages. As well as their financial resources, they are in the best spot to claim the big profits from the operating system. Apple's plans to build a car may be swiftly revived if it buys McLaren. And Google is ahead in machine-learning, the vital element in developing algorithms that will eventually replace drivers. But carmakers are coming up surprisingly fast on the inside lane. ■



自动驾驶汽车

谁在自动驾驶你的汽车

自动驾驶汽车之战日趋激烈

九月初在匹兹堡的街道上，优步成功完成了机器人出租车的测试，并以此占据了最近关于自动驾驶汽车的新闻头条。但是这出戏背后的三大集团——如优步这样的科技巨头、汽车制造商以及一大批汽车零部件供应商——正在激烈竞争。每一方都在争相研发自动驾驶汽车复杂的硬件和软件。

几年前科技公司在这场战斗中似乎占尽上风。不过近来，除优步外，它们都踩下了刹车。克里斯·乌尔姆森（Chris Urmson）是谷歌自动驾驶汽车项目的负责人，也正是他曾经承诺过2017年让自动驾驶汽车上路，然而其最近的离职是一个意味深长的逆转。苹果致力于研发自动驾驶电动汽车的团队最近的瘦身也表明科技公司在这条路上并非一帆风顺（不过苹果可能会和英国跑车制造商及一级方程式车队迈凯伦联手，这也许将会是让其造车梦重上轨道的一条途径）。

与此同时，汽车制造商虽启动较慢，却正在奋力前行。虽然最近其安全性引发担忧，但电动车制造商特斯拉在自动驾驶系统方面正在取得进展。沃尔沃也在同优步合作，让汽车能够自动驾驶，2017年它将首次将自动驾驶汽车交给一批挑选出来的普通人测试。八月，福特称将在2021年前为汽车共享计划推出全自动驾驶汽车。这款车没有方向盘，也没有脚踏板。

竞争各方都意识到自动驾驶最大的利润将源于生产出一套“操作系统”，它将软件和算法结合起来，处理并阐释来自传感器、地图和汽车机械部件的信息。科技公司在这方面可能很有优势。但是汽车制造商和零部件供应商也不会轻易言败。因此它们参与到一场疯狂的行动中，力图保持对自动驾驶汽车内在核心的控制。比方说七月，宝马、以色列专业自动驾驶技术供应商移动眼（Mobileye）和全球最大的芯片制造商英特尔宣布它们将强强联手。

汽车制造商的另一策略是内部研发自动驾驶技术。咨询公司AlixPartners的安德鲁·博格鲍姆（Andrew Bergbaum）称，它们正在大量吞并拥有有用自动驾驶技术的小公司。福特已经投资了一家激光雷达（LIDAR，一种遥感技术）公司，以及另一家出售地图服务的公司。它还收购了另外两家专门开发机器学习和其他人工智能技术的公司。

这场竞赛的输家看起来可能会是大型零部件制造商，它们跟主要客户的关系肯定会变得紧张起来。汽车制造商已经逐渐将大部分的新技术研发工作移交给了零部件制造商。如果它们推倒一切，重新垂直整合，那么留给供应商的生意也许就没那么多了。

科技巨头仍有巨大优势。除了财力之外，它们在从操作系统中获取丰厚利润方面也最具优势。如果买下迈凯伦，苹果的造车计划可能很快就会复兴。谷歌在机器学习上一路领先，而机器学习是开发最终取代司机的算法的重要元素。不过汽车制造商正从内道追赶，速度快得出人意料。 ■



American property

The REIT stuff

Explaining the boom in property-based investment trusts

THEY did not know it, but when a group of merchants raised money for the Boston Pier in 1772, they were early pioneers of a vehicle known today as a REIT (real-estate investment trust). The financing structure for the pier—the merchants owned the land together and shared the rent—in essence describes an investment product that, 250 years on, is all the rage.

A REIT is a legal structure that owns, or finances, property that generates income. It pays no taxes itself but has to distribute over 90% of earnings to shareholders. Crippled by the financial crisis in 2008, they have since grown fast. This year their market capitalisation passed \$1 trillion, or 4% of the American total, close to the size of the utilities sector. They have been performing well, beating the market in 2014, 2015 and so far this year, when they have generated a return of 18.1%, and are trading at an average multiple of 23 times earnings, compared with 17 times for the S&P 500 index as a whole. In a mark of their new prominence, in September S&P and MSCI, another index provider, classified real estate as a distinct sector.

The early REITs of the 1960s were seen as dull, niche investment vehicles designed to collect a steady stream of rental income. But what used to make them boring—that they resemble fixed-income bonds—is positively exciting in today's low-interest-rate world. REITs churn out stable and predictable cashflows from five- to ten-year-long property leases. Their current yield is 3.6%, higher than the 1.7% yield offered by a ten-year Treasury bond.

Moreover, the growth of REITs has coincided with a soaring rental market after America's housing crisis in 2008. As more people have opted to rent

than own, rents have surged by as much as 3-6% a year in cities such as New York and San Francisco. Even in the suburbs, national REIT operators have emerged, buying and leasing batches of single-family homes with gardens. As a group, three of these have made a return of 33% this year.

A third reason for the current craze for REITs is that, since the crisis, they have become more diverse. Businesses not traditionally seen as part of the property sector, such as telecom towers, data centres and forestry concessions, have labelled themselves as REITs to avoid corporate tax and achieve higher market valuations. They now make up one-sixth of REITs' total market capitalisation. Between 2013 and 2015 a wave of casinos and hotels spun off their properties, listed the assets separately as REITs, and leased them back to the operating business. Big firms such as Macy's and McDonald's have faced pressure from activist investors to do something similar.

The REIT-creation frenzy, however, may already have passed its zenith. In June the Internal Revenue Service, America's tax bureau, issued regulations banning companies outside the property industry from abusing the tax-free REIT structure. So far this year only one REIT has listed its shares, compared with seven last year and 19 in 2013. Another looming risk is an interest-rate rise. When the Federal Reserve hinted at tighter monetary policy in 2013, REITs prices dropped by 13.5% in five weeks. And the rental market is coming to a peak as supply picks up and demand weakens. "The days of 6% rent growth in lots of markets are probably over," says Mike Kirby, the chairman and co-founder of Green Street Advisors, a property-advisory firm.

But REITs also look more resilient than they were in 2008. They have reduced their debt-to-asset ratio from about 70% then to 31% today. E-commerce may threaten some shopping malls, but also boosts demand for facilities such as warehouses and data centres. Last year four out of the

seven top-performing REITs were data centres. The industry today bundles a range of different businesses whose only similarity is checking the same tax-free box. Another pier, anyone? ■



美国房地产

房地产信托投资基金（REIT）

解释以房地产为基础的投资基金的迅猛发展

1772年，当一群商人为波士顿码头筹款时，他们并不知道，自己成为了今天被称作房地产信托投资基金（REIT）这一投资工具的先行者。为码头筹款的融资结构（即商人们共同拥有土地并且分享租金），从本质上描绘了这个250年后风行一时的投资产品。

REIT是一种法律架构，拥有可产生收入的房地产资产的产权或为其提供融资。它本身不需缴税，但必须将90%以上的收益分配给股东。这类基金在2008年金融危机中一度遭受重创，之后又迅速发展。今年它们的总市值超过一万亿美元，占美股总市值的4%，接近公用事业部门基金的规模。它们的业绩始终不错，在2014年、2015年以及今年到目前为止，它们的回报率为18.1%，高于市场平均水平。这些基金平均按23倍的市盈率交易，而标准普尔指数整体为17倍。鉴于它们近来的突出表现，九月标准普尔和另一家指数供应商明晟公司（MSCI）将房地产列为一个独立版块。

在20世纪60年代，早期REIT被视作一种沉闷的利基投资工具，目的是获得稳定的租金收入。REIT就像是固定收益债券，但正是这一原先令其无聊乏味的特质，在当今的低利率环境下无疑令人兴奋。REIT通过五至十年的房地产租赁不断生成稳定且可预测的现金流。它们目前的收益率为3.6%，高于十年期美国国债1.7%的收益率。

而且，REIT的增长与2008年美国住房危机之后租赁市场的飙升同期发生。随着越来越多的人倾向于租房而非买房，纽约和旧金山等城市的租金每年上涨3%至6%。即便是在郊区，全国性的REIT经营者也已出现，它们成批买下带花园的独栋住宅用于出租。整体说来，其中三支REIT今年已经获得了33%的回报。

人们目前对REIT如此狂热的第三个原因是，自从金融危机以来，REIT已变

得越来越多样化。传统意义上被认为不属于房地产行业的资产，如电信塔、数据中心和林业特许经营权，为了免缴公司税以及获得更高的市场估值，都给自己贴上了REIT的标签。它们目前占REIT总市值的六分之一。2013年至2015年间，一批赌场和酒店分拆了它们名下的物业，将这部分资产单独列为REIT，然后再以运营商的名义将这些物业租回来。梅西百货和麦当劳等大公司都已受到来自维权投资者的压力，要求它们也采取类似的做法。

不过，创建REIT的热潮可能已经过了顶峰期。今年六月，美国国税局国内收入署（IRS）颁布规定，严禁非房地产行业的公司滥用免税的REIT架构。今年迄今为止仅有一支REIT上市，而去年为七支，2013年则有19支。另一个隐性的风险是加息。2013年当美联储暗示货币政策将紧缩时，REIT的价格在五周内下降了13.5%。随着供给增加而需求减弱，租赁市场也将到达顶峰。房地产咨询公司绿街顾问（Green Street Advisors）的董事长及联合创始人迈克·科比（Mike Kirby）说道：“很多市场里租金增长率达到6%，这样的好日子很可能就要结束了。”

但是REIT看起来也比2008年时更为坚挺。它们的资产负债率已经由当时的70%降至今天的31%。电子商务可能会威胁到一些购物商场，但也刺激了对仓库和数据中心等设施的需求。去年业绩最佳的七家REIT中有四家为数据中心。今天这一行业充斥着各行各业的公司，它们唯一的相似之处就是在“免税”一栏里打了勾。又是一次码头筹款，谁愿参加？ ■



Autonomous car insurance

Look, no claims!

Self-driving cars are set radically to change motor insurance

ON THE list of industries set to be disrupted by autonomous cars, the motor-insurance business can claim a high place. The regime of compulsory insurance in rich countries, with the insurer of the at-fault driver paying for damage, is reasonable in a world where 90% of accidents are caused by human error. But autonomy is supposed to mean that accidents drop by up to four-fifths, and those that occur may not be a human's fault. The motor-insurance market may shrink by 60% by 2040, according to KPMG, an accounting firm.

Lawyers and insurers concur that liability will move from private car-owners towards manufacturers for crashes when a car is in autonomous mode. But under the current legal system in Britain and America an owner might still be blamed for an accident in self-driving mode if, say, he neglected to install the latest software update, says Richard Farnhill of Allen & Overy, a law firm. A manufacturer might equally well try to shift the blame to a components supplier.

The best way to avoid endless blame-shifting and litigation may be what lawyers call a "strict" liability regime that automatically places responsibility on the owner. The insurer would keep an important role, of ensuring speedy victim compensation and assigning blame to the manufacturer or other at-fault parties. But that approach would still mean lower risk, and hence lower premiums, for insurers.

That regime also assumes that private car ownership remains widespread. But autonomous cars in the future may well be owned and operated in fleets, perhaps by a souped-up Uber or by car manufacturers. Personal

motor insurers would be out of luck. Only those who specialise in commercial fleet insurance would do well. Some manufacturers would simply “self-insure” and assume liability. Volvo, Google and Mercedes have said they will do so with their self-driving cars.

Hélène Chauveau, head of emerging risks at AXA, a French insurer, reckons that the persistence of existing risks, like manufacturing defects, and the emergence of new threats like hacking, will leave a role for insurers. Yet generally, notes Anand Rao of PwC, an accounting firm, they have been slow to react to faster-than-expected technological progress. There are no actuarial tables, it seems, to help insure against that. ■



自动驾驶汽车保险

看，没有索赔！

自动驾驶汽车必将从根本上改变汽车保险

如果把会被自动驾驶彻底颠覆的各行各业都列出来，那么汽车保险行业会名列前茅。富裕国家的强制保险制度是由犯错司机的保险公司为损失买单。在这个90%的事故由人为失误而引起的世界里，这样的制度合情合理。但是自动驾驶应该会让交通事故减少多达五分之四，而且即便发生也可能并非人为失误。根据毕马威会计事务所的数据，到2040年汽车保险市场可能会被压缩60%。

律师和保险公司都同意，当汽车处于自动驾驶模式时，如果发生车祸，责任将从私人车主转移到制造商。但是律师事务所Allen & Overy的理查德·法恩希尔（Richard Farnhill）称，按照目前英国和美国的法律体系，即便车祸是发生在自动驾驶模式下，如果车主出现疏忽，比如没有安装最新版的软件更新包，他仍可能要承担责任。同样，制造商也可能会想方设法把责任推给零部件供应商。

要避免无休止的推卸责任和诉讼，最好的方式或许是律师们所说的“严格”责任机制——自动将责任归于车主。保险公司仍将起到重要的作用，确保受害者获得迅速理赔并将过错归于制造商或其他责任方。但这种方法仍然意味着保险公司的风险更低，因而保费也会降低。

这一机制还是假定私人拥有车辆依旧十分普遍。但是未来的自动驾驶车辆很可能是由增强版优步或者汽车制造商以车队形式拥有并运营。私人车辆保险公司将会走背运。只有专门从事商业车队保险的公司才会顺风顺水。有的制造商会简单地“自我保险”并承担责任。沃尔沃、谷歌和梅赛德斯已经声明它们将对自家的自动驾驶汽车采用这种做法。

法国保险公司安盛（AXA）的新生风险主管海伦·肖沃（Hélène Chauveau）认为，因制造缺陷之类的已有风险持续存在，以及像黑客入

侵之类新威胁的出现，保险公司仍会有用武之地。不过普华永道会计事务所的阿南德·拉奥（Anand Rao）指出，总的说来，面对快于预期的科技进步，保险公司已经反应迟缓。看来并没有一套保险精算表能给这一现象保险。■



Long-term private-equity funds

The Omaha play

Buy-out firms are seeking out longer-term investments

WARREN BUFFETT'S Berkshire Hathaway is celebrated for identifying undervalued companies, buying them, holding on to them for years and reaping handsome rewards for its shareholders. Private-equity firms, by contrast, habitually deal in shorter timespans. Funds with a typical life of ten years aim to turn round troubled companies and sell them profitably within just three to five years. Recently, though, the private-equity industry has taken a page from Mr Buffett's playbook.

Several buy-out firms have been setting up funds that intend to lock up investor funds for 20 years and to hold individual companies for at least ten. Their target net annual return of 10-12% is well below the 20% usually aimed for by ten-year funds, but they promise less volatility and lower fees—1% or so, rather than the customary 2%. Among the largest private-equity firms, Blackstone, the Carlyle Group and CVC have all set up dedicated long-term funds. The largest, Blackstone's, has raised nearly \$5 billion. Specialised upstarts such as Altas Partners of Toronto, which raised \$1 billion for its first fund in the spring, are also getting in on the act.

Private-equity houses are establishing these funds mainly because their clients have an appetite for them. With interest rates at rock-bottom, investors are keen to find assets that can offer decent returns. Sovereign-wealth funds, which can invest for indefinite periods, are happy to accept long-term funds' illiquidity. Endowments, too, are locking up money for longer.

Creating long-term funds is not simple. Ludovic Phalippou, from Said Business School at Oxford University, says that getting fee and incentive

structures right can be “very tricky”. Fees, typically fixed for the life of a fund, may look reasonable at first but prove wrong later. Low fees may lure investors but give private-equity firms insufficient incentives to manage the investments diligently; high fees could allow firms to siphon off most of investors’ returns. In quick turnarounds, new managers are usually brought in with the promise of juicy bonuses linked to the sale; how, Mr Phalippou asks, could that be done with a 20-year horizon?

Some have concerns about conflicts of interest. One worried investor fears that large private-equity firms might earmark promising companies for their short-term funds—which remain their core business—leaving only mediocre ones for the new long-term funds.

Small, long-term specialists like Altas Partners should avoid that pitfall. Andrew Sheiner, Altas’s founder, says he intends to hold on to investments for up to 15 years, but to retain the flexibility to “own each business for as long as it makes sense”, so some may be sold sooner. Altas says it has attracted a lot of interest not only from investors but also from the owners and bosses of target companies, many of whom are tired, in Mr Sheiner’s estimation, of being handed from one private-equity owner to another, and instead seek a more stable, longer-term partner.

Despite their recent surge, longer-dated private-equity funds are likely to remain a niche. Last year investors committed \$384 billion to the whole industry; the amount going into long-term funds is a small fraction of that. Only 5% of funds set up in 2016 have an intended lifespan longer than 12 years, according to Preqin, a data provider. The large, sophisticated investors who would be the best fit for such long-term funds can often build internal private-equity teams more cheaply. For others keen to invest in a portfolio of companies for the long term, there is another option. If even Henry Kravis, co-founder of KKR, a buy-out behemoth, has called Mr Buffett’s method “the perfect private equity model”, might it not make

sense to invest directly in Berkshire Hathaway? ■



长期私募股权基金

巴菲特式投资玩法

并购公司正寻求更长期的投资

沃伦·巴菲特的伯克希尔·哈撒韦公司（Berkshire Hathaway）发现并收购被低估的公司，长年持有之后才进行收割，为股东带来丰厚的回报，这令它声名远播。相比之下，私募股权公司的交易周期通常都较短。典型的十年期基金的目标便是在收购陷入困境的公司后三到五年就获利退出。不过近来，私募股权已开始借鉴巴菲特的做法。

有几家并购公司已经开始设立长期基金，预期锁定投资者资金达20年之久，持有标的公司的期限为至少十年。这类基金的目标年净收益率为10%至12%，远低于十年期基金一般设定的20%，但这类基金的承诺是波动更小、管理费更低（1%左右，而不是通常的2%）。在最大的私募股权公司中，黑石集团（Blackstone）、凯雷集团（the Carlyle Group）和CVC都设立了专门的长期基金。黑石集团的此类基金规模最大，已经募集了近50亿美元。一些专业的新公司也正进入这一市场，例如多伦多的Atlas Partners，其首支此类基金在今年春天已募集到10亿美元。

私募股权公司设立这些基金主要是因为它们的客户有兴趣。利率已经触底，投资者热衷于找到能获得像样收益的资产。主权财富基金的投资可以是无期限的，因此乐于接受没有流动性的长期基金。捐赠基金也在寻觅更长期限的投资。

设立长期基金并不简单。牛津大学萨伊德商学院（Said Business School）的卢多维奇·法利普（Ludovic Phalippou）认为要设定适当的管理费率和收益分成机制可能会“非常棘手”。在存续期内通常一直固定的费率可能一开始看似合理，但后来却被证明是错的。收费低可能会吸引投资者，但私募股权公司就难以获得足够的激励去勤勉地管理投资；收费高的话，公司又有可能将投资者的大部分收益抽走。周期短的基金，一般都对新招募的基金经理承诺能拿到和销售挂钩的丰厚奖金；“对于20年的跨度，又如何

做到这点呢？”法利普问道。

有些人对利益冲突感到担忧。一位忧心忡忡的投资者害怕大型私募基金公司可能会将前景好的公司放入它们的短期基金（这仍是其核心业务），而只为新设立的长期基金留下效益平平的公司。

小型专业长期基金公司如Altas Partners应避免这一陷阱。Altas的创始人安德鲁·西尼尔（Andrew Sheiner）说他打算持有投资最长达到15年，但保留灵活度，“持有期限要看个案投资的商业意义”，因此有些可能会提早卖掉。Altas称它吸引了很多关注，其中不仅有投资者，也有目标公司的所有人和老板。据西尼尔推测，他们中的很多人厌倦了被私募基金不断转手，因此想找个更稳定、更长期的合作伙伴。

尽管近来数量激增，但更长期限的私募股权基金可能仍属小众。去年投资者在整个行业的总投资额为3840亿美元，长期基金仅占其中很小一部分。数据供应公司Preqin的数据显示，2016年设立的基金中仅有5%的预定投资期限长过12年。经验丰富的大型投资者最适合投资这类长期基金，在其内部建立私募股权团队的成本一般会更低。对于其他热衷于长期投资一揽子公司组合的投资者而言，也有另一个选择。如果就连并购大鳄KKR的联合创始人亨利·克拉维斯（Henry Kravis）都称巴菲特的方法为“私募股权最佳典范”，那么直接投资伯克希尔·哈撒韦公司岂不是更合情合理？ ■



Private-equity search funds

Seek and we shall fund

Private equity for absolute beginners

IN 2007 Lucas Braun and Ryan Robinson emerged from the Stanford Graduate School of Business with such a sense of “professional invincibility” that they decided not to return to their old jobs in a consultancy and a hedge fund, respectively. Instead the two Americans took a leap of faith—in themselves.

They were 32 and had no experience of running businesses, but they persuaded a group of investors to finance them for 21 months as they searched for a business to acquire. They discovered OnRamp, a Texas-based private company, and assumed the roles of chief executive and chairman. Following spin-offs and acquisitions, the company now provides cloud computing for industries with sensitive data. Over the past seven years, they say, revenues have grown by 30-35% a year.

The two executives are products of a niche of the private-equity industry known as search funds—such a small niche, in fact, that few in the business have heard of it. But Stanford, which helped pioneer the industry in the 1980s, tracks it, and says that it has grown sharply in the past two years. In 2015 more than 40 new funds were established, twice as many as in 2009. Over the same period the number of acquisitions made by these funds tripled, to more than 15 a year.

The typical search-fund principals are MBA graduates from an elite American university, who raise \$400,000 or so of “walking around money” from investors, who purchase a stake in the fund for about \$40,000 a share. The fund searches for a high-growth, high-margin target, valued at \$5m-20m. The fledgling businessmen then hold a second round of

acquisition financing, as well as raising debt. Their tenure as bosses lasts until they sell out.

Returns are surprisingly good. The average is 8.4 times the money invested and an internal rate of about 37%. They do much better than the average of the rest of the private-equity industry, analysts say. By the time of the exit the principals can hold a 30% equity stake, provided they have met their targets. That is not a bad deal for a no-money-down entrepreneur.

Some firms are injecting scale into the business. Boston-based Pacific Lake Partners, for instance, is dedicated to investing in search funds, and gives firm guidance regarding the industries and regions it prefers. Timothy Bovard, an industry expert, founded an incubator called Search Fund Accelerator in 2015 that provides capital and mentoring to aspiring search-fund entrepreneurs, in exchange for equity. Increasingly, the business is cherry-picking best practices from other bits of private equity. But the funds never invest in a portfolio of firms. Instead, the years knocking on doors can lead to a visceral sense of commitment to the targeted business.

For several decades, America and Canada were the sole home of search funds. But lately European MBA courses have included search-fund case studies that have whetted the appetite of some intrepid would-be entrepreneurs. There are plenty of reasons for caution, though. About a quarter of searches come to nothing, and about a third of the acquisitions end in failure. But that is still better odds than starting a business from scratch. ■



私募股权搜索基金

找到了，我们就资助

绝对新手的私募股权

2007年从斯坦福大学商学院毕业时，卢卡斯·布朗（Lucas Braun）和瑞安·鲁宾逊（Ryan Robinson）有一种“专业无敌”的感觉，于是他们决定不再回各自的咨询公司和对冲基金工作。相反，这两位美国人放手一搏，准备自己干。

他们当时32岁，没有经营企业的经验，却说服了一群投资者在21个月的时间里持续向他们提供资金，以供寻找可收购的公司。他们找到了一家位于得克萨斯州的私人企业OnRamp，并担任其首席执行官和董事长。经历了多次分拆和收购之后，该公司现在为拥有敏感数据的行业提供云计算服务。他们表示，过去七年里，公司的收入每年增长30%至35%。

这两位高管是私募股权行业中被称为“搜索基金”的这一利基市场的产物。这个利基市场非常之小，事实上连行业内也鲜为人知。但是，斯坦福大学在20世纪80年代就帮助开拓并持续跟踪这个行业的发展，它表示该行业在过去两年里有大幅增长。2015年，新设基金超过40只，是2009年的两倍。在同一时期，这些基金实施收购的数量增加至原来的三倍，每年超过15起。

搜索基金的管理人往往是美国名校的MBA毕业生，他们向投资者筹集大约40万美元的“探访资金”，而投资者则以大约4万美元一份的价格购买基金份额。这种基金寻找高增长、高利润率的目标，估值在500万到2000万美元之间。之后，这些初出茅庐的商人会进行第二轮收购融资并举债。在出售企业股权之前他们会担任老板。

收益出奇得好。平均收益是投资的8.4倍，内部收益率约为37%。分析人士表示，它们的表现超过私募股权行业其余基金的平均水平。退出时，管理人只要达标就可以获得30%的股权。对于分文未投的企业家来说，这是一

笔不错的交易。

一些公司正在扩大该行业的规模。例如，位于波士顿的Pacific Lake Partners公司就致力于投资搜索基金，并在它青睐的行业和地区方面提供坚定不移的指导。行业专家蒂莫西·博瓦德（Timothy Bovard）在2015年成立了一个名为“搜索基金加速器”的孵化器，为有抱负的搜索基金企业家提供资金和指导，以此换取基金股权。这一行业越来越多地从私募股权的其他领域优选出最佳实践。不过，这些基金从未投资于公司组合。相反，长期的上门探访可能会引发对目标企业发自肺腑的责任感。

几十年来，搜索基金一直仅存在于美国和加拿大。搜索基金的案例激发了一些勇敢的未來企业家的欲望，近来已被纳入了欧洲的MBA课程。不过仍有充分的理由保持谨慎。大约四分之一的寻找一无所获，大约三分之一的收购以失败告终。但是，这仍然比从零开始创办企业的胜算更大。■



Private share sales

Trading places

Psst! Wanna buy some unicorn shares?

FOR tech startups, paying employees with shares makes sense. Young companies can reduce their bills and so preserve their capital; workers receive a payout which, although deferred and uncertain, is potentially far more valuable than their salary. But there is a hitch: tech firms are taking much longer to list. Their average age at initial public offering (IPO) has risen from four years during the dotcom bubble in 1999-2000 in America to 11 today. That leaves many workers pining for a payday. Inevitably, another bunch of tech startups is trying to develop a solution.

In the past, the only means of selling unlisted shares was via an informal broker, who could take months to find a buyer and charge a fee worth 30-40% of the transaction. More recently, demand for Facebook's pre-IPO shares gave rise to a first wave of secondary markets; SharesPost and SecondMarket were the two largest players

But the number of American unicorns—private firms valued at more than \$1 billion—has since jumped, from 28 in 2013 to 96 today. New secondary-market players, such as EquityZen and Equidate, have emerged, closing deals within weeks and charging about 5% to each side. They are catching on: EquityZen has handled stakes in 40 companies this year, more than double 2014's figure.

Unicorns have mixed feelings about the platforms. Many accept that their employees cannot always wait for an IPO to finance a wedding, the purchase of a house, or private education. At least half of America's 25 biggest unicorns have given permission for secondary trades. Some even approach the marketplaces to help staff sell. However, since outsiders

sometimes interpret share sales by employees as a sign of trouble, many firms reserve the right to buy back employees' shares before they are offered elsewhere.

Regulators are paying attention to this growing market. Last year, the Securities and Exchange Commission closed Sand Hill Exchange for selling retail investors complicated derivatives linked to private shares. Now the private-company stockmarkets accept only "accredited" (ie, wealthy) investors. The big question is whether the talk of a unicorn bubble proves correct. Equidate is making some of its data available to the public, and giving investors real-time updates on share values. Tech employees might face a reality check when turning shares into cash. ■



私人公司股票出售 交易场

嘿！要买点独角兽股票吗？

对于科技创业公司来说，向员工发放股票合情合理。年轻的公司可因此减少支出，保存资本；员工所得股息的潜在价值也远高于薪酬，尽管是延迟获得且存在不确定性。不过这里有个问题：科技公司从创建到上市的时间拖得越来越久。在美国1999至2000年的互联网泡沫时期，科技公司从创立到上市平均需要4年，现在已升至11年，这让很多员工对获利的日子望眼欲穿。因而另一批科技创业公司自然就要试图找出解决方法。

过去，出售未上市股份的唯一途径便是通过非正式的经纪公司，可能需要数月才能找到一个买家，而且佣金要占交易额的30%到40%。几年前，对Facebook上市前股票的需求催生了二级市场的第一波浪潮，SharesPost和SecondMarket便是其中最大的两家。

但美国独角兽公司（市值超过10亿美元的私营企业）的数量已从2013年的28家跃升至今天的96家。新的二级市场参与者已经出现，如EquityZen和Equidate。它们几周之内就能完成交易，并向买卖双方各收取5%的佣金。如今它们的生意很火爆：EquityZen今年代理了40家公司的股票买卖，比2014年翻了一番还多。

独角兽公司对这种交易平台内心五味杂陈。很多公司都明白它们的员工不能等到公司上市才拿钱结婚、买房或为孩子支付私立教育的费用。美国最大的25家独角兽公司中至少有一半都已允许其股票在二级市场交易。有些公司甚至还主动接洽交易市场，帮助员工出售股份。然而，很多局外人有时会将员工出售股票视为公司遭遇麻烦的信号，很多独角兽公司因此会在员工股票对外出售之前保留回购的权利。

监管机构也越来越关注这一快速增长的市场。去年，美国联邦证券与交易委员会（Securities and Exchange Commission）因沙山交易所（Sand

Hill Exchange) 向个人投资者出售与私人公司股票相关的复杂衍生品而对其颁布了禁令。现在私人公司股票市场只接受“经认可的”（即有钱的）投资者。关注的焦点是独角兽公司泡沫之说是否会成为现实。Equidate正在将其一些数据公之于众，并为投资者提供股票价值的实时数据更新。科技公司的员工想要将股票套现实可能需直面现实。 ■



Business schools

Campus vs beach

The full-time MBA is under pressure from specialist degrees and online education

THE CONVICTION that the secrets of commerce can be taught in a classroom, whether real or virtual, shows little sign of fading. In America, more master's degrees are awarded in business than in any other discipline—over 189,000 in the 2013-14 academic year, the latest for which figures are available. Business is the most sought-after master's qualification in the world. The majority are masters of business administration (MBA), covering a broad range of business skills, a qualification that is close to a mandatory requirement for a budding tycoon. At any one time, around two-fifths of chief executives at Fortune 500 companies are likely to hold an MBA.

Yet a fresh case study on the MBA may be in the making. Interest in the full-time variety has waned markedly in recent years. Applications to most programmes are either falling or static, according to the Graduate Management Admission Council (GMAC), an association of business schools. Data from *The Economist's* own latest ranking of full-time MBA programmes tell the same story. Five years ago, a business school on our list could typically expect to receive 17 applicants for each available full-time MBA place. This year the figure is 10.

The MBA is under pressure on two fronts; from specialist masters degrees, for example in finance or data, which are growing in popularity; and also from online education, which is quickly shedding its former, shoddy reputation. Specialist degrees are taken straight after a bachelor's degree, and appeal to today's new graduates, many of whom are still feeling the effects of the Great Recession. Unemployment among recent graduates in America is back to pre-recession levels, but underemployment is higher, at

12.6% compared with 9.6% in 2007, according to the Economic Policy Institute (EPI), a think-tank.

This has encouraged many to shelter in education for a while longer and to learn a specialised discipline. Yulia Kot, a 21-year-old graduate reading for a masters in international finance at HEC Paris, says she needed a “big push” before embarking on a career in investment banking. Because jobs in that sector are now hard to come by, she says, she has to have the specialised qualification. Big data is another growing area of study. Last year, 94% of schools that offer a masters in subjects such as business analytics saw applications rise significantly. It was big business itself that lobbied for the programmes, says Daniel Wright, vice dean of Villanova University’s business school in Pennsylvania, because firms found that traditional MBAs were falling short in areas such as statistics.

Students who take the specialist business degrees and who then start in the workforce are far less likely to want to stop five years into their job and take a full-time MBA. And recruiters, too, are less keen on hiring MBAs. Big banks, in particular, hit by the crisis, no longer run huge business-school recruiting programmes. Employers now have two main needs, say MBA experts. They are looking for people they think have leadership skills, and who can come up with ideas on strategy, but they also need graduates who can carry out specific, complex tasks. They tend to raid generalist MBA programmes for the former and specialised masters programmes for the latter.

Those bent on the generalist qualification, meanwhile, are increasingly choosing internet MBAs. These used to be thought of as a poor substitute for the real thing, offered by so-called degree factories, from which few of the thousands of business students who joined would actually graduate. But things have moved on. The very best business schools are offering online MBA programmes, and their number will grow by 9% next year,

according to GMAC. “We often mistake the fact that millennials were born digital with a desire for online formats,” says Sangeet Chowfla, the president of GMAC. In fact, millennials want the experiences that come from campus education. Online options appeal most to the older generation, who can combine them with their full-time jobs, he says.

The high cost of the traditional MBA has left it particularly vulnerable both to specialist degrees and to the online sort. Tuition fees for HEC Paris’s 16-month MBA, for example, are €58,000 (\$63,768), compared with €31,000 for its one-year masters in international finance. The return on investment—ie size of salary—from an expensive, traditional MBA has gone down since the recession.

There are online courses that cost nearly as much as their full-time cousins—the online MBA at the University of North Carolina, which comes 22nd on *The Economist’s* ranking, for example, costs \$105,000, not much lower than the flagship campus programme—but most are far cheaper. Many students enrolled on the course at the University of North Carolina are firmly attached to their jobs and would not have considered an MBA course were it not for the chance to study online. Michelle Middleton, the chief operating officer of an insurance firm in New York, says that, 28 years after she took her undergraduate degree, returning to campus for an MBA was never an option, but with the online version she was able to complete classes on planes, trains and even the beach. Her firm promoted her twice as she studied.

Critics of online programmes argue that nothing beats the immersion that a university campus offers, where students mix daily with members of faculty and with well-connected peers. It is a selling point for the best business schools. Mid-ranking institutions may be struggling to fill classes for traditional, full-time, campus-based MBAs, but those at the top have no shortage of applicants. As the number of average MBA courses expanded in

recent years, it is seen as more important to make an impression on employers by attending one of the top schools. The dean of the Tuck school at Dartmouth College, Matthew Slaughter, says that nothing could convince him, for that reason, to launch a wholly online MBA (it is a highly-ranked school).

For most in the sector, it seems inconceivable that a serious business school would not offer a full-time MBA. But over the past few years some, including ones formerly included in *The Economist's* ranking, such as North Carolina's neighbour, Wake Forest University, have abandoned their flagship campus programmes and now offer only part-time courses. More may soon depart from the traditional approach. As one old business-school saw has it, organisations must adapt or die. ■



商学院

校园 vs 海滩

全日制MBA正受到来自专业学位和在线教育的压力

无论是真是假，人们对做生意的秘诀能在教室里教授的笃信未见消减。在美国，商科所授予的硕士学位比其他学科都要多。目前已有的最新数据显示，2013至2014学年，商科硕士达到189,000人。商科是世界上最令人趋之若鹜的硕士文凭。其中大部分是工商管理硕士（MBA），涵盖了形形色色的商业技能。对于刚崭露头角的商界大亨来说，这一文凭几乎是必备条件。任何时候，财富500强公司的总裁中可能都会有五分之二的人拥有MBA学位。

不过针对MBA的一项新的个案研究可能正在酝酿之中。近年来人们对全日制MBA的兴趣明显减弱。根据商学院协会管理专业研究生入学考试委员会（Graduate Management Admission Council，GMAC）的数据，大部分课程收到的申请数要么下降要么停滞。本刊发布的全日制MBA课程最新排名也显示出相同的情形。五年前，我们榜单上的每所商学院每个全日制MBA名额通常会收到17份申请。今年的数字仅为10份。

MBA正受到两方面的压力：一方面，像金融或数据这样的专业硕士学位越来越受欢迎；另一方面，在线教育也正迅速摆脱之前粗制滥造的恶名。专业硕士学位是在获得学士学位后直接攻读，吸引了如今刚毕业的本科生——他们中的很多人还能感受到大衰退的影响。智库经济政策研究所（the Economic Policy Institute，EPI）称美国新近毕业生的失业率已经恢复到衰退前的水平，但是不充分就业率更高，从2007年的9.6%升至现在的12.6%。

这让很多人想在象牙塔中再躲避久一点，学一门专业。21岁的本科毕业生尤利娅·科特（Yulia Kot）在巴黎高等商学院（HEC Paris）攻读国际金融硕士，她说在投行开启职业生涯之前她需要被“猛推一把”。这一行现在工作机会很难找，所以她说自己不得不读个专业文凭。大数据是另一个不断

增长的学习领域。去年设有商业分析等专业硕士学位的学校中，有94%收到的申请数都大幅上升。宾州的维拉诺瓦大学（Villanova University）商学院副院长丹尼尔·莱特（Daniel Wright）称，是大公司自身在为这些课程游说，因为各公司发现传统的MBA缺乏统计学等方面的培训。

攻读专业商科学位的学生以及随后走上职场的学生更不太可能想要等工作五年后再去读一个全日制MBA。而招聘者也不那么热衷于雇佣有MBA学位的人。特别是在经济危机中遭受重创的大型银行，已不再开展庞大的商学院招聘项目。MBA专家认为雇主们现在的需求主要有两类。他们既在寻找他们认为有领导才能和雄韬伟略的人，也需要能够执行具体复杂任务的毕业生。他们往往将拥有MBA学位的多面手挖来做前者，而聘用专业硕士当作后者。

与此同时，越来越多一心想要获得通才文凭的人选择了在线MBA课程。这些由所谓的学位工厂提供的文凭曾被视为真正MBA学位的拙劣替代品，成千上万参加课程的学生只有极少数能真正毕业。但是情况已发生了变化。顶尖商学院也开始提供在线MBA课程，根据GMAC的数据，它们的数量明年将增长9%。“我们常常误以为千禧一代生来就是数字化，以为他们渴望在线的形式。”GMAC的总裁桑吉克·乔弗拉（Sangeet Chowfla）说道。实际上，千禧一代想获得的是在校教育的经历。他认为在线教育对于更年长的一代才最有吸引力，因为他们可以将之与自己的全职工作结合起来。

面对专业学位和在线教育的压力，传统MBA的高昂费用令其显得格外脆弱。例如，巴黎高等商学院16个月的MBA课程学费为58,000欧元（63,768美元），而一年制国际金融硕士的学费为31,000欧元。并且，经济衰退以来，昂贵的传统MBA的投资回报（即薪资水平）已然下降。

有些在线课程的费用与全职课程几乎相当，例如在本刊排名中列第22位的北卡罗来纳大学（University of North Carolina）的在线MBA课程费用为105,000美元，并不比该校的王牌课程低多少，但大部分在线课程都便宜很多。很多选择了北卡罗来纳大学课程的学生坚定地继续工作，如果不是有在线学习的机会，他们可能不会考虑读MBA。纽约一家保险公司的首席

运营官米歇尔·米德尔顿（Michelle Middleton）说，在获得本科学位28年后，她绝不会重返校园攻读MBA。不过有了在线课程，她就可以在飞机上、火车上甚至海边完成课业。学习期间她在公司获得了两次提拔。

在线课程的批评者称，什么也比不上浸淫在大学校园里——在那里学生能够和教职员工朝夕相处，也能和社会关系良好的同窗相交。这是顶尖商学院的一个卖点。排名居中的学校可能苦于填不满传统的全日制校内MBA班，但顶级商学院并不缺少申请人。近年来一般MBA课程的数量不断增长，上一所顶尖学校并以此给雇主留下好印象就变得更为重要。达特茅斯学院塔克商学院院长马修·斯劳特（Matthew Slaughter）说，正因如此，他绝不会同意开设完全在线的MBA课程（这所商学院排名很高）。

对这一领域的大多数人而言，一所正经的商学院若不提供全日制MBA课程也许会显得不可思议。但在过去几年里，有些商学院，包括一些曾在本刊排名中出现的学院，如北卡罗来纳大学的近邻维克森林大学（Wake Forest University），已经放弃了它们的王牌校园课程，只开设非全日制课程。更多学校可能很快会脱离传统模式。正如商学院里一句老话所说，组织要么改变，要么衰亡。■



Climate change

The burning question

With or without America, self-interest will sustain the fight against global warming

BLOWING hot and cold doesn't begin to cover it. In 2009 Donald Trump signed a public letter calling for cuts to America's greenhouse-gas emissions. In 2012 he dismissed climate change as a hoax cooked up by the Chinese. On the campaign trail he promised to withdraw from an international accord, struck last year in Paris, to fight global warming. This week, as president-elect, Mr Trump said he has an "open mind" on the Paris deal and that there is "some connectivity" between human activity and climate change.

Such fickleness gives succour to pessimists and optimists alike. Those who are gloomy about the climate still expect America to ignore or withdraw from the Paris agreement, or to abandon the 1992 UN framework that underpins it. Sunnier folk hope that Mr Trump will govern differently from how he campaigned, enabling the fight against climate change to continue unabated. The reality is more complex. Mr Trump's brand of "America First" populism will do nothing to help the planet, but neither need it be the catastrophe many fear.

| *Hot air*

First, the bad news. Even if Mr Trump honours America's commitment to the Paris accord, it is unlikely that his administration will galvanise action. Many in the Republican establishment think that climate deals are examples of global regulatory over-reach. Plenty of Mr Trump's voters dismiss climate change itself as a phoney fad peddled by "bicoastal elites". Fossil fuels stand for prosperity and freedom—from the romance of the roughneck to the lure of the road. Sure enough, on November 21st Mr

Trump pledged that on day one of his administration he would scrap “job-killing restrictions” on the production of American fossil fuels, which account for 80% of America’s man-made greenhouse-gas emissions.

The rhetoric is not the only thing that will be markedly different. The main practical way a Trump administration is likely to weaken the Paris agreement is by avoiding America’s commitments to pay large sums to help other countries cope with climate change. The burden of fighting global warming falls less on rich countries, where energy demand is stagnant and efficiency is rising, than on poor ones, where billions still lack the cheap energy fossil fuels can provide. Poor countries were won over partly by the \$100bn a year that America and others promised to help them cope. Private investors were always going to have to stump up lots of cash to fund climate-change action; the onus on them will be heavier.

This is worrying. But, on close inspection, the path to a greener future still remains open, both in America and abroad. At home there are limits to what Mr Trump’s embrace of fossil fuels can achieve. For all the trillions of dollars-worth of oil and gas that he hopes will be fracked on federal lands, no one will sink a well unless it is profitable to do so. That needs oil prices to be substantially higher than they are now. Coal, too, has been displaced by cheap shale gas rather than Barack Obama’s regulations. Even if the new administration abandons America’s Paris pledges, California has its own clean-energy mandate and will continue to set fuel-efficiency standards that other states and the car industry follow. Besides, energy investments last for decades—firms may well be loth to bet that future presidents will stick with Mr Trump’s policies.

Nor need the fight against climate change elsewhere founder in the absence of American leadership. Self-interest will see to that. China takes air pollution in its cities at least as seriously as it does climate change—a recent study found that air pollution contributed to the deaths of 1.6m

people in China each year. Switching from burning coal to cleaner forms of energy thus makes sense twice over. India needs climate action as insurance against extreme weather: it spends a fortune in the wake of storms, floods and other events.

Commercial self-interest will also keep other countries on the path towards decarbonisation. The costs of clean energy are tumbling. The cost of batteries in electric vehicles has fallen by 80% since 2008; the bill for offshore-wind energy has more than halved over the past three years in northern Europe. Solar power is closing in on gas and coal as an attractively cheap source of power. China plans to have nearly 150 gigawatts of installed solar capacity by the end of the decade, triple what it has today as the world's biggest solar generator.

Such developments will curb demand for oil and coal in decades to come. Last year was the first in which renewable energy surpassed coal as the world's biggest source of power-generating capacity (although natural gas will remain an important complement to renewables because of the vagaries of sun and wind). These are epochal changes, with moneymaking opportunities to match. China, for instance, hopes to become a clean-energy superpower by producing cheaper panels, turbines, batteries and electric cars, as well as the systems that link them all together.

| *Don't COP out*

To be clear, there is much to regret in the prospect of America relinquishing its leadership on fighting climate change. The idea of the world's second-biggest polluter free-riding on the efforts of others has some countries mulling counter-attacks—one proposal, a carbon tariff on American exports, could lead to a damaging trade war. The Paris agreement was always likely to fall far short of its goal of limiting global warming to within 2°C of pre-industrial temperatures. A more recalcitrant America puts the prospect of deep decarbonisation even further off. And evidence that Mr

Trump's America is withdrawing from its global role is worrying.

Yet with climate change, as with other areas that have come to depend on American leadership, the rest of the world can make the best of a bad situation by staying the course. China's carbon emissions may already have peaked. Improvements in cars' fuel efficiency cut oil consumption by 2.3m barrels a day in 2015, even when petrol was cheap. China, India, the European Union, Canada and others have strong incentives to embrace cleaner technologies. If they work together they can make a difference—with or without the United States. ■



气候变化

热点问题

无论美国是否参与，自身利益仍会支持他国与全球变暖斗争

忽冷忽热根本不足以形容他的态度。2009年特朗普签署了一封公开信，呼吁削减美国的温室气体排放。2012年他又将气候变化斥为中国人炮制的一场骗局。在竞选过程中，他承诺退出去年在巴黎签署的一项对抗全球变暖的国际协议。本周，作为当选总统，特朗普又称他对《巴黎协定》持“开放态度”，并且说人类活动与气候变化之间还是“有一些联系”。

这样的反复无常既帮助了悲观主义者，也支持了乐观主义者。那些感觉气候变化前景无望的人仍然预计美国会无视或退出《巴黎协定》，或者放弃支撑这一协定的1992年联合国气候变化框架。乐观的人则希望特朗普执政后的行动会和他竞选时的说法不同，使得对抗气候变化的斗争能够坚持不懈。而现实更为复杂。特朗普招牌式的“美国第一”民粹主义对帮助地球毫无用处，但也不至成为很多人害怕的灾难。

| 嘴上热闹

先说坏消息。即使特朗普遵守美国在巴黎协定中的承诺，美国政府也未必会鼓励采取行动。共和党阵营里很多人都把气候变化协议看作是全球监管过度的例子。很多支持特朗普的选民对气候变化不屑一顾，认为这是“美国东西海岸精英”鼓吹的虚假故事。化石燃料代表着繁荣与自由——从钻井工人的浪漫情怀到公路上兜风的诱惑。果然，11月21日特朗普承诺其政府一上台就会废除针对美国化石燃料生产的“不利于就业的禁令”，而化石燃料占美国人为温室气体排放的80%。

显著的不同不仅仅在口头上。特朗普政府削弱《巴黎协议》很可能采取的一大实际做法就是违背美国的承诺，不提供巨额资金帮助其他国家应对气候变化。富裕国家对抗全球变暖的负担更轻——它们的能源需求停滞，能效也正在提升，而贫穷国家里仍有数十亿人缺乏廉价的能源，这正是化石燃料所能提供的。穷国加入协议一定程度上是因为美国和其他富裕国家承

诺每年提供1000亿美元帮助它们解决问题。一直以来私人投资者都不得不拿出大笔资金支持应对气候变化的行动；他们肩上的担子会更加沉重。

这颇令人担忧。但仔细审视便可发现，无论在美国还是国外，通往更为环保未来的道路依然开放着。在美国，特朗普对化石燃料的支持所能达到的程度会受到限制。他希望从美国土地上开采出价值数万亿美元的页岩油和页岩气，但是除非有利可图，否则一口油井也没人肯挖。而这需要油价大幅高于当前的水平。煤炭也一样，它更多是被廉价的页岩气所替代，而非受限于奥巴马的禁令。即使新政府放弃《巴黎协定》中的承诺，加州也有自己的清洁能源法令，并将继续设定其他州和汽车工业也会效仿的能效标准。此外能源投资要持续数十年，企业可能不愿押注以后的总统也会坚持特朗普的政策。

即便没有美国带头，其他国家也不会放弃应对气候变化的努力。这关乎自身利益。中国对待本国城市里空气污染的认真程度至少不逊于对待气候变化——近期一项研究表明，空气污染在中国每年导致160万人死亡。因此，从燃煤转向更清洁的能源是一举两得。印度则需通过应对气候变化来防止极端天气：该国在应对风暴、洪水和其他灾害上花费惊人。

商业上的自身利益也会让其他国家坚持减少碳排放之路。清洁能源的成本正在大幅下降。自2008年以来，电动汽车所用电池的成本已经下降了80%；过去三年里，北欧离岸风电的电价已也降低了一半以上。作为一种有吸引力的廉价能源，太阳能发电的成本也在接近燃气和煤炭。中国目前已是全球最大的太阳能发电国，它计划到2020年将太阳能发电装机总量提高到150GW，相当于目前水平的三倍。

这些进展将会在未来几十年里抑制对石油和煤炭的需求。去年可再生能源首次超越煤炭成为世界上最大的发电来源（尽管由于阳光和风力的不稳定性，天然气仍将是可再生能源的重要补充）。这些是划时代的改变，随之而来的还有滚滚商机。例如中国希望通过生产更廉价的太阳能面板、风力发电机、电池和电动汽车，以及与所有这些设备配套的系统，成为清洁能源的超级大国。

| 别出尔反尔

坦白地说，美国如果放弃应对气候变化的领导权将会是一大憾事。世界第二大污染国想要搭其他国家努力的便车，这会促使一些国家酝酿反制措施。一个方法是对美国的出口征收碳关税，这可能会引发危害巨大的贸易战。《巴黎协定》一直以来可能都远远落后于其目标——将全球变暖的幅度控制在高于工业化前的气温 2°C 之内。而美国愈加抗拒的态度会令进一步削减碳排放变得更加难以实现。特朗普治下的美国有退出其全球角色的迹象，这令人担忧。

然而对于气候变化，以及其他有赖美国主导的领域内的问题，其他国家仍可坚持到底，以此来妥善应对目前的糟糕局面。中国的碳排放可能已经达到顶点。在2015年，即使油价低廉，汽车燃油效率的提高还是令日石油消耗量减少了230万桶。中国、印度、欧盟、加拿大和其他国家也有着强烈的动机拥抱更清洁的技术。如果它们通力合作，便可大有作为，不论美国参与与否。■



Pacific trade

Try, Persist, Persevere!

America's participation in TPP is over. But don't give up efforts to free trade and harmonise standards in Asia

ONE of the first casualties of Donald Trump's victory on November 8th has been the Trans-Pacific Partnership (TPP), a free-trade deal with 11 Pacific Rim countries that Barack Obama saw as central to one of his defining foreign policies—the “pivot”, or “rebalance”, to Asia. White House officials last week made clear that they will now not try to push TPP through the lame-duck session of Congress before the inauguration of president-elect Trump in January.

On the face of it, that also kills TPP for the 11 other Pacific Rim countries that signed it in February. Yet, as the leaders of the TPP countries gather in Lima on November 19th to join their colleagues at the Asia-Pacific Economic Co-operation (APEC) chat-fest, instead of burying TPP, they should try to salvage what they can from the wreckage. One job is to pursue TPP even without American participation; the other, complementary, task is for seven of the TPP countries to conclude another trade agreement they are negotiating, the so-called Regional Comprehensive Economic Partnership (RCEP).

With TPP, the temptation will be to junk it. Since improved access to the American market was its main attraction, few of the other countries will want to amend the deal so that it can proceed without America. In many places, powerful forces would celebrate its demise. In Malaysia Najib Razak, a prime minister treading water in a swamp of financial scandal, may be relieved if an unrelated but unpopular policy is magicked away. In communist Vietnam conservatives would cheer the removal of a powerful external impetus for reform. In Japan the vested interests that resisted TPP

would be comforted. Even in open countries such as Australia and Canada governments may welcome the death of a controversial scheme that voters have seen (when they have noticed it at all) as typical of the arrogance of the global elite, ploughing ahead with its secretive dealmaking.

| *TPP, not RIP*

Yet the 11 should fight to keep TPP alive. Officials toiled for a decade to produce the 6,000-page agreement. That deal is worth retaining even if, without America, its economic impact is far more modest. One reason is that the signatories of TPP have won hard-fought political battles for reforms in their own countries that are beneficial in themselves, whether America joins in or not. Vietnam has reformed labour standards, for example; in Japan TPP promises to serve as a bowstring for what Shinzo Abe, the prime minister, calls the “third arrow” of reform—the structural sort (the others are fiscal and monetary). Now that he has won parliamentary ratification, it would be a tragedy to let TPP lapse.

It is also worth keeping TPP alive in the hope that America will one day change its mind. The United States has even more reason to regret the pact’s failure than the other countries, and not just because it was designed to be the economic underpinning of America’s strategic role in Asia. Far more than other trade agreements, TPP’s focus is on removing “behind the border” barriers to trade, and harmonising standards—in intellectual-property protection, labour, the environment and so on. Since these are often the most pernicious barriers to commerce in 21st-century economies, enacting TPP will establish a healthy template for trade in Asia that could one day bind in China and America, too.

As for RCEP, it encompasses even more of the world’s population: the ten South-East Asian countries, Australia, China, India, Japan, New Zealand and South Korea. It, too, faces big obstacles—notably deep Indian suspicion of Chinese mercantilism. But its immediate benefits are more obvious than

TPP's because it is a traditional agreement covering tariff reduction; and trade between RCEP countries is subject to higher tariffs.

China's involvement (and exclusion so far from TPP) means the two pacts are sometimes portrayed as a facet of its global competition with America. But RCEP's limited ambitions mean it is neither an alternative nor, necessarily, a rival to TPP. Both should proceed—indeed, the plan has always been that they would one day merge into a vast Asia-Pacific free-trade area. TPP's travails are no reason to abandon that dream, even if that day has just moved even further away. ■



太平洋贸易

尝试，坚持，不放弃！

美国已不再参与TPP。但不要放弃在亚洲推动自由贸易并统一标准的努力

11月8日特朗普获得胜利后的首批牺牲品之一便是《跨太平洋伙伴关系》（TPP）。奥巴马曾将这一与环太平洋11国缔结的自由贸易协定视为他一项既定外交政策的中心：“重返亚太”，或“亚太再平衡”。上周白宫官员明确表示在当选总统特朗普明年一月宣布就职前，他们不会在国会的“跛脚鸭”会期间推动通过TPP。

乍看起来，这也为二月签订协定的其他11个环太平洋国家扼杀了TPP。不过，当TPP国家的领导人11月19日集聚利马，与他国首脑一起参加亚太经合组织（APEC）非正式会谈时，他们非但不该埋葬TPP，反而应当从残骸中尽力抢救它。努力之一是继续推进TPP，即便没有美国的参与；作为补充，第二项任务是由TPP国家中的七国缔结另一项正在协商的贸易协定，即《区域全面经济伙伴关系》（Regional Comprehensive Economic Partnership, RCEP）。

说到TPP，诱惑之处在于将它抛弃。由于其主要魅力就是美国放宽市场准入，其余国家中只有极少数会愿意修改协定以令协定在美国缺席的情况下也能继续推进。在许多地方都会有强大的力量庆祝它的终止。在马来西亚，总理纳吉布正在财政丑闻的泥沼中挣扎，如果一项不相干也不受欢迎的政策凭空消失，他或许会松一口气。在共产党执政的越南，保守派会欢呼，因为推动改革的强大外部动力就此消失了。在日本，抵制TPP的既得利益者会颇觉安慰。即便是在如澳大利亚和加拿大这样开放的国家，政府可能也会乐于见到这一争议计划的终结，因为选民们将其视作（如果他们真注意到的话）全球精英主义傲慢自大的典型代表，一心只为推动秘密交易。

| TPP，坚持而非埋葬

然而，11国仍应奋力让TPP存活下去。官员们辛苦十年才制定出这一长达

六千页的协定。这一协定值得继续保持，即使因美国的缺席它的经济影响会微弱得多。原因之一是TPP的签署国经过激烈的政治斗争才赢得了在自己国家改革的机会，而无论美国参与与否，这些改革对它们自身都大有裨益。例如，越南已经改革了劳工标准；在日本，TPP能够为首相安倍晋三称之为“第三支箭”的结构性改革充当弓弦（其余两支箭分别为财政和货币改革）。既然他已赢得议会批准，任由TPP终止将是个悲剧。

值得让TPP维持的另一原因是希望有朝一日美国能够回心转意。比起其他国家，美国更应当为协定的失败感到惋惜，不仅仅是因为这一协定旨在成为美国在亚洲战略地位的经济支撑。相较于其他贸易协定，TPP更加关注消除“边境内的”贸易壁垒，以及在知识产权保护、劳工、环境等领域统一标准。对于21世纪的经济体而言，这些常常是最致命的贸易壁垒，因此实施TPP将为亚洲贸易建立一个健康的模板，有朝一日也可能也会把中国和美国纳入进来。

而RCEP则涉及全球更多人口：十个东南亚国家，以及澳大利亚、中国、印度、日本、新西兰和韩国。它也面临着巨大的障碍，特别是印度对中国重商主义深深的怀疑。但是它的短期效益比TPP更加明显，因为它是一个推动降低关税的传统协定；而且RCEP国家间的贸易关税较高。

中国对RCEP的参与（以及至今为止还被排除在TPP之外）意味着这两个协定有时会被描述成它与美国全球竞争的体现。但RCEP追求的目标有限，这表明它既不是TPP的替代品，也不一定是TPP的敌手。两者都应继续，实际上计划一直都是有一朝一日它们能融合成一个庞大的亚太自由贸易区。TPP当下的阵痛不是放弃这一梦想的理由，即便那一天刚刚变得更加遥远了。■



The world's best MBA programmes

Worth it?

While many MBA programmes are feeling the pinch, life is rosy for the very best business schools. Chicago retains its place at the top of our ranking of full-time MBAs. It is the sixth time in seven years that it has taken first place. Like most of Chicago's peers, nearly all of its MBA class can expect to find a job immediately after graduation, with a basic salary well in excess of \$100,000. Such degrees do not come cheap. The average cost of tuition at the top 15 schools is \$112,000. America, the spiritual home of the MBA, dominates our list, accounting for 11 of the top 15 schools. The ranking is based on a mix of hard data and subjective marks given by students. It weights data according to what students tell us is important. The four categories covered are: opening new career opportunities (35% weighting), personal development and educational experience (35%), increasing salary (20%) and the potential to network (10%). ■



世界最佳MBA课程 值不值？

虽说很多MBA课程如今都光景惨淡，但那些顶尖商学院的前景却一片光明。在我们全日制MBA的排名中，芝加哥大学商学院仍然位居榜首，这是其七年来第六次拔得头筹。与其他多数同等层次的MBA课程一样，芝加哥大学商学院几乎所有的学生都有望一毕业就找到工作，并且基本工资超过10万美元。这样的学位读下来并不便宜。排名前15位的商学院平均学费要11.2万美元。作为MBA的“精神家园”，美国的院校在我们的排名中占据着主导地位——包揽了前15名中的11席。本排名结合硬数据及学生们的主观打分，并依据学生的意见来衡量数据的重要程度。数据涵盖的四个类别分别为：拓展新的工作机遇（占35%的权重）、个人发展及教育经历（35%）、涨薪（20%），以及建立关系网的潜力（10%）。 ■



Business in America

Vertical limit

AT&T's takeover of Time Warner should be blocked

ONE of the biggest problems facing America's economy is waning competition. In the home of free enterprise two-thirds of industries have become more concentrated since the 1990s, partly owing to lots of mergers. Fat, cosy incumbents hoard cash, invest less, smother new firms that create jobs and keep prices high. They are rotten for the economy.

Boosting competition should be a priority for whoever occupies the White House in 2017, and for Congress. Now a test case is waiting in the in-tray. AT&T, America's fifth-biggest firm by profits, wants to buy Time Warner, the second-biggest media firm. The \$109bn megadeal isn't a simple antitrust case, because it involves a firm buying a supplier, not a competitor. But there is a strong case that it will limit consumer choice in a part of the economy that is rife with rent-seeking and extend a worrying concentration of corporate power. It should be stopped.

| *Dial M for monopoly*

The business of what Americans watch and how they communicate has seen waves of change. In 1984 AT&T's national phone monopoly was broken up. In 1990-2010 the rise of the web and mobile phones led to manic dealmaking. Today people are buying fewer bundles of shows from traditional TV firms and instead viewing online, including through Netflix and Amazon. They are watching their phones more and TVs less. AT&T, which makes 80% of its sales from "pipes"—mobile and fixed broadband and voice lines—says it wants to buy Time Warner, which owns HBO and Warner Brothers, among other assets, to bulk up in the media business.

Antitrust authorities have recently blocked "horizontal" telecoms mergers,

in which a firm seeks to buy a rival. They stopped AT&T from buying T-Mobile in 2011, and Comcast, a broadband firm, from buying TWC in 2015. But they have been easier on “vertical” mergers, in which a firm ties up with a supplier—such as when pipe companies buy content firms. Comcast was allowed to buy NBC Universal, a broadcaster, in 2011, albeit with the condition that it made its content available to all its rivals and kept its pipes open to other content, so that customer choice was not hurt.

There are two reasons why trustbusters should now take a tougher line. First, the telecoms industry is already a rent-seekers’ paradise. Americans pay at least 50% more for mobile and broadband service than people in other rich countries. For each dollar invested in infrastructure and spectrum, American operators make 28 cents of operating profit a year, compared with 18 cents for European firms. That reflects the lack of competition. AT&T and Verizon control 70% of the mobile market, and are the only firms that reach 90% or more of Americans with high-speed services. Half of the population has no choice of fixed-broadband supplier. The lack of downstream competition in pipes could distort competition in upstream content.

A combined AT&T and Time Warner might seek to limit what any near-captive customers watch, for instance, thus denying other content providers viewers. Safeguards of the sort attached to the Comcast-NBC deal are not much use in practice. One way round them is “zero-rating” plans, in which pipe firms exempt some TV services from people’s monthly data caps, making them more attractive. Another is altering the placement of content in on-screen menus in order to bury rivals’ material. AT&T says this is not its aim, but why else would it pay a \$20bn premium for Time Warner?

A second concern is that AT&T-Time Warner would have vast political and lobbying power, allowing it to bend rules over time, including any antitrust remedies that it agreed with regulators. It would capture 28% of the media-

and-telecoms industry's pre-tax profits and 2% of all corporate profits, making it America's third-biggest domestic firm. Media and telecoms regulation is already intensely political, and AT&T today is no shrinking violet, being a vocal opponent of net neutrality, the rules that ensure that all online traffic is treated equally.

Precedent suggests that the trustbusters in the Department of Justice (under the auspices of the president), and not the Federal Trade Commission (a creature of Congress), will have the biggest say on the tie-up. This means the deal is being struck just as there is a change of leadership at the top. Those advising on the merger may be gambling that this makes the authorities unlikely to initiate a strong line on vertical mergers. That is all the more reason to be bold. Politicians and regulators may eventually resolve to open up the industry more, for example through "unbundling", which lets upstart firms use others' pipes. Until then they should block the AT&T-Time Warner deal and make clear that competition, not consolidation, is the way to get America's economy working better. ■



美国的商业 垂直极限

应阻止AT&T对时代华纳的收购

美国经济面临的重大问题之一就是竞争的式微。自20世纪90年代以来，这个实行自由企业制度的典型国家中有三分之二的行业都变得愈发集中，部分原因是大量的并购。臃肿而志得意满的在位企业囤积现金、减少投资、扼杀可创造就业机会的新公司并维持高昂的价格。它们对经济有着恶劣的影响。

无论谁将在2017年入主白宫，其与国会的一个首要任务都是要促进竞争。眼下收件盘里就有这么一个判例有待考量：盈利居美国企业第五位的美国电话电报公司（AT&T）欲收购美国第二大传媒公司时代华纳。这个价值1090亿美元的超大规模交易并不是一个简单的反垄断案例，因为它涉及的是一家公司要收购其供应商，而非竞争对手。但有足够证据证明，在一个已然充斥着寻租的经济领域，这起并购将限制消费者的选择，并进一步扩大令人担忧的企业权力集中。这次并购应该被阻止。

| “超完美垄断”

美国的电视媒体与通讯业曾历经变迁——1984年，AT&T电话业务在美国的垄断地位被打破；1990年到2010年间，互联网和移动电话的崛起引发了狂热的交易潮；如今，人们从传统电视公司购买的节目正在减少，并转向Netflix和亚马逊等平台在线观看节目。他们看手机的时间增加了，看电视的时间则在变少。AT&T有80%的销售额都来自“管道”，即移动通信、固定宽带以及传统电话语音业务。该公司称，此次收购时代华纳（旗下拥有HBO、华纳兄弟等其他公司），是为了壮大其媒体业务。

反垄断机构近来已阻止了一些电信企业的“横向”兼并，即一家公司试图收购竞争对手的行为。它们在2011年阻止了AT&T收购T-Mobile，并在2015年叫停了宽带网络公司康卡斯特（Comcast）对时代华纳有线（TWC）的收购。然而，它们对“垂直”兼并（即一家公司整合其供应商的行为，例如“管

道”公司收购内容公司）却向来较为宽容。2011年，康卡斯特获准收购了广播公司NBC环球（NBC Universal），尽管仍有附带条件：为使消费者的选择权不至于受损，康卡斯特所有的竞争对手都可使用其内容，其“管道”也需向他人的内容开放。

反垄断专员们如今应采取更为强硬的立场，原因有二。首先，电信行业已成为寻租者的天堂。和其他富裕国家的居民相比，美国人在移动通信及宽带服务上的花费要多出至少50%。每在基础设施及频段上投入一美元，美国的运营商就能得到28美分的营业利润。相形之下，欧洲的公司只能获得18美分。这反映出竞争的缺乏。AT&T及威讯（Verizon）控制了美国70%的移动通信市场，此外，仅这两家公司就为90%乃至更多的美国人提供了高速上网服务。有一半的人口都不能自由选择固定宽带供应商。下游的“管道”缺乏竞争或许会扭曲上游内容的竞争。

举例来说，AT&T同时代华纳联合后，任何一个几乎被“绑定”的用户所收看的内容都可能会受其限制。这样一来，其他内容提供商或许就会失去观众。康卡斯特-NBC并购交易中附加的那种防护措施在实际操作中并没太大作用，“零费率”方案便是绕过这些措施的一种方法。这一方案是指“管道”公司将一些电视服务不计入人们的月度数据流量，以增加这些服务的吸引力。另一种方法是改变屏幕菜单上内容的排布，从而埋没竞争对手提供的内容。AT&T称这并不是其想要达到的目的，那它肯为时代华纳支付200亿美元的溢价，难道还有什么别的理由吗？

第二个引人忧虑的问题是，AT&T-时代华纳或许将获得强大的政治影响力和游说能力，随着时间的推移，终会绕过一些规定，包括其与监管者达成的任何反垄断措施。该公司还将获得媒体及电信行业28%的税前利润以及美国全部公司利润的2%，从而成为美国国内第三大公司。对媒体及电信行业的监管早已沾染上强烈的政治色彩，而今AT&T更是没有一点畏首畏尾的样子，旗帜鲜明地反对网络中立性（net neutrality）这一确保所有互联网流量均获得平等对待的规则。

根据先例推测，在此次整合中拥有最高话语权的将会是司法部（向总统汇

报)的反垄断专员,而不是听命于国会的联邦贸易委员会(Federal Trade Commission)。而这笔并购交易达成之时正值最高领导层的权力更迭。那些建议两家公司合并的人赌的也许是一一在这种情形下,当局不太可能会对垂直并购采取严正立场。若真是这样,当局就更有理由采取大胆行动。政客和监管者最终也许会下决心进一步放开行业一一例如采取“拆分”的方式,允许新兴企业使用别家的管道。但在此之前,他们应阻止AT&T与时代华纳的并购交易,并让人们明白,要改善美国经济的运转,竞争才是正途,而非整合。■



Elon Musk's empire

Countdown

The entrepreneur's finances are as jaw-dropping, inventive and combustible as his space rockets

LIKE most technology tycoons, Elon Musk exudes disdain for finance. Convertible bonds and lease accounting are problems for Wall Street, while the visionaries in California focus on driverless cars and space travel. Yet while he might be loth to admit it, Mr Musk has become America's most audacious corporate financier as well as its best-known entrepreneur. In just over a decade he has created an empire valued at a cool \$44 billion despite its heavy losses (see chart). A blend of financial laboratory, corporate labyrinth and buttock-clenching thrill ride, Musk Inc has pushed the boundary of what was thought possible.

As has been the case for a decade, Mr Musk's businesses face a difficult struggle to sustain their market valuations over the next 18 months, and to bolster confidence he is expected to unveil new financial measures and also new products over the next few weeks. Mr Musk has repeatedly defied the odds. But the stakes have got bigger now that shareholders, creditors and counterparties have tens of billions of dollars at risk. Tesla, an electric-car manufacturer, must ramp up production quickly and also meet the threat from new electric models designed by traditional car firms. Mr Musk wants to merge two of his firms, Tesla and SolarCity, a company which installs rooftop solar panels. Both firms burn up cash. He already has a place in American business history, but whether as a cautionary or inspiring tale will soon become clear.

As a child growing up in South Africa, Mr Musk would enter trances in which he could imagine complex computer systems. His business can be visualised as having four parts (see diagram). The biggest one is Tesla,

which is publicly listed. SpaceX launches rockets for government and commercial clients and is financed by private investors. SolarCity is listed and struggling, so Tesla is trying to buy it in a backdoor bail-out. Lastly there is Mr Musk's personal balance-sheet. It is rich in assets—his stakes in the firms are worth \$13 billion—but he has little cash on hand.

In total Musk Inc has perhaps \$8 billion of sales, and is set to burn \$2.3 billion of cash during 2016. Its structure developed in a haphazard fashion. It includes both public and private firms, reflecting the fact that Tesla and SolarCity floated before the craze for so-called unicorns, or technology firms such as Uber that rely on private investors. Musk Inc also carries echoes of Asian and Italian business federations, which pool resources and people: SolarCity uses batteries made by Tesla, for example, and SpaceX has made loans to SolarCity. Mr Musk is the chairman of all three firms, which share some directors. His cousins manage SolarCity. Fidelity, a big asset manager, owns large stakes in each of the trio.

Mr Musk dreams of populating Mars and of hyperloops that transport people in pods between Los Angeles and San Francisco in 35 minutes. But his financial objectives are probably identical to those of carpet or chewing-gum tycoons: to raise cash, to get a high valuation and to keep control.

Consider the ways in which Mr Musk drums up cash, first of all. He has raised an epic \$6 billion of equity from investors, staff and even from Tesla's competitors (for a while, Toyota and Daimler owned stakes in the carmaker). Musk Inc also owes about \$6 billion of debt to bond investors and banks. But what sets it apart is the \$7 billion of cash and revenue that it has squeezed from unconventional sources. That includes deposits from customers before their cars are delivered; asset-backed securities and special-purpose funding vehicles that raise funds against assets without guarantees from Mr Musk's firms; emissions credits, loans from the

government and deals under which leasing firms purchase cars in return for a guarantee that Tesla will buy them back. (Mr Musk's firms dispute our total figure on their unconventional sources of funds).

| *It's lonely out in space*

The second goal, a high valuation, is vital to command confidence and for raising cash. The business itself is volatile—in April, 400,000 people pre-ordered Tesla's \$35,000 new car, the Model-3, a welcome surprise. In September one of SpaceX's rockets exploded. So the key is to control perceptions of the distant future, in order to influence financial forecasts from banks and investors. Here Mr Musk is dazzlingly skilful. He publishes plausible "master plans" and uses shifting targets to anchor expectations. For example, in May he said Tesla would make 500,000 cars a year by 2018, ahead of his previous target of 2020. It will make only about 85,000 this year.

The result is spectacular: the average of investment-bank analysts' projections says that Tesla's revenues will soar from \$7 billion to about \$30 billion by 2020, following a path like those of three of history's most successful firms, Google, Apple and Amazon, at their raciest point, in the mid-2000s. Only about a fifth of these cumulative sales are from existing customer orders, yet these medium-term bank forecasts, upon which the edifice partly rests, are stable despite operational wobbles. Incredulous short-sellers have queued up to bet against SolarCity and Tesla. But the Musk empire also has plenty of fans in Silicon Valley and on Wall Street.

The last objective, control, is key to Mr Musk, who in 2000 was ousted as the boss of PayPal, an internet-payments firm he co-founded. He owns about 50% of SpaceX, but his shareholdings in Tesla (23%) and SolarCity (22%) are near the threshold where control is no longer guaranteed.

To keep all these balls in the air, the firms must meet their targets. SpaceX

generates cash and has an impressive order book, but must recover from the explosion in September. SolarCity needs to cut costs. Tesla must ramp up production of its Model X and Model 3 cars, and compete with rival electric cars to be launched by General Motors, Daimler and Audi, among others.

If the firms fall behind, a cash crunch becomes likely. Mr Musk's companies insist they will not burn up much more money. But they could easily eat up \$4.5 billion, starting from the second half of 2016 to the end of 2018. They will also need to refinance \$2 billion of maturing debt. Against this, the Musk group has about \$5 billion of cash and liquidity lines from banks. Mr Musk's own finances look stretched. He has spent most of the \$180m in cash from selling his stake in PayPal to eBay in 2002. He has personally borrowed \$490m, secured against his Tesla shares, and most of that comes from Morgan Stanley, a Tesla underwriter. The car firm's shares would have to fall by more than half before the loans went underwater.

In the event of a squeeze, the triple objectives of raising cash, boosting the valuation and keeping control will start to conflict. The proposed SolarCity acquisition illustrates this: by getting Tesla to buy the struggling SolarCity, Mr Musk can keep it alive and maintain control. But it could hurt the valuation of Tesla, which will be lumbered with its sister firm's debt and losses. To his credit, Mr Musk has said that the independent shareholders of both firms must approve the deal.

Similarly, if Tesla were to try to ease the financial pressure by raising lots of equity, Mr Musk's stake could drop below 20%, threatening his control. He could issue non-voting shares—as Facebook has—or invoke the poison-pill provisions Tesla has in its statutes. But that might hurt the group's valuation. He could try to sell Tesla to a car or technology firm (Google almost bought it in 2013), or SpaceX, through gritted teeth, to a defence firm. But their punchy valuations mean that they would be a mouthful for

even giants such as General Motors or Lockheed Martin, a defence group.

Given all this, it is likely that in the coming weeks Mr Musk will adopt a more familiar approach: squeezing costs in the short term, dreaming up new products and explaining how lean manufacturing techniques will allow his companies to revolutionise their industries. But with expectations already sky-high, it is hard to see how much more euphoria he can inspire. Mr Musk's most extraordinary creation may not be cars or spacecraft, but a business empire with a financial structure that works only if risky companies perform perfectly on ambitious plans. Mr Musk is like an astronaut orbiting the earth with no easy way down. ■



埃隆·马斯克的帝国

倒计时

这位企业家的财务状况如同他的太空火箭一样，令人惊叹、别出心裁，且一点就着

像大多数技术大亨一样，埃隆·马斯克时时流露出对财务的鄙夷之情。可转换债券及租赁会计是留给华尔街去考虑的问题，在加州，具有远见卓识的技术先锋专注的是无人驾驶汽车及太空旅行。然而，马斯克除了是美国最知名的企业家外，也成了最大胆敢为的金融家，虽然他可能不愿承认。在仅仅十年多的时间里，他已经创建了一个价值高达440亿美元的商业帝国，尽管存在严重亏损（见图表）。作为金融实验室、企业迷宫及刺激过山车的混合体，马斯克的商业帝国已突破了人们对可为与不可为的认知界限。

正如十年来的情况一样，马斯克的企业要在未来18个月维持其估值，面临重重难关。为提升市场信心，估计他将在未来几周公布新的财务方案及推出新产品。马斯克曾多次成功扭转乾坤。但如今股东、债权人及交易对手面对的是数以百亿美元的风险，赌注大大增加。电动车制造公司特斯拉必须迅速提高产量，并应对传统汽车公司推出新电动车型带来的威胁。马斯克希望将旗下两家公司合并：特斯拉和安装屋顶太阳能电池板的SolarCity。两者都是烧钱的企业。马斯克已在美国商业史上占据一席之地，但究竟是警世反例还是鼓舞人心的榜样，答案即将揭晓。

在南非长大的马斯克孩童时会幻想打造各种复杂的计算机系统，并沉湎其中。他旗下的业务可图示为四部分（见图表）。最大一部分是已公开上市的特斯拉。SpaceX为政府及商业客户发射火箭，由私人投资者注资。SolarCity也是上市公司，但目前经营困难，所以特斯拉正欲将其并购，以进行内部纾困。最后还有马斯克的个人资产负债表，其中资产充裕（他在这些公司的股份市值高达130亿美元），但他手头并没有多少现金。

马斯克的企业帝国总销售额约为80亿美元，2016年估计将继续烧掉23亿美元。该企业帝国现今的结构是无意中形成的，既包含上市公司也有私人企

业，因为在所谓独角兽（即像优步这类依赖私人投资者的科技公司）热潮出现前特斯拉和SolarCity就已公开上市。马斯克企业帝国还体现着亚洲及意大利商业集团的影子，倾向于汇聚资源和人力：比如说，SolarCity使用的是特斯拉生产的电池，SpaceX则向SolarCity提供贷款。马斯克是这三家公司的董事长，三者的董事成员也有所重叠。SolarCity由马斯克的表兄弟管理。大型资产管理公司富达国际（Fidelity）在三家公司均持有大量股份。

马斯克梦想移民火星，并打造超级回路列车，用运输舱在35分钟内把人们从洛杉矶运送到旧金山。但其财务目标跟那些卖地毯或口香糖的商界大亨们却并无二致：募集现金、获取高估值、保持控制权。

首先，看看马斯克是怎样融资的。马斯克已从投资者、员工及甚至特斯拉的竞争对手（丰田和戴姆勒曾一度拥有该公司的股份）那里募集到惊人的60亿美元股本。马斯克商业帝国同时通过向投资者发行债券及银行贷款获取了60亿美元资金。但让它与众不同的是从非常规来源挤得的70亿美元现金及收入。这包括了购车客户预付的定金、资产担保证券及通过特殊用途融资工具无需马斯克公司担保的抵押资产融资、碳排放配额、政府贷款、租赁公司在特斯拉保证回购汽车的前提下达成的购车协议（马斯克的公司并不认同我们对其非常规资金来源的统计总额）。

| 独在太空为异客

第二个目标——高估值，这对鼓舞信心及募集资金都至关重要。业务本身是不稳定的，今年四月，40万人预订了特斯拉售价3.5万美元的新车Model-3，令人惊喜。而在九月，SpaceX的一枚火箭爆炸。所以，关键在于把控人们对长远未来的认知，这样才能影响银行和投资者的财务预测。马斯克正是这方面的高手。他发表貌似可信的“总体规划”，又不断变换目标来锚定期望。比如，在五月份，他表示特斯拉将在2018年前做到年产50万台汽车，而原本的计划是在2020年达到这一目标。而公司今年的产量仅为8.5万台左右。

结果是惊人的：投行分析师一般预测特斯拉到2020年时，营收将从目前的

70亿美元跃升至300亿美元，追随史上三大成功企业（谷歌、苹果、亚马逊）的轨迹，重现它们在2005年前后的巅峰。这些累积销售额中只有约五分之一来自现有客户订单，但尽管存在业务波动，这些中期银行预测（马斯克商业帝国在一定程度上依赖其支撑）却仍保持稳定。持怀疑态度的投资者纷纷看空SolarCity和特斯拉，但在硅谷和华尔街，马斯克商业的帝国支持者甚众。

最后一个目标——控制权，对马斯克而言是关键所在。他曾参与创立互联网支付公司PayPal，却在2000年被赶出管理层。他目前持有SpaceX约50%的股份，但他在特斯拉和SolarCity的持股已接近无法确保控制权的临界水平，分别为23%和22%。

要一切顺利，这些公司必须达成目标。SpaceX有现金收入且订单强劲，但必须走出九月份火箭爆炸的阴影。SolarCity需要降低成本。特斯拉则必须提高Model X和Model 3两款车型的产量，与通用汽车、戴勒姆和奥迪等厂商推出的竞品电动汽车一较高下。

马斯克的这些公司若在竞争中落后，就很可能会出现资金紧缩的情况。这些公司坚称将不再大笔烧钱，但从2016年下半年到2018年底，它们轻易便可消耗掉45亿美元。它们还要为20亿美元的到期债务做再融资。为此，马斯克的公司已从银行取得50亿美元的现金及流动性额度。马斯克本人的财务也一派捉襟见肘之状。他在2002年把自己在paypal的股份卖给eBay，所获的1.8亿美元现金目前已花掉大部分。他个人通过抵押在特斯拉的股份已借款4.9亿美元，这些借款大部分来自特斯拉的承销商摩根士丹利。特斯拉的股价要跌去一半以上，借款才会违约。

假如资金短缺，融资、提高估值及保持控制权这三大目标将出现冲突。拟议的SolarCity并购案突显了这一点：通过让特斯拉收购经营困难的SolarCity，马斯克可以为后者续命并保住控制权。但特斯拉将受姊妹公司的债务和亏损拖累而估值受损。但他已表态说，两家公司的独立股东必须批准这一交易。

同样地，如果特斯拉想通过大量股权融资来缓解财务压力，马斯克的股份可能下降至低于20%，这将威胁到他的控制权。他可以像Facebook那样发行无投票权股份，或启动特斯拉公司章程中的“毒丸计划”条款。但那可能影响到集团的估值。他还可以把特斯拉卖给一家汽车或科技公司（2013年时谷歌差点成为其买家），或者狠下心来把SpaceX卖给防务公司。但這些公司高昂的估值意味着，即便是像通用汽车或军火集团洛克希德马丁这样的巨头也不容易吞下。

鉴于这一切，马斯克很可能将在未来几周采取人们更熟悉的方法：短期内压缩成本，构想新产品，并宣扬其公司如何运用精益制造技术为行业带来彻底变革。但市场的期望已高至天际，他不见得还能进一步激发出多少热情。马斯克最非凡的创造也许不是汽车或航天器，而是财务结构只有在高风险公司完美实施宏伟计划时才能运作的这么一个商业帝国。马斯克就像是正在环绕地球飞行的宇航员，回归着陆却没那么容易。■



China's growth

The greatest moderation

Has any country ever grown as repetitively as China?

ON OCTOBER 19th China reported that its economy grew by 6.7% in the third quarter. It would have been an unsurprising, reassuring headline, except that China had reported exactly the same figure for the previous quarter—and for the quarter before that. This freakish consistency invited the scorn of China's many "data doubters", who have long argued that it fudges its figures. China has expanded at the same pace from one quarter to the next on numerous occasions. But it has never before claimed to grow at exactly the same rate for three quarters in a row.

Has anywhere? This growth "three-peat" is not entirely without precedent. Seven other countries have reported the same growth rate for three quarters in a row, according to a database spanning 83 countries since 1993, compiled by the Economist Intelligence Unit, our sister company. The list includes emerging economies like Brazil, Croatia, Indonesia, Malaysia and Vietnam, but also two mature economies: Austria and Spain. Indeed, Spain has performed this miracle of consistency twice. It grew by 3.1% (year-on-year) in the first three quarters of 2003 and by 4.2% in the first three quarters of 2006. Those were the days.

Contrary to popular belief, China's GDP statistics have not always been unusually smooth. Since 1993, the average gap between one quarter's growth and the next has been (plus or minus) 0.77 percentage points (see table). Fourteen countries, including America, have reported a smaller average gap. But in recent years, the zigzags in China's growth have been less pronounced. Since 2012 only France and Jordan have enjoyed more stable growth (as measured by statistical variance, a common measure of volatility) and only Indonesia has recorded a smaller average gap between

one quarter's growth and the next.

Either China's policymakers are newly successful at stabilising growth or its statisticians are newly determined to smooth the data. But if the number-crunchers are to blame, one wonders why they do not try harder to hide it. ■



中国的经济增长 最大的缓和

还有哪个国家曾像中国这样，多次以同一速度增长？

10月19日，中国公布第三季度经济增速为6.7%。这原本会是一个意料之中、令人欣慰的标题，只是中国上个季度以及再上个季度都公布了完全相同的增长率数字。这种异乎寻常的一致遭到了中国许多“数据怀疑论者”的鄙视。这些人一直认为中国在数字上弄虚作假。中国已经有很多次连续两个季度增速相同了。但此前它还从未连续三个季度公布完全相同的增速。

其他地方有过类似的情况吗？这种增速“三连同”并非完全没有先例。根据本刊的姐妹公司经济学人智库（EIU）始于1993年、涵盖83个国家的数据库，另有七个国家曾报告过连续三个季度都相同的经济增速。它们包括巴西、克罗地亚、印度尼西亚、马来西亚和越南等新兴经济体，但也包括奥地利和西班牙这两个成熟经济体。事实上，西班牙已经创造过两次这种一致性的奇迹。它在2003年前三个季度的同比增长均为3.1%，2006年前三个季度则各增长4.2%。那真是一段美好的时光。

与普遍看法相反，中国的GDP统计数字并不总是异乎寻常地平缓。1993年以来，两个季度增速之间的平均差为（正/负）0.77个百分点（见图表）。美国等14个国家公布的增速平均差均小于这一数字。但近年来，中国的之字形增长已经不再明显。2012年以来，只有法国和约旦享有比中国更稳定的增长（用一种衡量波动性的常用方法，即统计方差来测量），而且只有印尼录得比中国更小的季度增速平均差。

要么是中国的政策制定者近来在稳定增长方面颇为成功，要么就是中国的统计人员最近决定要平滑数据。但如果是数据统计人员在捣鬼，那么人们不禁纳闷，为什么他们不更努力些，好好把这一点隐藏起来呢。■



Asian deflation

Steel trap

Producer prices perk up in Asia

BESIDES being dirty and dangerous, making steel in China has been a good way to burn through money over the past few years. But in recent months, the fires from the country's blast-furnaces have started to emit the warm glow of profits. Steel prices have risen by nearly 50% this year. Production, which fell in 2015 for the first time in decades, is also up. Smelters are set for a strong recovery after losing \$10bn last year. And it is not just the steelmakers who will be pleased. Asia's central bankers can also take some comfort in the rising prices: they suggest that the threat of deflation might be receding.

Once seen in Asia as a peculiarly Japanese phenomenon, deflation spread throughout the region's factories in the past half-decade. The prices that consumers see in shops have on the whole continued to increase, albeit more gently than before. But the prices that companies charge for goods as they leave their factories' gates have dipped lower and lower. Virtually all big Asian economies, including South Korea, India, the Philippines, Taiwan and Thailand, have experienced prolonged bouts of falling producer prices.

China, the biggest economy and the centre of the deflationary spiral, recorded 54 consecutive months of declines. It broke that gloomy run at last in September, when prices increased by 0.1% from a year earlier, thanks to rebounds in the steel and coal industries. Elsewhere in Asia, producer prices are now also rising, or at least falling more gradually than before (see chart).

This turnaround should be cause for relief. Deflation is often a symptom of economic torpor. For companies, falling prices cut into revenues and make

it harder to repay debts, which are fixed in nominal terms. As companies sour on future prospects, they also pare back their investment—a potentially vicious circle. In its outlook for 2016, the Asian Development Bank (ADB) called producer-price deflation the “new spoiler” for the region. This is one forecast it would be glad to get wrong.

Still, no one is about to declare victory yet. A couple of years ago, producer prices also appeared to be edging up, when they were battered by a renewed slowdown in China’s industrial sector. The ebbing of deflation now is partly thanks to a much lower base of comparison. Oil at \$50 a barrel is still relatively cheap by the standards of the past decade, but it is two-thirds higher than the lows of January.

More promisingly, the rise in producer prices does point to vigour in the Chinese economy. A big jump in property sales ignited demand for steel, with iron ore and coal rallying alongside it. Some of the excitement is clearly speculative, with investors punting on commodities as they have in the past. Official orders to curb excess capacity in the coal industry also proved rather too effective, and led to supply shortages. The government has now shifted gears, instructing miners to increase coal production ahead of the winter, when demand for heating spikes.

Whatever the future course of prices, Asia’s half-decade of deflation has already yielded valuable lessons. It is clear that prices around the region are closely linked. Prices for commodities are, of course, global, explaining some of the similarity in inflation trends but not all of it. Researchers at the Hong Kong Institute for Monetary Research calculated that the correlation between Chinese producer prices and those of most Asian economies is very high, at about 0.7-0.9 (with 1 being a perfect correlation). A research paper for the Federal Reserve Bank of Dallas argued that the integration of the supply chain in Asia might explain the tight relationship: inflation rates are more similar in countries that trade more with each other.

Asia's long battle with falling factory prices should also affect the way that policymakers think about inflation. It is common to dwell on consumer prices, not least because of their impact on just about everyone's pocketbook. But for consumers, deflation is not necessarily bad. If, for instance, technological innovation leads to lower prices, this can create more, not less, prosperity. An ADB study examined nearly 150 years of deflationary episodes and came to a sobering conclusion. Although in many cases, consumer-price deflation has not caused a growth slowdown, producer-price deflation does indeed tend to be a big drag on investment. The message for central bankers is simple: keep a close eye on those Chinese steel mills, and hope their good fortune lasts. ■



亚洲通货紧缩

钢铁陷阱

亚洲生产者价格抬头

过去几年里，炼钢在中国除了又脏又危险以外，还是一个烧钱的好方式。但是近几个月，中国高炉里的火焰开始释放出盈利的温暖光芒。今年钢材价格上涨了近50%，几十年来首次在2015年出现下降的产量现在也在回升。经历了去年100亿美元的损失之后，冶炼厂将强劲复苏。高兴的不仅是钢铁公司，亚洲各央行的官员们也从价格回升中找到了些许安慰：他们认为通货紧缩的威胁可能正在消退。

通货紧缩在亚洲曾被认为是日本特有的现象，但过去五年已在整个地区的工厂中蔓延开来。消费者在商店里看到的价格总体上在不断上涨，尽管态势较之前温和些。而货物出厂时的公司定价则在不断降低。实际上亚洲所有大型经济体，包括韩国、印度、菲律宾、台湾和泰国，都经历了一次次旷日持久的生产者价格下跌。

作为亚洲最大的经济体及通缩漩涡的中心，中国经受了连续54个月的生产者价格下跌。这轮暗淡的衰退终于在九月被打破：得益于钢铁和煤炭行业的复苏，价格比上年同期上涨了0.1%。亚洲其他地方的生产者价格如今也在上升，或者至少比之前下降得更缓慢（见图表）。

这一转变应当会让人松一口气。通货紧缩通常是经济停滞的表征之一。对于公司来说，价格下跌减少了收入，让它们更难偿还债务，因为债务的名义价值是固定的。由于不看好未来的前景，公司也削减了自己的投资，这可能会形成一个恶性循环。亚洲开发银行在其2016年的展望中将生产者价格通缩称为该地区“新的破坏分子”。人们乐于看到这一预测是错的。

不过，现在还没人准备宣布胜利。数年前生产者价格也曾有过微升，但又受到中国工业部门新一轮放缓的重创。现在通缩处于低潮，原因之一是相比较的基数低得多。按照过去十年的标准，50美元一桶的油价已经算相对

便宜，但这比今年一月的低价位还是高了三分之二。

更让人欣慰的是，生产者价格的上涨的确表现出中国经济的活力。房地产销售的大飞跃点燃了对钢材的需求，一同上涨的还有对铁矿石和煤炭的需求。这一热潮有部分显然是投机行为——投资者在大宗商品上下注，正如他们以前所做的那样。抑制煤炭工业产能过剩的官方命令也被证明是矫枉过正，并且引发了供应短缺。政府现在已经转变思路，指示煤矿公司在冬季供暖需求高峰到来之前提升煤炭产量。

无论价格未来走势如何，亚洲五年来的通货紧缩已经给了我们宝贵的教训。这一地区的价格显然紧密关联。大宗商品的价格当然是全球化的，这解释了通货膨胀趋势的某些相似之处，但并不能解释全部。据香港金融研究中心的研究人员计算，中国生产者价格和大部分亚洲经济体生产者价格之间的相关性非常强，相关系数约为0.7至0.9（1为完全相关）。达拉斯联邦储备银行（Federal Reserve Bank of Dallas）的一份研究报告指出，亚洲供应链的一体化或许能解释这一紧密的关联：贸易往来较多的国家的通货膨胀率更为接近。

亚洲与不断下降的出厂价之间的持久战也会影响决策者对通货膨胀的看法。人们通常会始终关注消费者价格，尤其因为它们会影响几乎每个人的钱包。但是对于消费者而言，通货紧缩不一定是坏事。比方说，如果技术革新使得价格降低，这将会促进而非减少繁荣。亚洲开发银行的一项研究考察了近150年来的历次通货紧缩，得出的结论发人深省。尽管在很多情况下，消费者价格通缩并未引发增长减缓，但生产者价格通缩往往确实极大地拖累了投资。给央行官员们的启示很简单：密切关注那些中国钢厂，并希望它们能一直好运。■



Schumpeter

The business of outrage

Some Americans are getting rich by pushing politics to extremes

ONE of the gentler quips uttered by the writer and thinker H.L. Mencken was that nobody ever went broke underestimating the intelligence of the American public. By the same token, nobody ever went broke overestimating the anger of the American people. The country is in an unusually flammable mood. This being America, there are plenty of businesspeople around to monetise the fury—to foment it, manipulate it and spin it into profits. These are the entrepreneurs of outrage and barons of bigotry who have paved the way for Donald Trump's rise.

The very first of them was Rush Limbaugh who, back in the 1980s, transformed himself from a disc jockey into a radio commentator. Mr Limbaugh shook up the ossified talk-show format by dispensing with the tedious call-ins and adding anarchic humour. Soon an army of “ditto-head” followers hung on his every word. He has 13m regular listeners and hundreds of imitators, ranging from national stars such as Sean Hannity to local ranters.

The second entrepreneur of outrage was Roger Ailes, a Republican operative who teamed up with Rupert Murdoch to build Fox News. Mr Ailes took talk radio and added TV production values and 24-hour news. Mr Ailes has now left Fox News following a sex scandal. But his formula—outspoken conservative pundits (such as Bill O'Reilly and the ubiquitous Mr Hannity) plus serious journalists—continues to produce results. Fox is the highest-rated cable-news channel but is also respectable enough to host presidential debates.

The internet produced a new crop of outrage merchants. Matt Drudge got in

early with a quirky website that published material the mainstream press deemed too hot to handle. Then 9/11 and an outpouring of patriotism gave another boost to the conservative blogging industry. But the most successful of the internet generation was Andrew Breitbart. He started in journalism working for Mr Drudge, then helped Arianna Huffington set up her website and put the two experiences together to launch Breitbart News—a no-holds-barred website that spends at least as much time attacking liberal institutions as it does commenting on daily news. Mr Breitbart died of a heart attack in 2012, aged 43, but found an equally hard-edged successor in Stephen Bannon.

Messrs Limbaugh and Breitbart were quintessential examples of Clay Christensen’s “disruptive innovators”. They discovered a vast, underserved market—people who were interested in the news but who had little in common with the Ivy League university-educated liberals who dominated regular news outlets such as NPR. Mr Limbaugh used a technology that was supposed to be dying—AM radio—but which allowed him to communicate with his followers as they drove to work. Breitbart News built an audience of millions without backing from a bigger media company. Contrary to what Marshall McLuhan, a media scholar, said, what mattered was not the medium but the message.

The message that flew off the shelves was outrage. Messrs Limbaugh & Co divided the world into two camps—hardworking Americans struggling to make a living versus liberals bent on taking them for a ride. They railed at limousine liberals who preached one thing and did another. They reserved particular venom for internal traitors—RINOs (Republicans in name only) and (soft) squishes—who were constantly selling them out in return for establishment kudos. Mr Limbaugh summed up the outrage entrepreneur’s formula for success in a single phrase: “What the hell is happening out there?”

Fury can easily turn into bigotry. Mr Limbaugh called Sandra Fluke, a student who campaigned for free contraception, “a slut”. And, like drug addicts, outrage junkies require ever stronger fixes to achieve the same effect. Breitbart News, in particular, has excelled in pushing boundaries. It has employed undercover “journalists” to get people to say shameful things. It specialises in publishing items of “click bait” that have little factual basis but create an image of a world gone wild. It has provided platforms in its comment section for members of far-right hate groups who rail against immigration and Jews.

The outrage industry has clearly reached a milestone with Donald Trump’s presidential campaign. Mr Trump’s training for his reinvention as a politician was the show “The Apprentice” on NBC. He won the hearts of 13m Republican primary voters by recycling conservative media hits such as “build a wall” and “ban all Muslims”. He tried to rescue his troubled campaign by drafting Mr Bannon as his chief executive.

| *There are big bucks in bigotry*

The question in American politics is whether the milestone is the end point or another marker on a long road. Many Republicans reckon the outrage industry is a mortal threat to their party, landing them with an unelectable candidate for what should have been a winnable election. “They’re in the hate business, they’re a bunch of nuts,” Stuart Stevens, Mitt Romney’s chief election strategist, said on CNN about Breitbart. The formula may not last. The audience for talk radio and Fox News is ageing. Advertisers are reluctant to be associated with toxic content. Several mainstream brands fled Mr Limbaugh’s show after his “slut” remarks.

Yet anyone who thinks the outrage boom is finished is likely to be disappointed. If Mr Trump wins the election, America will discover what it is like to be run by the entrepreneurs of outrage. If he loses, he may turn his presidential campaign into a media empire, encompassing 24/7 Trump TV

and more. Conservative media will still have the doings of the Clinton family to help propel profits from all those who hate them. And foreign markets beckon. Breitbart News has opened offices in London, and is producing a stream of stories about Islamic terror attacks, the refugee crisis and Brexit. It plans to expand into Belgium, Germany and France. Whatever happens on November 8th, Mr Trump's presidential campaign signals that there is worse to come. ■



熊彼特

怨气的生意

一些美国人靠把政治推向极端而致富

作家及思想家亨利·路易斯·孟肯（H.L. Mencken）有这么一句还算温和的讽刺之语：没有人曾因低估美国民众的智商而破产。同样道理，也没有人曾因高估美国人的怨怒而破产。这个国家正处于怨气一触即发的非常状态。这里可是美国，有大量商人要把这股怨愤化为金钱——煽动、操纵并化之为利润。正是这些“愤怒企业家”和“偏执大亨”为特朗普的崛起建基铺路。

其中为首的当属拉什·林博（Rush Limbaugh）。在上世纪80年代，他从一名DJ摇身变为电台评论员。林博撤掉乏味的听众来电环节，加入天马行空的幽默调侃，颠覆了僵化的电台清谈节目形式，随即赢得一批“应声虫”追随，对其字字奉为圭臬。他拥有1300万长期听众及数以百计的模仿者，从肖恩·汉尼提（Sean Hannity）这样的全国明星到一些地方大嘴巴，尽在其中。

第二位愤怒企业家是共和党操盘手罗杰·艾尔斯（Roger Ailes），他曾与鲁伯特·默多克（Rupert Murdoch）合作打造福克斯新闻。艾尔斯接管了电台谈话节目，并增加了电视产品的价值和24小时新闻节目。在性丑闻曝光后，艾尔斯现已离开福克斯新闻。但他所开创的模式还在发挥作用，即敢言保守派名嘴（如比尔·奥雷利及无处不在的汉尼提）加严肃记者的模式。福克斯不但是收视最高的有线新闻频道，而且够体面，足以主办总统候选人电视辩论。

互联网制造出了新一批“怨气商人”。马特·德鲁德（Matt Drudge）在早期便打造了一个剑走偏锋的网站，发表主流媒体不敢触碰的棘手材料。911事件及之后的爱国主义热潮是保守派博客产业的又一推动力。互联网世代中最成功的要数安德鲁·布莱巴特（Andrew Breitbart）。他刚投身新闻界时为德鲁德效力，之后帮助阿里安娜·赫芬顿（Arianna Huffington）

设立网站。后来他结合这两方面的经验推出了布莱巴特新闻（Breitbart News），这是一个毫无顾忌的新闻网站，在日常新闻评论的同时还花至少同样的时间攻击自由主义机构。布莱巴特在2012年因心脏病去世，终年43岁，而其继任者斯蒂芬·班农（Stephen Bannon）同样是个强硬派。

林博和布莱巴特是学者克莱·克里斯滕森（Clayton Christensen）所谓“颠覆性创新者”的典型例子。他们发现了一个需求未被满足的巨大市场——对新闻感兴趣，但又与常春藤名校出身并主导NPR等主流媒体的自由主义者格格不入的一群人。林博运用的是被认为已日趋没落的AM广播电台，但这使他可在追随者开车上班的途中与他们交流。布莱巴特新闻无需更大型媒体公司的支持便成功发展了数百万受众。这与传媒学者马歇尔·麦克卢汉（Marshall McLuhan）的说法刚好相反。他曾表示，媒体不重要，传递的讯息才是关键。

“怨怒”正是被火速散播的讯息。林博之流把世界分为两大阵营——辛勤工作却生活艰难美国人以及一心忽悠、利用这些劳动人民的自由派。他们抨击乘豪车出入的自由派说一套做一套，对内部叛徒（名不副实的共和党人及党内温和派）更是出言毒辣，认为他们不断出卖政党利益以换取建制派的赏识。林博用一句话总结了愤怒“企业家”成功的要诀：“这到底是发生什么了？”

怨怒很容易会变成偏执。林博把倡导免费避孕运动的学生桑德拉·弗卢克（Sandra Fluke）称为“荡妇”。就像吸毒者一样，愤怒“瘾君子”的口味也是越来越重。布莱巴特新闻尤其善于突破界限。它雇用卧底“记者”诱使人们口不择言。它擅长发表“点击诱饵”类的信息——全无事实根据但却营造出一副“世界已疯”的形象。该网站的评论留言区也为抵制移民和犹太人的极右仇恨团体成员提供了言论平台。

随着特朗普的总统竞选活动，美国的“怨气生意”显然达到了一座里程碑。特朗普当年通过NBC的真人秀节目《学徒》（The Apprentice）小试牛刀，为变身政客作准备。他重拾保守媒体热衷的“修建边境墙”及“全面封禁穆斯林”论调，在共和党初选中赢得1300万的选票。他又招揽班农作为竞

选团队的首席执行官，力图扭转劣势。

| 偏执背后是大钱

这一里程碑是终点，还是漫漫长路上的又一标记？这是美国政治的问题所在。许多共和党人认为，“怨气生意”是对本党的致命威胁。明明是一场有机会胜出的大选，却落得这么一位胜选无望的候选人。“他们一心煽动仇恨，就是一群神经病。”米特·罗姆尼（Mitt Romney）的首席竞选顾问斯图尔特·史蒂文斯（Stuart Stevens）在CNN上如此形容布莱巴特新闻。这样的模式也许无以为继。电台谈话节目及福克斯新闻的受众日趋变老。广告主也不愿和偏激的节目扯上关系。在林博发表“荡妇”言论后，几家主流品牌纷纷中止对其节目的赞助。

但认为这股“怨气生意”热潮已过的人们可能会失望。假如特朗普赢得大选，美国将感受到由愤怒企业家掌权是怎样一种体验。假如败选，他可能将竞选团队变成一个媒体帝国，上演24小时特朗普电视及其他内容。保守媒体还可针对克林顿家族的一举一动，从所有讨厌他们的人身上赚钱。外国市场也在招手。布莱巴特新闻已在伦敦开设办事处，正在制作有关伊斯兰恐怖袭击、难民危机及英国脱欧的一系列新闻报道。该机构还计划扩展至比利时、德国和法国。无论11月8日的竞选结果如何，特朗普的总统竞选活动都表明，更糟的还在后头。■



Clean energy v coal

Fighting the carbs

Wind and solar advance in the power war against carbon

THE battle between clean energy and dirty coal has entered a new phase. The International Energy Agency (IEA), an industry forecaster, last week reported that in 2015 for the first time renewable energy passed coal as the world's biggest source of power-generating capacity.

The IEA, whose projections for wind and solar energy have in the past been criticised as too low, accepted that renewables are transforming electricity markets. Last year 500,000 solar panels were installed every day around the world. In China alone, home to a whopping 40% of the 153 gigawatts (GW) of global growth in renewable-energy installations, two wind turbines were erected every hour. Based on existing policies, it forecasts that from 2015-21, 825GW of new renewable capacity will be added globally, 13% more than it projected just last year.

All those new wind and solar plants will not generate electricity all the time. Unlike coal, which burns around the clock, renewables are intermittent. But the IEA expects the share of renewables in total power generation to rise to almost 28% from 21%. Government policies to curb global warming and reduce air pollution are the driving force behind the clean-energy revolution, as well as falling prices of solar panels and wind turbines. The IEA expects America to eclipse the EU to become the second-biggest market for renewables (after China) in the next few years, thanks to an extension of federal tax credits to wind and solar producers. Because electricity demand in rich countries is falling, renewables are driving out other sources of electricity. But in developing countries, they are still not being built fast enough to keep up with demand (see chart).

Lauri Myllyvirta, a Chinese-energy expert at Greenpeace, an environmental NGO, says the IEA may still be underestimating the “exponential growth dynamics” of renewables. For instance, more grid-connected solar energy was installed in China in the first half of 2016 than in the whole of last year, he says.

Yet coal is also showing surprising resilience. Earlier this year the betting was that thermal-coal prices would sink because of falling investment in new coal-fired power plants and a decline in long-term demand. Since mid-year, however, they have doubled to \$100 a tonne. The reason, again, is China. Its authorities imposed restrictions on its debt-strapped coal miners, limiting them to 276 working days of production a year, in order to push up prices. Partly because of rampant speculation in the Chinese futures market, the measures worked better than expected. Faced with an unwanted surge of imports, the government has since set out to loosen them. Yet if the rally continues, it would give a further fillip to the green brigade: higher coal prices will squeeze the margins of their dirty rivals. ■



清洁能源vs煤炭

抗击碳排放

在对抗碳排放的电力战争中，风能与太阳能一往无前

清洁能源与污染环境的煤炭之间的战斗已步入一个新阶段。上周，行业预测机构国际能源署（IEA）的报告称，2015年可再生能源首次超过煤炭成为世界最大的电能来源。

过去IEA曾因对风能及太阳能的前景预估过低而遭到批评，如今它终于承认可再生能源正在逐步改变电力市场。去年，世界各地平均每天安装50万块太阳能电池板。仅在中国，每小时就会安装两台风力发电机；此外，中国还占据了全球153吉瓦（GW）新增可再生能源装机容量的40%。IEA预测，在现有政策下，2015年到2021年间，全球可再生能源装机容量将增加825吉瓦。这一数字较其前一年的预测要高出13%。

并不是所有新增风力及太阳能发电厂都能一直发电。煤炭可以全天候燃烧，但可再生能源却不同，只能间歇性发电。然而IEA预测，可再生能源的发电比例将从占总发电量的21%上升到接近28%。政府着力抑制全球变暖、降低空气污染的政策是推动这场清洁能源革命的力量。此外，太阳能电池板及风力发电机价格下降也是一个因素。IEA预计，接下来几年美国将超越欧盟，成为世界第二大可再生能源市场（第一大是中国）。这要归功于美国政府延长了给予风力及太阳能发电设备生产商的联邦租税减免。由于富裕国家的电力需求逐步降低，其他电力来源正受到可再生能源的排挤。但在发展中国家，可再生能源的发展仍不够快，难以满足增长中的需求（见图表）。

环保领域非政府组织绿色和平的中国能源问题专家柳力（Lauri Myllyvirta）称，IEA对可再生能源的“爆炸式增长态势”也许仍有低估之嫌。他举例说，仅2016年上半年，中国太阳能并网发电系统的装机量就超过了去年全年的数字。

然而，煤炭也展现出令人惊异的坚挺。今年早些时候，由于对新建燃煤发电厂投资的减少，以及长期需求的下降，有人便押注热煤价格将会下跌。但自年中以来，热煤价格翻番，已涨至100美元一吨。这背后的原因仍然是中国。之前，为推高煤价，中国政府对债务缠身的煤炭企业加以限制，令其将全年的生产限制在276个工作日。某种程度上，因中国期货市场上投机盛行，这些举措效果比预想得要好。在此之后，因不乐见煤炭进口激增，中国政府又着手放开上述限制。然而，如果煤价继续反弹，“绿色军团”也许将进一步得到助力：煤价上涨，将会挤压其污染环境的竞争对手的利润空间。 ■



America's workers

Feel the force flow

How long can America create jobs without unemployment falling?

YOU would expect strong job growth to be accompanied by falling unemployment, but America is proving that one does not always entail the other. Over the past year, employment is up by fully 3m but the unemployment rate has stayed around 5%. In fact, a few more workers are unemployed than a year ago (see chart). The reason is that more Americans are seeking jobs. Over the past 12 months the labour-force participation rate of so-called “prime-age” workers—those between 25 and 54—is up by just under one percentage point, the fastest growth recorded since January 1989. Economists trying to spot inflation on the horizon want to know how long this trend can continue.

The recent surge in prime-age participation follows a long decline from its peak, 84.6%, scaled in January 1999. Between then and September 2015, it tumbled by an average of about a fifth of a percentage point a year. Among men, it had been falling since the mid-1960s. The long slide accelerated after the financial crisis, as laid-off workers quit the labour force in droves.

Hence the refrain of some that low unemployment is a mirage: stronger economic growth, they say, could draw plenty of folk back into work. Indeed, some 1.8m people say they want a job, but are not technically in the labour force because they have not recently looked for one. Restoring the employment-to-population ratio among prime-age workers to its pre-crisis high would require getting all these hands to work and then some: a total of at least 2.9m new jobs would be needed (or more, since the prime-age population is growing by about 0.3% a year).

This reservoir of potential workers remains untapped. Rising participation

does not reflect more Americans getting off the couch to seek work. Rather, the long-term unemployed are less likely to stop looking for a job. The probability of a worker who has been unemployed for 53 weeks or more leaving the workforce in a given month is about 25% today, down from over 30% at the end of 2015, according to Zach Pandl and David Mericle of Goldman Sachs. That more than accounts for higher participation, they say, because rejoining the workforce has become slightly less common over the same period. The newfound reluctance of jobseekers to give up may reflect the restoration in January in 22 states of strict limits on the period when the jobless can claim food stamps.

This wealth of potential workers suggests that participation could rise much further. But there are reasons for scepticism. A new paper by Alan Krueger of Princeton University finds that participation is only loosely connected to short-term swings in the economy. Instead, Mr Krueger identifies several underlying factors holding it down. For instance, even within the prime-age bracket, the population has been ageing. Those aged 45-54 have long been less likely to work than those aged 25-34. And prime-age men outside the workforce are in startlingly bad health. Nearly half of them take painkillers daily; 34% report at least one disability (though only 25% receive disability benefits). A vast majority say that their disability is a barrier to employment.

An unpublished paper by Mark Aguiar at Princeton University and three co-authors suggests another potential obstacle: that better video games could be luring young men away from work. Mr Krueger reports that among men aged 21-30 “idleness”—meaning not working, seeking work or studying—rose by 3.5 percentage points between 1994 and 2014. Over the past eight or so years, the time young men outside the labour force spent gaming rose from 3.6 to 6.7 hours per week.

Any of these forces could halt the recovery of participation, but it is hard to

know whether they will. Messrs Pandl and Mericle think the remaining slack in the labour market is equivalent to only 0.5% of the workforce. But their estimate has been roughly flat since early 2016, suggesting the economy's speed limit is not being tested. Until it is, the Federal Reserve, which is pondering raising interest rates, should let employment keep growing strongly. ■



美国的工人

感受力量的流动

在失业率不下降的情况下，美国还能创造就业多久？

你也许认为就业的强劲增长会伴随着失业率的下降，但美国的情况证明这两者并不总是相伴相生。过去一年就业人数足足增加了300万，可失业率还是保持在5%左右。事实上，现在的失业人数比一年前还多了一些（见图表），原因是更多的美国人在找工作。在过去的12个月里，所谓“核心”劳动力（25岁至54岁的人）的劳动参与率提高了将近一个百分点，这是1989年1月以来的最快增速。试图辨认通胀即将到来迹象的经济学家们想知道，这一趋势能持续多久。

在经历最近的飙升之前，核心劳动力的参与率在1999年1月达到84.6%的峰值后曾长期下行。从那时到2015年9月，该指标平均每年下跌大约五分之一个百分点。从上世纪60年代中期起，男性人口中这个指标一直在下滑。金融危机后，随着一批批下岗工人退出劳动大军，这种长期下滑更是加快了。

因此一些人反复表示，低失业率是一种幻象。他们说，强劲的经济增长能吸引许多人重返职场。的确，大约180万人表示自己想要一份工作，但严格来说他们并不在被统计的劳动力之列，因为他们最近没有去找工作。想让核心劳动力的就业参与率恢复到危机前的高位，就得让所有这些人、而不只是其中的一部分去工作。而这将至少需要总计290万个新职位（或者更多，因为核心劳动力人口每年大约增长0.3%）。

这一潜在的劳工群体一直未被开发。参与率上升并非表明有更多的美国人离开了安逸的沙发去找工作，而是长期失业者停止找工作的可能性更小。据高盛集团的扎克·潘德尔（Zach Pandl）和大卫·梅里赛尔（David Mericle）研究，在某个月内，失业53周或以上的工人离开劳动大军的几率目前约为25%，而在2015年底则是30%。他们认为，这不只解释了更高的参与率，因为同一时期内重回就业队伍已变得不那么常见。最近这种求职

者不愿放弃找工作的现象，还可能反映了一月份有22个州恢复对失业者申请食品券期限的严格限制。

这么多的潜在工人表明，参与率可能会进一步提升。但也有理由对此感到怀疑。普林斯顿大学阿兰·克鲁格（Alan Krueger）的一篇新论文发现，参与率与短期经济波动只有松散的关联。克鲁格反而发现了一些压低参与率的潜在因素。例如，即使在核心劳动力的年龄段内，人口也在老龄化。45岁至54岁的人工作的可能性一直都低于25岁至34岁的人。而且，未参与就业的核心年龄段男性的健康状况差得惊人。他们中近一半每天服用止痛药；34%有至少一种残疾（但只有25%领取伤残津贴）。绝大多数人表示，他们的残疾妨碍了就业。

普林斯顿大学的马克·阿吉利亚（Mark Aguiar）和其他三位合著者在一篇尚未发表的论文中提出了另一个潜在障碍：更好玩的电子游戏可能会诱使年轻人远离工作。克鲁格表示，在21岁至30岁的男性中，处于“闲散”状态（即没有在工作、找工作或学习）的比例在1994年至2014年间上升了3.5个百分点。在过去八年左右的时间里，未参与就业的年轻人每周花在游戏上的时间从3.6小时增至6.7小时。

这些力量中的任何一股都可能阻止参与率的复苏，但很难知道它们是否会发挥作用。潘德尔和梅里赛尔认为，劳动力市场中剩余的未就业人口仅相当于劳动力的0.5%。但他们的估算从2016年初以来就一直基本持平，这表明经济的限速尚未经受考验。在其受到考验之前，正在考虑加息的美联储应该保持就业的强劲增长。■



Private Equity

The barbarian establishment

Private equity has prospered while almost every other approach to business has stumbled. That is both good and disturbing

THIS year Henry Kravis and George Roberts, the second “K” and the “R” of KKR, celebrated their 72nd and 73rd birthdays, respectively. Steve Schwarzman, their equivalent at Blackstone, turned 69; his number two, Hamilton James, 65. In the past few months David Rubenstein, William Conway and Daniel D’Aniello, the trio behind and atop Carlyle, turned 67, 67 and 70. Leon Black, founder and head of Apollo, is just 65.

These men run the world’s four largest private-equity firms. Billionaires all, they are at or well past the age when chief executives of public companies move on, either by choice or force. Apple, founded the same year as KKR (1976), has had seven bosses; Microsoft, founded the year before, has had three. On average, public companies replace their leaders once or twice a decade. In finance executives begin bowing out in their 40s, flush with wealth and drained by stress.

The professional longevity of the private equiteers—whose trade is the use of pooled money to buy operating companies in whole or in part for later resale—is thus rather remarkable. But do not expect to see a lot of fuss made about it. Since the uproar over a lavish 60th birthday party for Mr Schwarzman on the eve of the financial crisis (guests were entertained by his contemporary, Rod Stewart), such celebrations have become strictly private affairs. At KKR there has been little fuss over the company’s 40th anniversary—a striking milestone, given the fate of the institutions that previously employed the big four’s founders: Bear Stearns (gone), Lehman Brothers (gone), First National Bank of Chicago (gone) and Drexel Burnham Lambert (gone). The company has announced a programme encouraging

civic-minded employees to volunteer for 40 hours.

| *Out of the private eye*

There are good reasons for this low profile. The standard operating procedures of private equity—purchasing businesses, adding debt, minimising taxes, cutting costs (and facilities and employment), extracting large fees—are just the sort of things to aggravate popular anger about finance. Investors in private-equity firms (as opposed to investors in the funds run by those firms) have their own reasons to withhold applause. All of the big four have seen their share prices fall over the past year; Blackstone, Carlyle and KKR are all down more than 20%. Apollo, Blackstone and Carlyle trade for less than the prices at which their shares initially went public years ago (see chart 1). First-quarter earnings were bleak, though things have picked up a little since.

A chief executive in any other industry with challenging public relations, poor profits and a depressed share price would have a list of worries. There would be a restive board, a corporate raider, and possibly—ironically enough—a polite inquiry from a private-equity firm. Perhaps in the deep corporate waters such concerns are percolating; there may even have been a redundancy or two. But on the surface, things seem placid. There has been nothing like the rending of garments that would be seen if an investment bank were going through a similarly rough patch. The unusual design of private equity makes it resistant to all but the most protracted turbulence; its record redefines resilience.

It is not just that old private-equity firms persist; new ones continue to spring up at a remarkable rate. According to Preqin, a London-based research house, there were 24 private-equity firms in 1980. In 2015 there were 6,628, of which 620 were founded that year (see chart 2). Such expansion looks all the more striking when you consider what has been happening elsewhere in business and finance. In America, for which there

are good data, the number of banks peaked in 1984; of mutual funds in 2001; companies in 2008; and hedge funds, probably, in 2015. Venture-capital companies are still multiplying; but they are effectively just private equity for fledglings.

Private equity's vitality has seen it replace investment banking as the most sought-after job in finance. This is as true for former secretaries of the treasury (Robert Rubin departed the Clinton Administration for Citigroup; Timothy Geithner the Obama Administration for Warburg Pincus) as it is for business-school students. Some investment banks now pitch themselves to prospective hires as gateways to an eventual private-equity job. If banks resent their lessened status, they respond only with the kind of grovelling deference reserved for the most important clients. The funds made deals worth \$400 billion in 2015 (see chart 3). The fees they pay each time they buy or sell a company provide a fifth of the global banking system's revenues from mergers and acquisitions.

The growth of private equity has been so strong it has a bubblish feel. "The existing number of private-equity funds won't be topped for 20 years, if at all," predicts Paul Schulte, head of a research firm in Hong Kong that carries his name. His sentiments are shared, if quietly, by many in the industry as well as outside it, and there is good reason for them. But there is also good reason to believe that the expansion will continue, at least for a while, if only because it is very hard for the money already in the funds to get out.

Private-equity investments are sometimes liquidated and investors repaid. Firms can even be wound down. But investors in private-equity funds are called "limited partners" for good reason, and a key limitation is on access to their money. The standard commitment is for a decade. Getting out in the interim means finding another investor who wants to get in, so that no capital is extracted from the fund. That usually comes with off-puttingly large transaction costs.

| *Billion-dollar roach motels*

The contrast with the alternatives is stark. Clients who want to withdraw money from a bank can do it on demand, from a mutual fund overnight, from a hedge fund monthly, quarterly, annually, or in very rare cases, bi-annually. It is because of the speed with which money can flee them that banks receive government deposit insurance; it shields them from market madness. It is because investors can get out that hedge funds suffering a spell of poor performance can find themselves collapsing even though they have investments that might, given time, pay off handsomely.

The stability that their never-check-out structure provides has enabled private-equity firms to assemble enterprises of enormous scale. Look at the companies themselves and this is not immediately apparent. The market capitalisation of the big four is about \$50 billion, which would barely break the top 100 of the *Fortune* 500; between them they employ only about 6,000 people. But the value and economic importance of the businesses held by their funds (which are owned by the limited partners, rather than being company assets) are far greater. The 275 companies in Carlyle's portfolios employ 725,000 people; KKR's 115 companies employ 720,000. That makes both of them bigger employers than any listed American company other than Walmart.

The big four have by far the largest portfolios, but others such as TPG, General Atlantic and Mr Geithner's Warburg Pincus have a long list of familiar businesses that they either used to own or still do. According to Bain, a management consultancy, in 2013 private-equity-backed companies accounted for 23% of America's mid-sized companies and 11% of its large companies.

Not long ago most of those companies were owned by armies of individual stockmarket investors—a system seen as both beneficial to business and befitting a capitalist democracy, and as such one that other countries

sought to replicate. Private equity's deployment of chunks of capital from holders of large pools of money has severely dented that model. And this, too, is being replicated abroad. Only half of the world's private-equity firms, and 56% of their funds' assets, are American. A quarter of private-equity assets are in Europe. There are funds in Barbados, Botswana, Namibia, Peru, Sierra Leone and Tunisia.

The rise of private equity has always been subject to scepticism. When KKR launched the first big private-equity takeover, of RJR Nabisco in 1988, it and its cohorts were described in a bestselling book as the "Barbarians at the Gate". Success, adroit public relations and strategic philanthropy have tempered these concerns, and political donations probably haven't hurt, either. But the industry's limitations are still apparent, and current conditions are exacerbating them.

Private equity is structured around a small group of selective investors and managers whose efforts are magnified by the heavy use of leverage in the businesses that the funds control. This is an inherently pricey set-up. Investors need higher returns to offset illiquidity; interest costs are high to offset the risk that comes with leverage; managers who have demonstrated the skills needed to design these arrangements and to maintain strong relationships with providers of capital demand high fees.

During the industry's growth some of these costs were ameliorated by a long-term decline in interest rates, which enabled deals to be periodically refinanced at lower rates. Today rates can hardly go any lower, and should eventually rise. This is one of the reasons Mr Schulte and others see little growth to come.

| *Political positions*

Another change is that banks which are under orders to curtail the risks that they face are reducing the amounts available for highly leveraged deals.

That means borrowing will cost more. To see how that could throw a wrench into the system, look at the brief stretch between September 2015 and this February. The average yield on sub-investment grade, or “junk”, bonds jumped from 7% to 10%. Transactions all but ceased. The value of assets held by private-equity firms with any public stub had to be written down, resulting in those poor first-quarter results. Money was suddenly unavailable for new deals. Carlyle’s purchase of Veritas Technologies, announced just before the crunch, almost failed to close and was saved only after a renegotiation that led to a lower price and lower leverage.

The political environment, too, may be changing. The industry benefits from two perverse aspects of the tax code—the incentive it provides for loading up companies with debt, and the reduced rate of tax the general partners benefit from owing to most of their personal income being taxed at the rate applied to capital gains. There are strong arguments for reform under both heads. In the second of the two cases a change looks quite likely.

There is also a broader political risk, identified in a paper published in January by professors at New York University and the Research Institute of Industrial Economics, a Swedish think-tank, called “Private Equity’s Unintended Dark Side: on the Economic Consequences of Excessive Delistings”. As companies shift from being owned by public shareholders to private-equity funds, direct individual exposure to corporate profits is lost. The public will become disengaged from the capital component of capitalism, and as a consequence will be ever less likely to support business-friendly government policies.

Another far-reaching question to consider is that sometimes the only truly “private” thing about private equity seems to be the compensation structure. The money within the funds is to a large extent either directly tied to public institutions (sovereign-wealth funds and municipal

pensions), or, as a matter of public policy, tax-exempt (private foundations and school endowments). This irks both those who yearn for truly private markets and those dismayed at seeing public policy arranged so as to enrich particular groups of private citizens. The implicit tie between the allocation of funds, investments and the state creates a breeding ground for corruption and crony capitalism.

| *The madding crowd*

The largest threat to the industry, though, comes not from its critics but its success, and those who seek to emulate it. According to Bain, the share of America's mid-sized companies controlled by private equity tripled between 2000 and 2013; for large companies it increased more than fivefold (see chart 4). That doesn't mean private equity is running out of road quite yet; but it does suggest that opportunities will get more scarce.

At the same time other kinds of entities with access to cheap and often state-related capital have entered the buy-out market, including Chinese multinationals (financed by state banks), sovereign-wealth funds and pension funds that want to invest directly, such as the Ontario Teachers' Pension Plan. That means more competition for new deals. In 2007 private-equity firms were responsible for 28% of the purchases of mid-sized health-care companies, according to Bain. In 2015 their share was only 8%. The trend has been similar, if not so pronounced, in the acquisition of retailers and companies involved in technology and consumer products. It is "the roughest environment for private equity I've ever lived in," Joshua Harris, a co-founder of Apollo, told attendees at a Milken conference in early May.

This may go some way to explaining the amount of money private-equity firms have on hand—their so-called "dry powder". Prequin puts the current pile at over \$1.3 trillion. Adjust for the leverage applied in private-equity deals (say two-to-one) and that sum by itself would account for roughly 70% of the value of acquisitions carried out in 2015. If fertile fields

beckoned, the amount of available cash would be shrinking, not rising. A confirmation of tight conditions comes from the willingness of the largest private-equity firms to look further afield for new opportunities.

Blackstone now has larger investments in property, \$103 billion, than private equity, \$100 billion (plus an additional \$112 billion in hedge funds and credit). Less than half of Carlyle and KKR's invested assets are now in corporate equity, and just one-quarter of Apollo's.

Competition has had an impact on fees, too. A decade ago the standard formula was a 2% annual management fee and 20% of profits. These are still the terms quoted. In reality, though, management fees have fallen to about 1.2%, according to one large firm—similar to what a plebeian mutual fund charges. The 20% slice of profits remains; but some clients are now allowed to “co-invest”, matching the stake in a company they buy through a fund with a stake bought directly. That reduces the fees on the deal.

All good reasons for doubt. But although that mountain of dry powder may betoken a lack of opportunities, it also shows that there is a lot of money still eager to get in. Whether that is wise is not clear. The lack of daily pricing, used to assess mutual funds and, often, hedge funds, introduces doubt into the discussion of private-equity results. The “internal rate of return” measure that private-equity companies tout can be fudged. This makes academic assessments of performance hard.

This July, in an update of a previous study*, business-school professors at the Universities of Chicago, Oxford and Virginia found that, although in recent years buy-out funds had not done much better than stockmarket averages, those raised between 1984 and 2005 had outperformed the S&P 500, or its equivalent benchmarks in Europe, by three to four percentage points annually after fees. That is a lot. Ludovic Phalippou, also of Oxford, is more sceptical; he argues that when you control for the size and type of asset the funds invest in, their long-term results have never looked better

than market-tracking indices. That said, getting the same size and type of assets by other means is not easy.

The average return, disputed as it may be, does not tell the whole story. Studies find some evidence that private-equity managers who do well with one fund have been able to replicate their success (though again the effect seems to have decreased in the past decade). The biggest inducement to invest may simply be a lack of alternatives. Private equity's current appeal rests not on whether it can repeat the absolute returns achieved in the past (which for the big firms were often said to be in excess of 20% annually) but on whether it has a plausible chance of doing better than today's lacklustre alternatives. This is a particular issue for pension funds, which often need to earn 7% or 8% to meet their obligations.

The standard explanation for why private equity might be expected to outperform the market is that it can ignore the dictates of "quarterly capitalism"—meaning impatient investors. This is not particularly convincing. The people who work for private-equity firms are a caffeinated bunch. During volatile times they often require constant updates on their portfolio companies' results, and can intervene to quash even the most trivial use of cash.

What does differ, though, is focus. Private-equity funds, the boards they put in place and the top managers who work for them all tend to concentrate on underlying performance to the exclusion of almost everything else. Public companies face a mountain of often incomprehensible or conflicting regulatory demands that are not relevant to performance; that delisting has risen in step with such demands seems unlikely to be a coincidence.

Disclosure requirements, in many ways the most appealing characteristic of the public company for investors, have come to constitute a legal

vulnerability. A sharp drop in a company's share price can prompt litigation based on the idea that investors caught in the downdraft were unaware of a possible risk. So too could any internal discussion of a potentially controversial issue, as reflected by the New York attorney general's investigation into ExxonMobil's lack of disclosure on the risks associated with climate change.

Law is not quite the same sport outside America. But the ways that capital markets operate (or fail to) elsewhere provide other opportunities for private equity to outperform. In China, for example, the term structure for bank loans is only one year, and seeking the longer-term funding offered by a public offering means joining a government-controlled queue. Private-equity financing can be arranged in short order, with money coming in, and out, depending on the needs of the business.

A recent working paper published by Harvard Business School** summarises the possible benefits of private-equity ownership: the substitution of debt for equity, thereby reducing taxes and magnifying profits; compensation structures that provide huge incentives to management for increasing benefits; the addition of new expertise; and transactional dexterity. Perhaps the most compelling point is speed. The upper managements and boards of firms the funds acquire are typically replaced within months. Purchases are done at what are perceived to be opportune moments. So too are sales and refinancings. When the public markets are cool, as has recently been the case, private-equity funds resist relisting holdings or taking on new credit, and may choose to repay some loans. When markets become accommodating, the flows reverse.

Public companies could do much of this, too. They tend not to, perhaps because their inner workings are more open to inspection and criticism. Sometimes they bring in private equity to do what they would not. After acquiring Kraft and Heinz in deals that a Brazilian private-equity firm, 3G

Capital, also took part in, Warren Buffett of publicly traded Berkshire Hathaway explained things like this in his annual report: “We share with [3G] a passion to buy, build and hold large businesses that satisfy basic needs and desires. We follow different paths, however, in pursuing this goal. Their method, at which they have been extraordinarily successful, is to buy companies that offer an opportunity for eliminating many unnecessary costs and then—very promptly—to make the moves that will get the job done.” Berkshire, it appears, with its annual meetings featuring happy shareholders applauding a jovial peanut-brittle-munching chief executive, outsourced the hard decisions to a less exposed firm happier to take them.

There are other reasons for public companies and private equity to cooperate. In 2015, when GE undertook a massive reduction in its finance arm, a quarter of the more than 100 transactions that quickly unfolded involved private-equity firms. There were only three public offerings. As well as being speedy, private equity is innovative. When Walgreens Boots, a health-care company, sold a business providing intravenous fluid treatments to Madison Dearborn, a private-equity firm, it was able to retain a significant (if undisclosed) stake. This sort of transaction, which lessens the embarrassment of selling too cheap something which goes on to be a success, is referred to on Wall Street with a pejorative term that can be roughly translated as “sucker insurance”.

| *They were a kind of solution*

Given the flexibility private equity displays, the time may come when there are fewer questions about why a company is held in a private-equity structure rather than a public one. Less taxation, fewer operating constraints and less legal vulnerability are all attractive. There are political risks: structures which skew their benefits to the privileged are always subject to popular backlashes. But that potential vulnerability is also a

source of strength. Raise your money from the very wealthy and asset-rich, and from institutions such as the pension funds of state governments and municipal workers, sovereign-wealth funds and universities with large endowments, and you get a certain clout.

In theory, there should be a cost to such privilege. Public markets are inclusive and deep; they should provide capital efficiently (meaning inexpensively and intelligently) and should, as a result, be the best solution for both companies and investors. They should thus outperform the competition. Alas, at the moment it seems that internal and external constraints on public companies are holding that performance in check. The result is that the old lions of private equity, and their many cubs, could be making themselves ever more comfortable for decades to come.

* “How do Private Equity Investments Perform Compared to Public Equity?”, Robert Harris, Tim Jenkinson and Steven Kaplan, *Journal of Investment Management*, 2016.

** “What Do Private Equity Firms Say They Do?”, Paul Gompers, Steven Kaplan and Vladimir Mukharlyamov, Working paper, *Harvard Business School*, 2015. ■



私募股权基金

蛮族集团

私募股权基金蓬勃发展，而几乎所有其他经营方式都步履维艰。这既是好事，也令人不安

今年，亨利·克拉维斯（Henry Kravis）和乔治·罗伯茨（George Roberts）分别庆祝了72岁和73岁生日。他们的姓氏即是“KKR”这家公司名字中第二个“K”和“R”的来源。在黑石集团中拥有同样地位的史蒂夫·施瓦茨曼（Steve Schwarzman）今年69岁，而二号人物汉密尔顿·詹姆斯（Hamilton James）也65岁了。在过去的几个月中，凯雷集团（Carlyle）背后和塔尖的三巨头——大卫·鲁宾斯坦（David Rubenstein）、威廉·康威（William Conway）和丹尼尔·达尼埃洛（Daniel D'Aniello）分别满67岁、67岁和70岁。阿波罗（Apollo）的创始人和老板莱昂·布莱克（Leon Black）则刚刚65岁。

这些人经营着世界上最大的四家私募股权基金公司，个个都是亿万富翁。到了他们这把年纪，无论是自主选择还是被逼无奈，上市公司的首席执行官们都准备或者早已衣锦还乡。与KKR同年创办（1976年）的苹果公司已经换了七任老板，再早一年成立的微软则换过三任。平均而言，上市公司每十年要换一到两次领导人。金融业的高管40多岁就逐步退隐，赚得盆满钵满却也因压力而精疲力竭。

这样看来，私募股权基金从业人士（他们的工作是募集资金，全部或部分购买运营公司以备日后转售）的任职年限如此之长令人称奇。不过不要指望他们对此大做文章了。施瓦茨曼在金融危机前夕举办的60岁奢华生日派对（请到了与他同时代的罗德·斯图尔特【Rod Stewart】为宾客助兴）备受指责，这样的庆祝现已变成了绝对秘密的活动。在KKR，公司成立40周年这样引人注目的里程碑也没有多少动静，大概是考虑到那些曾经雇佣了四大私募股权基金创始人的机构的命运：贝尔斯登（倒闭了）、雷曼兄弟（倒闭了）、芝加哥第一国民银行（倒闭了）和德崇证券（倒闭了）。该公司已经宣布了一项计划，鼓励富有公民意识的员工参加40小时的志愿工

作。

| 私人视角

它们保持低调是有理由的。私募股权基金的标准运作流程——收购公司，增加债务，尽量少缴税，削减成本（以及设施和员工），攫取大额收费——恰恰是那种让民众对金融业的愤怒情绪火上浇油的事。投资于私募股权基金公司（而非私募股权基金所管理的资金）的投资者不愿喝彩则另有原因。去年，四大私募股权基金的股价齐齐下跌，黑石、凯雷和KKR的跌幅均超过20%。阿波罗、黑石和凯雷的股价还不及多年前初上市时的价格（见图表1）。几家公司第一季度的收益业绩黯淡，不过之后稍有起色。

换做其他任何行业，要是公关不佳、利润惨淡、股价低迷，首席执行官该要担心的东西会有一长串。董事会心存不满，会有人购股夺权，讽刺的是，还可能会有私募股权基金礼貌地上门询价。也许在企业世界的深水中这些担忧会不断渗透，甚至还会有一两个高层被炒。但在表面上，一切似乎波澜不惊。如果投资银行也经历这样的困境，绝对会看到大打出手的情况发生。私募股权基金不同寻常的设计，使得它能够承受动荡——除非动荡实在太过漫长。它的历史让人重新认识到什么叫做韧性。

不光是老牌私募股权基金公司依然坚挺，新基金也继续以惊人的速度涌现。总部位于伦敦的研究机构Preqin称，1980年时有24家私募股权基金公司，到2015年则有6628家，其中620家在当年成立（见图表2）。如果考虑到其他商业和金融领域内发生的情况，这样的扩张就更加令人瞩目。美国的数据比较完整，我们看到银行数量达到顶峰是在1984年，共同基金是在2001年，公司是在2008年，而对冲基金也许是在2015年。风险投资公司仍在迅速涌现，不过它们基本上就是投资初创小公司的私募股权基金。

私募股权基金取代投资银行成为最抢手的金融工作，足见其生命力。无论对美国前财政部长（罗伯特·鲁宾离开克林顿政府后去了花旗集团，蒂莫西·盖特纳则离开奥巴马政府去了华平投资）还是商学院学生而言，都是如此。一些投资银行在向潜在雇员宣传时，会自我标榜为通往私募股权基金工作的途径。如果银行对自己身份降低心怀怨恨，它们唯一的回应就是

那种只有在面对最重要的客户时才有的卑躬屈膝式的尊重。这些基金在2015年达成的交易价值4000亿美元（见图表3）。它们每次购买或出售公司时所支付的费用，占到了全球银行体系从并购中所获收入的五分之一。

私募股权基金的增长如此迅猛，让人感觉其中存在泡沫。“现有的私募股权基金数量在未来20年都不会突破，如果真有突破的那一天的话。”保罗·舒尔特（Paul Schulte）说。他是香港一家同名研究机构的负责人。许多业内外人士都持同样的观点（也许并未说出来），而且这也确有道理。但我们也有充分的理由相信扩张将持续，单单考虑到已经投入基金的资金很难脱身，扩张也至少会持续一段时间。

私募股权基金的投资有时会被清算并偿还投资者，公司甚至也会关门。但私募股权基金的投资者被称为“有限合伙人”是很有道理的——一个关键的限制就是对撤资的约束。标准的出资承诺是十年。若想中途撤资就得找到另一个想要进入的投资者，从而保证基金中的资金不会减少。这通常涉及高额的交易成本，令人望而却步。

| 十亿美元的蟑螂旅馆

私募股权基金与其他投资品形成了鲜明的对比。客户从银行取钱可以随用随取，从共同基金取钱需要一天时间，从对冲基金取钱则可以每月、每季、每年进行，或在极少数情况下，每两年取一次。正是因为资金可能迅速逃离，银行会获得政府存款保险，使之免受疯狂市场的影响。正因为投资者可以撤资，一段时期内表现不佳的对冲基金可能面临崩溃，即使它们的投资假以时日也许会带来丰厚的回报。

无法退出的结构所带来的稳定性，使私募股权基金公司得以聚合规模庞大的企业。单看公司本身还不是很明显。四大私募的市值大约为500亿美元，勉强能够挤进《财富》500强的前100名，它们一共也只雇用了大约6000人。但这些基金所持有的企业（为其有限合伙人所有而非公司资产）的市值和经济重要性则要大得多。凯雷投资组合中的275家公司雇用了72.5万人，KKR投资的115家公司雇用72万人。这使得这两家公司雇用的人数比除沃尔玛以外的所有美国上市公司都要多。

迄今为止，四大私募股权基金的投资组合最大，但其他如TPG、泛大西洋投资集团（General Atlantic）和盖特纳的华平投资（Warburg Pincus）都曾经或仍然持有许多大家熟知的公司。贝恩管理咨询公司的报告称，2013年，由私募股权基金支持的公司占美国中型企业的23%，大型企业的11%。

不久前，这些公司大部分都为大批股市散户所有——人们认为这种体制既有利于企业，也与资本主义民主相称，因此其他国家也试图复制这一体系。而私募股权基金则调配来自于庞大基金池所有者的的大笔资金，大大削弱了这一模式。这也同样被复制到了其他国家。世界上的私募股权基金中，只有一半的公司和56%的基金资产位于美国。私募股权基金资产中有四分之一在欧洲。还有些基金位于巴巴多斯、博茨瓦纳、纳米比亚、秘鲁、塞拉利昂和突尼斯。

私募股权基金的兴起一直受到怀疑。当KKR第一次发起大规模私募股权基金收购——即于1988年收购RJR纳贝斯克公司时，它和它的同伙成了畅销书中描述的“门口的野蛮人”。私募股权基金的成功，以及娴熟的公关和战略性慈善活动已经平息了这些担忧，政治捐款大概也没什么坏处。但该行业的局限性仍然十分明显，而目前的状况正在加剧这些问题。

私募股权基金围绕着一小撮精英投资者和管理者组建，通过在基金控制的企业中大量使用杠杆来放大自己的影响。这种做法天生就十分昂贵。投资者需要更高的回报来弥补流动性不足；利息成本很高，以抵消杠杆带来的风险；能够设计这些安排，并能与资本提供者保持稳固关系的基金管理人，收费也不菲。

在行业的增长期，利率长期下降使得交易能以较低的利率进行再融资，部分改善了成本问题。如今利率已经没有什么下降空间，最终应该会上升。这也是舒尔特和其他人认为增长前景不大的原因之一。

| 政治立场

另一个变化是，银行收到降低风险的命令，于是减少了高杠杆交易可用的

资金。这意味着借款成本会更高。如果想知道这对体系有多大的破坏，看看从2015年9月到今年2月这短短几个月的情形就好了。次投资级，也就是“垃圾”债券的平均收益率从7%上升到了10%。私募股权基金的收购交易几乎停止，其所持有的资产中，但凡有上市部分的都必须减记价值，导致第一季度业绩惨淡。可用于新交易的钱突然就没有了。凯雷在紧缩之前刚刚宣布收购Veritas Technologies，交易差点没法完成，只有在重新谈判达成更低的价格和更低的杠杆后才得以挽回。

政治环境也可能会发生变化。这一行业得益于税法中两个不合常理的方面：对企业大量借债的激励，以及一般合伙人享受较低的税率——因为其大部分个人收入都可按资本利得的税率缴税。现在这两方面要求改革的呼声都很强烈，后者看起来尤其可能发生改变。

还有一个更广泛的政治风险。纽约大学的教授和瑞典智库产业经济研究院在1月份发表了一篇论文，题为《私募股权基金的无意识黑暗面：论过度退市的经济后果》。随着公司由公众股东所有转向私募股权基金所有，个人与企业利润之间的直接关系被割裂了。公众将会与资本主义的资本要素脱离，由此可能导致他们更不愿意支持那些亲商业的政府政策。

还有一个影响深远的问题值得考虑，即有时私募股权基金唯一真正“私人”的东西似乎是其薪酬结构。在很大程度上，基金中的钱要么直接与公共机构相连（主权财富基金和市政养老金），要么是根据公共政策而免税（私人基金会和学校捐赠）。无论是渴望真正的私人市场的人，还是那些沮丧地看到公共政策养肥了特定私人小群体的人对此都十分恼火。基金分配、投资和国家之间暗藏的纽带创造了腐败与裙带资本主义的温床。

| 狂乱的人群

不过，对该行业最大的威胁并非来自其批评者，而是来自它自身的成功以及那些一心要效仿的人。根据贝恩咨询公司的数据，在美国中型企业中，由私募股权基金控股的公司占比在2000至2013年间增长了两倍；而在大型企业中该比例增长了五倍多（见图表4）。这并不表示私募股权基金已经没有增长的空间，但确实意味着机会将变得更少。

与此同时，能够获得廉价资本（通常是国家相关资本）的其他类型的实体也已进入收购市场，包括中国的跨国企业（由国有银行注资）、主权财富基金，以及想要直接投资的养老基金，比如安大略省教师养老计划。这意味着新交易的竞争会更加激烈。根据贝恩的数据，2007年被收购的中型医疗企业中28%由私募股权基金公司完成，到了2015年该比例仅为8%。科技和消费品零售商及企业收购案也呈现类似的趋势，尽管可能不那么明显。阿波罗的联合创始人乔舒亚·哈里斯（Joshua Harris）在5月初的米尔肯学会全球大会（Milken conference）上对与会者们说，这是“我所经历过的对私募股权基金而言最艰难的环境”。

在某种程度上，这或许可以解释私募股权基金公司手头持有的资金量——即它们所谓的“干火药”。据Preqin估计，目前的资金存量超过1.3万亿美元。考虑到私募交易中运用的杠杆（假设为二比一）后，单单这一数额就占到了2015年并购交易总值的约70%。如果出现利润丰厚的投资领域，那么可使用的现金量本该缩水而非增加。从另一点上也可证实形势的严峻：最大的私募股权基金公司愿意在其他更不相干的领域寻求新机会。黑石目前在房地产领域的投资达1030亿美元，超过了在私募股权基金领域1000亿美元的投资（另有1120亿美元投资于对冲基金和信贷）。卡雷和KKR目前投资的资产只有不到一半是企业股权，阿波罗则仅为四分之一。

竞争对收费也产生了影响。十年前，标准的算法是2%的管理年费加上利润的20%。目前广泛引用的数字仍是如此，但实际上，根据一家大型企业披露，管理费已下跌至约1.2%，和面向大众的共同基金收费差不多了。从利润中还能抽走20%，但部分客户已被允许“共同投资”，即在通过私募股权基金购买一家企业股权的同时，还可以自己直接收购同样的股权。这减少了交易中的费用收入。

这些都是引发疑虑的好理由。但是，尽管“干火药”的数额可能预示了机会不多，它也显示出仍有大量资金跃跃欲试。尚不清楚这是否明智。私募股权基金不像共同基金用每日净值来评估业绩（对冲基金也常用这种方式），这使得人们对其业绩存疑。私募股权基金公司标榜的“内部回报率”衡量法可能会被做手脚。这使得很难对其表现进行学术性评估。

今年7月，芝加哥大学、牛津大学和弗吉尼亚大学的商学院教授们对先前的一项研究*发表了最新发现：虽然近年并购基金的回报并不比股市的平均回报好多少，但那些在1984年至2005年间融资的并购基金的年度回报（扣除费用后）相较标普500指数和标普欧洲350要高出三到四个百分点。这是很大的差距。同样来自牛津大学的洛多威克·法利普（Ludovic Phalippou）则持更为怀疑的态度，他认为如果控制私募股权基金所投资资产的规模和类型，那么它们的长期表现从来不比市场跟踪指数更好。话虽如此，但要通过其他方式来获得同样的规模和类型的资产组合并非易事。

平均回报多高虽有争议，但它并不能体现全局。研究发现了一些证据，证明那些在某一基金上表现出色的私募股权基金经理能够复制其成功（虽然这种效应在过去十年中似乎也减少了）。最大的投资诱因可能仅仅是缺乏其他替代选项。私募股权基金目前的吸引力并不在于它能否复制以往的绝对高回报（大公司的年回报率据称常高于20%），而在于它是否有可信的机会让回报优于目前表现平平的其他投资方式。这对养老基金来说尤其是个问题，这类基金通常需要赚取7%或8%的利润才足以履行其义务。

为何人们可能期待私募股权基金的业绩优于公开市场？一个标准的解释是它可以无视“季度资本主义”，即缺乏耐性的投资者的意旨。这种解释并不特别令人信服。为私募股权基金公司效力的是一批仿佛喝了兴奋剂的人。在动荡时期他们常常要求其投资组合中的公司不断汇报业绩，也可能会出手阻止哪怕是最无关紧要的现金开支。

不过，确实不一样的地方在于专注度。私募股权基金、其设立的董事会以及为其效力的高管层都倾向于专注基金的实质业绩，而将几乎所有其他因素都排除在外。上市企业面对着排山倒海的监管要求，这些要求常常晦涩难懂或自相矛盾，而与业绩无甚关系。上市公司退市的数量和这类监管要求同步增长看来并非巧合。

公开披露的要求在很多层面上看都是上市公司最吸引投资者的特点，然而它已经造成了一种法律上的脆弱性。一家企业可能会因为股价骤跌而被告

上法庭，理由是被套牢在亏损中的投资者并不了解可能的风险。同样可能招致官司的还有对某个具潜在争议性议题的任何内部讨论，比如纽约州检察长调查埃克森美孚对气候变化相关风险披露不足便是一个例子。

在美国以外的地区，法律可能不尽相同，但那里资本市场运作（或者运作不佳）的方式为私募股权基金跑赢大市提供了其他机会。比如在中国，银行贷款的利率期限仅为一年，而寻求上市以获得较长期的融资则意味着要在由政府控制的队伍中排队。私募融资可以在短期内迅速部署，并根据业务的需要决定资金的进出。

最近由哈佛商学院发表的一份工作报告**总结了私募所有权可能的益处：以股权替代负债，由此减少了纳税而扩大了利润；报酬结构为管理层提供了提升收益的巨大动力；增加了新的专长；提高了交易灵活度。或许最具吸引力的一点是速度。被私募股权基金收购的企业通常在几个月内就会替换高管及董事会成员。收购在被视为有利的时机完成，销售和再融资亦是如此。当公开市场表现不佳——比如近来的情况下——私募股权基金反对将股权再上市或借入更多贷款，并且可能选择偿还部分贷款。但在市场的包容力增强之时，它们则会做出相反的动作。

上市公司也可以做到上述大部分工作，但它们往往不这么做。这可能是因为其内部运作更易受到检查和批评。有时它们会引入私募股权基金来做自己不便做的事。上市公司伯克希尔·哈撒韦（Berkshire Hathaway）收购了卡夫（Kraft）和亨氏（Heinz），这些交易中也有巴西私募公司3G Capital的参与。在交易后，巴菲特在其年度报告中这样解释道：“我们和3G公司有着同样的热情去购买、创建和持有那些满足人们基本需求和欲望的大企业。不过，我们在追求这一目标时遵循了不同的道路。它们的方法是买下那些有机会帮助它们消除许多不必要成本的企业，而后非常迅速地执行来达成目标。它们做得极为成功。”看起来，伯克希尔·哈撒韦把艰难的决策外包给了另一家相较而言不太公开、更愿意承担这些艰难任务的公司，难怪在它的年度大会上，快乐的股东们总会为这位快活地嚼着花生糖的CEO鼓掌。

上市公司和私募股权基金合作还有其他的理由。2015年，当通用电气大规模缩减金融业务时，随后披露的100多项交易中有四分之一都涉及私募股权基金。仅有三个公开上市案例。除行动迅速外，私募股权基金也具有创新性。当医疗保健公司沃尔格林博姿联合公司（Walgreens Boots）将其提供静脉输液治疗的业务出售给私募公司麦迪逊·迪尔伯恩（Madison Dearborn）时，它得以保留了重大股份（未对外披露具体为多少）。这类交易减少了将某些将会获得成功的业务以过低价格出售的尴尬，在华尔街对此有一个轻蔑的称法，差不多是“傻逼保险”的意思。

| 它们是某种解决方案

鉴于私募股权基金所展现的灵活度，或许这样的时刻已经到来：人们对于为何一家企业是由私募股权基金持有而非上市的疑问会减少。缴税更少、运作限制更少、法律风险更小，这些都很吸引人。但也存在着政治风险：那些利益向特权阶层倾斜的架构总是会遭到公众的炮轰。但这种潜在的弱点同样也是力量的源泉。从非常富裕和资产丰厚的人群融资，从州政府和市政府员工养老基金、主权财富基金和有大量捐赠基金的大学等机构融资，你就获得了一定的影响力。

理论上说，这样的特权应该会有其代价。公开市场广博而深厚，它们应能高效地（以不昂贵且聪明的方式）提供资本，也因此对于企业和投资者双方来说都应该是最佳解决方案。所以它们应该会赢得竞争。可惜，目前看来，上市公司受到的内部和外部限制都压制了它们的表现，其结果是私募界的老手及其培育的众多新秀在未来几十年里的日子可能会越来越好过。

* 《私募股权基金投资和公众股权的回报比较》（How do Private Equity Investments Perform Compared to Public Equity?）作者：罗伯特·哈里斯（Robert Harris）、蒂姆·詹金森（Tim Jenkinson）和史蒂芬·卡普兰（Steven Kaplan）于2016年发表于《投资管理期刊》（*Journal of Investment Management*）。

** 《私募公司自称做些什么》（What Do Private Equity Firms Say They Do?）作者：保罗·冈珀斯（Paul Gompers）、史蒂芬·卡普兰（Steven Kaplan）

Kaplan) 和弗拉基米尔·穆卡尔亚莫夫 (Vladimir Mukharlyamov)。哈佛商学院2015年工作论文。■



American business

Meet the new boss

Businesses may come to love or to fear Donald Trump. Either way, they will have to make a deal

ALTHOUGH he styles himself as a chief executive who can turn the country around, Donald Trump is an outsider in the world of American business. His commercial operation is tiny by the standards of the country's mega-firms and few of their bosses have ever viewed the president-elect as an equal or ally. He has "no friends" among the business elite, sniffed a private-equity baron a few weeks ago, who will doubtless now join a queue of executives waiting at Trump Tower to curry favour and to assess the new man's priorities before he assumes office.

Those supplicants will soon discover that Mr Trump's attitude towards business has three contradictory strands. He is passionate about unleashing the might of the private sector in order to revive growth. There is certainly plenty of scope: last year listed American companies invested a mediocre 46% of their total cashflow. Yet he is also a populist who thinks the economy is rigged in favour of big business and crony capitalists, and he is a protectionist. In the coming months these three different strands will respectively excite, worry and scare the business world.

Start, first, with the things firms will like. Mr Trump's tax plans have been ridiculed by economists but their broad thrust will be wildly popular with companies. He has said he wants to slash the headline corporate-tax rate from about 40% to 20% or less, at the same time as removing a myriad of exemptions that allow businesses to dodge their bills. Mr Trump also wants to make it possible for companies to bring home the \$2trn or so of accumulated profits they have stashed abroad, without triggering a huge tax bill in America. An amnesty, or a big reduction of the rate paid, will

prompt companies to repatriate a wall of cash, although whether they will invest it or spend it on buying back shares remains to be seen.

Mr Trump's proposed war on red tape will also be popular. He was cheered by an audience of business bigwigs in New York when he spoke on the theme in September. By repealing Barack Obama's Affordable Care Act, he may help small firms who complain they are swamped by bureaucratic requirements. And if he succeeds in kneecapping the country's environmental regulators, that should mean more lenient treatment of carbon-intensive industries including oil, gas and coal. On November 9th the share price of Peabody Energy, a coal firm that is trying to emerge from Chapter 11 bankruptcy, surged by almost 50%. Mr Trump's energy secretary could well be Harold Hamm, a pioneer of the hydraulic-fracking industry in North Dakota and elsewhere.

An infrastructure-spending boom will go down well with business, too. All firms complain about America's crumbling roads and late-Brezhnev-era airports. And the construction industry could earn windfall profits—one reason why an index of shares of companies in the sector rose by 9% the day after the election.

| *Tax, lies and red tape*

If tax cuts, deregulation and new infrastructure are things that firms of all sizes will cheer about, big companies will worry about the second factor: Mr Trump's populist suggestion that the economy is rigged against consumers and ordinary workers. Had she won, Hillary Clinton would have been widely expected to reinforce America's antitrust apparatus in response to mounting evidence that competition has waned across the economy and incumbent firms have got too powerful.

Mr Trump's signals on this have been mixed. In October he objected to AT&T's \$109bn bid for Time Warner, a media firm, which he says will lead

to a concentration of corporate power. But he has taken a softer line on the pharmaceutical industry's high prices for drugs, and share prices in the sector rose on news of his victory, having been pummelled by expectations that Mrs Clinton would rein in pricing.

Policies that boost competition and attack cronyism make sense, but the risk is that under Mr Trump they spiral into a nastier, populist confrontation with big business. That is a particular vulnerability for the two great power centres of the American economy, Wall Street and Silicon Valley. Mr Trump wants to repeal the Dodd-Frank Act, a clumsy law passed after the global financial crisis of 2008, aimed at re-regulating banks. Bankers despise it. But he has also proposed separating investment banking from commercial and retail banking, which would be a nightmare for universal banks such as JPMorgan Chase, which have spent miserable years adapting to today's rules.

Silicon Valley is also a potential flashpoint. Big platform companies such as Facebook and Google are powerful, verging on arrogant, and they have been openly hostile to Mr Trump. So far he has taken aim at what he called the "monopolistic tendencies" of Amazon, an e-commerce company. It is also easy to imagine him objecting to Uber's treatment of its drivers, or forcing Apple to unlock customers' iPhones on grounds of national security. Then the technology industry's disruptive, liberal vision of America would be primed to clash with Mr Trump's more nativist one.

However, it is the third strand of Mr Trump's ideas on business, his protectionism, that is most clearly bad for business. Since Mr Trump struck his very first big deal in Manhattan back in the mid-1970s, building the Hyatt Hotel at Grand Central Terminal, corporate America has ventured ever farther afield: 44% of the sales of the S&P 500 index of big companies are now earned abroad (see chart). Global firms will come under pressure to locate more production at home. During the campaign Mr Trump

lambasted Ford and Mondelez, a food firm, for employing too few people in America. Trade wars and rising tariffs could severely disrupt supply chains: the American car industry relies heavily on component suppliers in Mexico. And if America imposes tariffs on Chinese imports, as Mr Trump has said it will under his leadership, an obvious and logical response from China could be to clamp down on the activities of American multinationals in a country where they reap sales of \$300bn a year.

Plenty of American chief executives will tell themselves that Mr Trump, whatever his other manifest flaws, understands business. That is true: he has a far more instinctive feel for companies and capitalism than does Mr Obama, or Mrs Clinton. But partly as a result, he is also an interventionist. He believes that American business can be an instrument of his power, to be bought, bullied and remoulded in order to achieve a national revival. His first career, as a self-styled tycoon, made little mark on corporate America. In his second, as a politician, his impact could be profound. ■



美国企业

迎接新老板

企业可能会热爱或害怕唐纳德·特朗普。无论如何，它们都得达成交易

虽然他把自己塑造成能够为美国力挽狂澜的首席执行官，但对于美国商界来说，唐纳德·特朗普是个局外人。以美国大型企业的标准来看，他的商业布局太过渺小，很少有大公司老板会将这位新当选的总统视作平级或盟友。几个星期前，一位私募股权基金巨头还在对他不屑一顾，说他在商业精英中“没有朋友”——无疑此人现在就会加入守候在特朗普大厦外拍马屁的高管队伍，希望在他走马上任之前揣摩出这位新总统的施政重点。

这些乞求者很快就会发现，特朗普对商业怀有三股相互矛盾的心态。他热衷于释放私营部门的力量以恢复经济增长。这当然有很大空间——美国上市公司去年仅将其总现金流中不温不火的46%用于投资。然而他也是个民粹主义者，认为经济被操纵以有利于大企业和权贵资本家。此外他还是个贸易保护主义者。在未来数月里，这三股不同的心态将分别令商业界兴奋、担忧和恐惧。

先来看看公司会喜欢的东西。经济学家已经嘲笑过特朗普的税收计划，但其主旨将会受到众公司的热烈欢迎。他说希望将整体公司所得税率从约40%砍到20%或更低，同时取消众多能让企业减免税的漏洞。特朗普还想创造条件，使公司将藏匿海外的约2万亿美元累积利润带回本土，而不用担心这一过程会导致在国内被征收重税。大赦或大幅减少支付税率将鼓励企业汇回大批现金，但它们是资金用于投资还是回购股票则还有待观察。

特朗普对繁文缛节宣战也将大受欢迎。他在九月份就这一题目演讲时，受到了纽约商界大佬们的全场欢呼。通过废除奥巴马的平价医疗法案，他可以帮助到那些对官僚要求烦不胜烦的小企业。如果他成功地让美国的环境监管者屈服，应该就意味着石油、天然气和煤炭业等碳密集行业会获得更宽松的对待。11月9日，试图摆脱破产保护的煤炭公司皮博迪能源的股

价飙升近50%。特朗普的能源部长很可能是北达科他州等地水力压裂开采页岩气的先驱哈罗德·哈姆（Harold Hamm）。

基础设施投资热潮也正中企业的下怀。所有的公司都在抱怨美国破破烂烂的道路和老旧的机场。建筑业可以大发横财——这也是大选日过后该板块公司股价指数上涨9%的原因之一。

| 税收、谎言与繁文缛节

如果说减税、放松监管和新的基础设施让大大小小的公司都欢欣鼓舞，那么大公司就该担心第二个因素了：特朗普的民粹主义说辞，即经济遭到操纵因而不利于消费者和普通工人。假如希拉里·克林顿赢得大选，人们会普遍预期她将加强美国的反托拉斯机构——有越来越多的证据表明，整个经济中的竞争都在减弱，在位企业都变得太强大了。

特朗普对此发出的信号让人喜忧参半。10月份他反对AT&T以1090亿美元收购传媒公司时代华纳，称这会导致企业力量过度集中。但他对于制药行业高药价的态度则较为温和。该行业股价原本因预期希拉里会遏制药价而受挫，在特朗普胜选后随即上涨。

鼓励竞争和打压任人唯亲的政策是有意义的，但风险是，在特朗普的领导下，这会演变成一场针对大企业的、更为肮脏的民粹主义对抗。美国经济的两大权力中心——华尔街和硅谷尤其容易受此影响。特朗普希望废除《多德-弗兰克法案》。这是2008年全球金融危机后通过的一项笨拙的法律，旨在重新对银行进行监管，为银行家们嗤之以鼻。但是，他还提出要把投资银行与商业和零售银行业务分离开，这对于摩根大通等全能银行将是个噩梦——它们光是为了适应今天的规则就已经苦苦挣扎了好些年。

硅谷也是一个潜在的爆发点。Facebook和谷歌等大型平台公司强大到近乎傲慢，而且它们一直公开反对特朗普。到目前为止，他已经瞄准了电子商务公司亚马逊的所谓“垄断趋势”。也不难想象他会反对优步对待司机的方式，或以国家安全为由迫使苹果解锁客户的iPhone手机。那么科技行业颠覆性的自由派美国价值观就难免会与特朗普更为本土主义观念发生碰

撞。

然而，特朗普的第三股经营理念——贸易保护主义，则是再清楚不过地不利于企业。自从特朗普于20世纪70年代中期在曼哈顿拿下第一笔大生意——在中央车站附近修建了凯悦酒店以来，美国企业已经拓展到越来越远的地方：如今标普500指数的大公司有44%的销售额都从国外获得（见图表）。全球化公司会面临将更多生产转移回本土的压力。在竞选期间，特朗普抨击福特和食品公司亿滋（Mondelez）在美国雇用的人太少。贸易战和上升的关税会严重破坏供应链：美国汽车业在很大程度上依赖墨西哥的零部件供应商。如果像特朗普所说，在他治下美国对从中国进口的产品征收高关税，那么中国明显而合乎逻辑的反应就是，在这个美国跨国公司每年收割3000亿美元销售额的国家打击它们的活动。

很多美国公司的首席执行官都会告诉自己，无论特朗普有多么明显的缺陷，他还是懂商业的。此言不虚：他对公司和资本主义的本能直觉确实比奥巴马或希拉里强得多。但这也是他成为一个干预主义者的部分原因。他认为美国企业可以成为他权力的工具，可以被收购、欺凌或重塑以实现国家复兴。作为一个自封的大亨，他第一个职业生涯对美国企业界影响甚微。而在作为政治家的第二个职业生涯中，他的影响可能会十分深远。■



Trump and tech

System crash

Silicon Valley is right to be worried about a Trump presidency, but it helped get him elected

“I’D LIKE to wake up now please,” tweeted Sam Altman, who heads Y Combinator, Silicon Valley’s foremost startup school. The sentence neatly encapsulates the mood in the high-tech hub. To many in the technology industry, America under Donald Trump means dystopia. Perhaps no other sector regards his victory with less enthusiasm.

The main reason is that his stated views are antithetical to the beliefs that most entrepreneurs and tech types hold on a range of topics from trade to offshoring to policy on immigration. By one estimate the tech industry gave nearly \$8m to Hillary Clinton’s campaign. Silicon Valley also worries that it will lose its direct lines to the administration in Washington. According to the Campaign for Accountability, a transparency group, no fewer than 22 former White House officials have gone to work for Google since Barack Obama moved in. Under Mrs Clinton the door would have kept revolving.

Only one noted Valleyite is likely to have the president’s ear: Peter Thiel, a venture capitalist. He alone supported Mr Trump, speaking at the Republican convention and donating \$1.25m to his campaign. He will now be in high demand to help with damage control for the industry.

Mr Trump may limit immigration of the skilled workers and assorted entrepreneurs upon which the tech business relies. He has criticised Apple for having its iPhones assembled in China. He has also lambasted the smartphone-maker for not helping the FBI to crack a device belonging to a terrorist, which suggests he may push for “backdoors” in encryption software for governments to access. And he may go after big tech firms on

antitrust grounds (of Amazon, for example, he has said, “If I become president, oh do they have problems”). But if Mr Trump cuts the tax rate firms have to pay if they bring home earnings kept abroad, that would especially benefit tech giants, who sit on much of the more than \$2.5trn stashed overseas.

His victory also offers an opportunity for introspection. Silicon Valley treated Mr Thiel shabbily: some called on Facebook to eject him from its board. The industry also indirectly added to populist fury. Its own firms have not created enough well-paid jobs and its algorithms have ushered in an age of anxiety about many more being automated away. And it does nothing to ease resentment of elites. Last year tech firms handed out more stock-based compensation than Wall Street paid in bonuses, and the streets of San Francisco are a Trumpian brew of some of America’s most expensive property and soaring homelessness. ■



特朗普与科技行业

系统崩溃

硅谷有理由担心特朗普上台，但也正是硅谷为他的胜选提供了助力

“快让我从梦中醒来吧。”硅谷最有价值的创业孵化器Y Combinator掌门人山姆·阿尔特曼（Sam Altman）发了这样一条推特。这句话精辟地概括了笼罩着这个高科技中心的情绪。对许多科技企业来说，特朗普领导下的美国就意味着一团糟。科技行业可能是对特朗普大选获胜反应最不热烈的行业了。

这其中的主要原因是，特朗普在贸易、离岸外包、移民政策等一系列问题上所陈述的观点与大多数企业家和科技人才持有的看法都大相径庭。据估计，科技行业为希拉里的竞选活动捐赠了近800万美元。硅谷还担心将失去与华府的直接联系。问责运动（Campaign for Accountability，监督公共政治领域透明度的组织）的数据显示，自奥巴马入主白宫以来，已经有不少于22名前白宫官员加入谷歌。希拉里获胜的话，这个势头有可能还会继续。

只有一位著名硅谷精英有可能能跟新总统说上话，他就是风险资本家彼得·泰尔（Peter Thiel）。他孤军支持特朗普，在共和党大会上做了发言，还向特朗普的竞选活动捐赠了125万美元。以后将会有很多人向他寻求帮助，控制对行业可能带来的损害。

特朗普可能会限制熟练工人和各种企业家移民美国，而这些人正是科技企业发展所依赖的。他曾批评苹果在中国组装iPhone，还抨击苹果没有帮助FBI破解一部属于恐怖分子的手机。这意味着他可能推动在加密软件中设置“后门”，让各个政府部门得以获取信息；他还有可能会以反垄断为由讨伐大型科技公司——比如针对亚马逊，他就曾说过，“要是我当了总统，哦，它们可就有麻烦了。”不过，如果特朗普降低企业将海外利润带回国内所需缴纳的税金，科技巨头会尤为受益，因为它们在海外藏匿着超过2.5万亿美元的利润。

特朗普的胜利还给科技行业提供了一个反思的机会。硅谷一度对泰尔很不客气：一些人还曾呼吁Facebook将他逐出董事会。科技行业还间接给民粹主义者的怒火浇了油。科技公司并没有创造足够多的高薪工作机会，而它们的算法也把人们带入了一个焦虑的时代，令他们担心会有更多岗位被自动化所替代。在缓解底层大众对精英的怨恨方面，科技行业也无所作为。去年，科技公司发放的股权激励比华尔街支付的奖金总额还要多。旧金山的街道上林立着美国最贵的地产，同时无家可归者的数量又在激增，而这恰恰是特朗普描述的景象。 ■



The world economy

Our election, your problem

A Trump presidency will be bad for the world economy and worse for places outside America

IT IS not clear precisely how Donald Trump will govern, the extent to which he will carry out some of his scarier promises on trade and immigration, and who will be his economics top brass at the Treasury and in the White House. But a decent first guess is that President Trump will be bad for the world economy in aggregate; and a second is that his actions are likely to do more harm, in the short term at least, to economies outside America.

When America has in the past stepped aside from its role at the centre of the global economic system, the damage has spread well beyond its borders. In 1971, when Richard Nixon ended the post-war system of fixed exchange-rates that had America at its centre, his Treasury secretary, John Connally, told European leaders, “The dollar is our currency, but your problem.” This election result, to paraphrase Connally, belongs to America but is potentially a bigger economic problem for everyone else.

The scale and nature of that problem depend on the interplay of the two main elements of Mr Trump’s economic populism. The first is action to boost aggregate demand. Mr Trump favours tax cuts and extra public spending on infrastructure. The second element is trade protectionism. He has pledged to slap tariffs on Chinese imports and to renegotiate the North American Free-Trade Agreement (NAFTA) with Mexico and Canada. To the extent that he leans more on the first element and less on the second, the immediate damage to America’s economy will be limited. But even in that event, the net effect of a Trump presidency on economies outside America is still likely to be harmful.

To understand why, go back to the subject of Connally's gibe: the dollar. As it became clear that Mr Trump would win the election, the greenback fell against rich-country currencies, such as the euro, yen, Swiss franc and pound, as investors sought a haven from policy uncertainty in America. An index of its value against major currencies dropped by 2% in early trading on November 9th. Within hours it had regained almost all the lost ground, as investors pieced together a positive story for the dollar, based on the prospects of a boost to demand in America's economy and an inflow of capital from abroad.

| *Bringing it all back home*

A deal between Mr Trump and Congress to cut corporate taxes, goes the logic, would spur flush American companies to repatriate retained profits held offshore. It would also allow them to increase capital spending in America, because they would have more ready cash; and consequent profits would be taxed more lightly. The larger budget deficits entailed by tax reform, along with more public spending on infrastructure, would underpin yields on long-term Treasury bonds. Indeed, after falling in the initial aftermath of Mr Trump's victory, yields on 10- and 30-year Treasuries are on the rise again (see chart). Add the potential for higher inflation from the stimulus and the likelier use of some protectionist tariffs, plus a Federal Reserve with a more hawkish tilt, as Mr Trump's appointees alter the complexion of its interest-rate-setting committee, and you have the makings of a renewed dollar rally.

A fiscal stimulus coupled with an investment splurge in the world's largest economy should, all else equal, also be good for global aggregate demand. And if this kind of "reflation populism" improves the near-term prospects for America's economy, it may dissuade Mr Trump from resorting to full-strength "anti-trade populism". Well, perhaps. But given his leanings, it is easy to imagine him resorting to soft protectionism that keeps much of the

additional demand within America's borders. He might for instance lean on companies to favour domestic suppliers, or attach local-content conditions to publicly funded infrastructure projects. What is more, the repatriation of profits by American firms would draw resources away from their subsidiaries abroad.

In 1971 the world feared dollar weakness. These days, dollar strength tends to have a tightening effect on global financial conditions. The waxing and waning of the dollar is strongly linked to the ups and downs of the credit cycle. When the dollar is weak and American interest rates are low, companies outside America are keen to borrow dollars. Often big firms, flush with such cheap loans, will further extend credit in local currencies to smaller ones. But when the dollar goes up, the cycle goes into reverse, as corporate borrowers outside America scramble to pay down their dollar debts. That causes a more general tightening of credit.

Mexico has the most to lose from Mr Trump's presidency, should he keep his campaign promises. So the peso plummeted in the wake of the result. But Mexico, along with Chile, Turkey, the Philippines and Russia, also has a large burden of dollar debts, which are becoming more expensive in local currency. Mr Trump's protectionist bent may make it hard for emerging markets to trade their way out of trouble. Only a few are likely to be unharmed by his victory.

Where does a Trump victory leave China, the world's second-largest economy? China accounts for roughly a half of America's net trade-deficit, so in Mr Trump's zero-sum reckoning, it has a lot to lose should America launch an all-out trade war. In fact, the resulting disruption to global supply-chains would badly hurt American firms, and higher prices on imported goods would squeeze American consumers, especially poorer households, which spend proportionately more on them.

Yet there are risks to China's economy too, from even a milder form of Trumpian populism. The dollar's weakness over the spring and summer helped stem the outflow of capital from China that had threatened to unmoor the yuan and so unsettled global financial markets at the turn of the year. A sustained dollar rally would thus mean a severe headache for China's policymakers, as it would revive the pressure on its capital account. They might then face an unpalatable choice: let the yuan sink against the dollar or keep domestic monetary policy tighter to support it.

China is safe from the biggest indirect effect of Mr Trump's victory: the boost it gives other populist politicians. Europe is far more vulnerable. Britain's vote in June to leave the European Union was one early ballot-box reflection of anti-establishment sentiment. Since then, insurgent political parties in France, Germany, Italy and elsewhere have called for referendums on membership. Such parties typically favour trade barriers and limits on immigration, and are gaining in popularity.

The euro area's economy has been faring better in recent years, but the single currency remains fragile. The kind of cross-border risk-sharing needed to put the euro on a sound footing is at odds with the rising tides of nationalism and populism. An immediate hurdle is Italy's referendum on constitutional reform on December 4th. A defeat would weaken Matteo Renzi, the reformist prime minister, and embolden the populist Five Star Movement, which favours ditching the euro. Around 14% of the euro area's goods exports go to America, quite a bit less than China's 18%. But America accounts for about 40% of the currency zone's recent export growth, according to economists at HSBC, a bank. So American protectionism is arguably a bigger threat to Europe than to China.

The whole world has much to fear from Mr Trump's threats to tear up trade agreements and impose punitive tariffs on imports. And even if he refrains from starting a trade war, the loose-tongued, fact-lite style he cultivated

during the campaign could wreak serious damage when he is president. His hyperbolic threats now carry the weight of the American presidency. His victory was enough to chill some financial markets; what he might do with it could spark full-scale panic.

Even short of that, like the Brexit vote, it marks an alarming step away from a liberal, open economic order towards more isolationism and less prosperity. ■



世界经济

选举是我们的，问题是你们的

特朗普的当选会对世界经济造成负面影响，对美国以外的地区尤甚

特朗普将会如何治国，会在多大程度上履行其在贸易及移民方面一些更为可怕的承诺，他又将任命谁来担任财政部和白宫的经济管理高层，答案目前尚不十分清楚。但一个合理的猜测是，特朗普总统将会对世界经济整体产生不利影响；另一个猜测是，他的行动很有可能会对美国以外的经济体造成更大的损害，至少在短期内会是如此。

美国早前不再担任世界经济体系的核心角色时，所造成的破坏远远超出了美国的范畴。1971年，理查德·尼克松终止了战后以美元为核心的固定汇率体系。时任财政部部长的约翰·康纳利（John Connally）对欧洲各领导人说，“美元是我们的货币，但却是你们的问题。”套用下康纳利的这句话，可以说这次选举结果是属于美国的，但之后更严峻的潜在经济问题却会波及其他所有人。

至于这一问题的程度和性质如何，则取决于特朗普经济民粹主义中两个主要因素的相互作用。第一个是刺激总体需求的举措。特朗普主张减税以及增加在基础设施上的公共支出。第二个因素是贸易保护主义。他承诺将对中国进口商品提高关税，并与墨西哥及加拿大就《北美自由贸易协定》（NAFTA）重新进行谈判。鉴于二者之间他更倾向于前者，美国经济遭受的直接损害因而将会很有限。但即使是这样，特朗普当政对美国以外经济体的直接影响仍有可能会是有害的。

要了解个中缘由，还是得回到康纳利那句讥诮之语的主题：美元。随着特朗普胜选的可能性逐渐明朗，美元兑富裕国家货币（如欧元、日元、瑞士法郎和英镑）的汇率便出现下跌，原因是投资者欲避开政策充满不确定的美国，另寻避风港。11月9日早盘，美元兑主要货币的指数下跌了2%。但几个小时之内美元便几乎收复全部失地，因为投资者们依据美国经济需求提升以及国外资本回流的预期，为美元拼凑出了一幅积极乐观的图景。

如果特朗普与国会就削减企业所得税达成协议——按照投资者拼凑出的逻辑演绎——将会鼓励富有的美国企业将留存在海外的利润转移回国内。这一协议还将使这些企业得以增加在美国的资本支出，因为它们将会拥有更多现金；而企业随后获得的利润也会将以较低的税率缴税。税收改革引发的预算赤字增加，以及基础设施公共支出的提高——这些因素也将巩固长期国债的收益。事实上，因受到特朗普胜选的波及，10年及30年国债的收益率起初曾有所下降，但现已再度呈上升趋势（见图表）。加上刺激手段可能会带来的通胀水平上升，以及一些更有可能被采取的具贸易保护主义色彩的关税，再加上美联储更加强硬的倾向（鉴于特朗普的任命者们将会改变这个利率制定委员会的格局）——美元再度反弹所需的要素就齐活了。

假设其他条件相同，财政刺激加上世界第一大经济体的投资热潮应该还会有助于全球总体需求的提升。此外，假如这种“通货再膨胀民粹主义”得以在近期内改善美国经济的前景，那么特朗普可能就会考虑放弃全力推行“反贸易民粹主义”。嗯，也许吧。但考虑到他的一贯倾向，不难想象他还是采取温和的贸易保护主义，并以此将大部分新增需求都留在美国国内。例如，他也许会向企业施压，令其优先考虑国内供应商，或向政府出资进行的基础设施项目施加本地采购要求。此外，美国公司若将利润汇回国内，也将抽走其海外子公司的资源。

1971年，整个世界都因美元疲软而忧惧。如今美元的强势却趋于对全球金融环境造成紧缩效应。美元的涨跌与信贷周期的起伏密切相关。当美元疲软、美国利率低迷时，美国以外的公司便会热衷于借进美元。坐拥大量这类廉价贷款的大公司通常会以当地货币向小公司提供贷款。而一旦美元走高，美国以外的借款机构就会争相偿还自身的美元债务，信贷周期便会随之发生逆转。这会引发更为普遍的信贷收紧。

如果特朗普履行其竞选期间的许诺，墨西哥将会因特朗普的当选遭受最为严重的损失。因而选举结果一出，比索便直线下跌。然而，墨西哥（以及智利、土耳其、菲律宾和俄罗斯）还有着沉重的美元债务；以本国货币

计，这些债务正变得愈加高昂。由于特朗普的贸易保护主义倾向，新兴市场想通过贸易走出困境也许会很难。或许只有少数国家不会因特朗普胜选而遭受损害。

特朗普的胜选会将中国这个世界第二大经济体置于何种境地？中国几乎占据了美国净贸易赤字的一半，依特朗普的想法——即贸易是“零和”的，如果美国发动一场全面的贸易战，中国将损失惨重。但实际上，选举结果对全球供应链的破坏同样将重创美国的公司。此外，由于美国消费者（尤其是较为贫困的家庭）购买进口商品的比例更高，进口商品价格的提高还将令他们的生活变得拮据。

不过，即使是稍微温和些的特朗普式民粹主义，也会为中国经济带来风险。此前中国的资本外流已对人民币构成致其失序的危险，并因此造成了岁末年初全球金融市场的动荡。而今年春夏，美元的疲软帮助中国阻止了资本的外流。因此，美元的持续反弹或许会成为令中国政策制定者十分头痛的问题，因为这将对中国的资本账户再次施压。如此一来，他们也许就要面临这样令人不快的两难选择：或是让人民币在美元的冲击下大幅贬值，或是在国内实行更为紧缩的货币政策，以支撑人民币汇率。

至于特朗普获胜最重大的间接影响——即助长了其他民粹主义政客的气焰，中国则得以幸免。而欧洲对此却要无力得多。6月英国公投脱欧便是一个反建制情绪通过投票箱的初步体现。自那时起，法国、德国、意大利及其他地方的右翼政党都已要求就欧盟成员身份举行公投。这些政党通常都推崇构筑贸易壁垒以及限制移民，且如今正变得越来越受欢迎。

欧元区的经济近些年已有所好转，然而欧元这个单一货币仍旧脆弱。若要将欧元置于坚实的基础之上，就要实现跨境风险共担，但这又与日渐高涨的民族主义和民粹主义大潮相抵牾。眼下的一个障碍就是将于12月4日举行的意大利宪法改革公投。若其提议未能获得通过，主张改革的总理马泰奥·伦齐（Matteo Renzi）的力量将被削弱，而主张抛弃欧元的民粹派政党五星运动（Five Star Movement）则会大受鼓舞。欧元区约有14%的货物出口去向美国，这与中国18%的数字尚有一定差距。然而，根据汇丰

银行经济学家们的数据，美国占据了欧元区近期出口增长的40%。因此可以说，较之中国，美国的贸易保护主义对欧洲构成的威胁要更大。

至于特朗普撕毁贸易协定、向进口商品施加惩罚性关税的威胁论调，则会引起全世界更深切的担忧。即使他克制住了发动贸易战的想法，他在竞选期间树立起的口无遮拦、罔顾事实的风格也可能会在其上任后造成严重损害。他毫无节制的威胁言论如今更是因其美国总统身份而有了分量。光是他的胜利就足以使一些金融市场胆寒，而他获胜后的行动也许更是会引致全面的恐慌。

即使不谈这一点，特朗普的获胜也会像英国脱欧公投一样，标志着一个令人担忧的情形：世界进一步偏离了自由而开放的经济秩序，逐渐滑向孤立主义，进而令繁荣受损。■



Chinese aerospace

We are sorry to announce

China's aerospace ambitions are big, but the departure clock is still ticking

STEALTH fighter jets are designed to be as furtive as possible and sneak through radar without being noticed. China's new J-20 stealth fighter demanded plenty of attention as it roared over the heads of spectators during its public debut at the Zhuhai air show early in November. The message was clear: China is aiming high in the aerospace business. That ambition, though, is as much about commercial aircraft as it is about fighter jets, and in particular one model was noticeably absent from the show: the C919, a single-aisle short-haul passenger jet which China is developing to take on Airbus and Boeing.

Over the next 20 years both the European and the American aerospace giants forecast that China will become their biggest single market due to demand for new aircraft by Chinese airlines keen to meet the rising middle classes' desire for air travel. Boeing estimates that China will need 6,810 jets worth \$1trn over that period (see chart). The state-owned Commercial Aircraft Corporation of China (COMAC) is eager to supply some of those planes. This puts Airbus and Boeing in a tricky spot: "Their problem is that their biggest customer wants to become their biggest rival," is how Michael Goldberg of Bain & Company, a consultancy, sums it up.

China's aerospace ambitions are not just a matter of national pride. The country is keen to move up the manufacturing value chain. Making military jets is one thing, but mastering complex production systems to produce relatively large numbers of passenger aircraft that must meet the extremely high quality and reliability standards demanded by international airlines is quite another. The bigger game is that, if China can manage this, the lessons can be applied across other industries.

| *Tally-ho!*

COMAC was founded in 2008 to develop a range of aircraft. In an impressive display of its determination, within just two years it had built a factory and offices for more than 50,000 workers in Shanghai. But then it hit turbulence. The first aircraft, a regional jet called the ARJ21, only entered service in June with Chengdu Airlines, eight years behind schedule. And the larger C919, designed to compete directly with the popular Boeing 737 and Airbus A320 family of short-haul models, is now three years behind schedule. Although the first mock-up was revealed at a glitzy party in Shanghai last November, only a scale model appeared at Zhuhai. The aircraft is now unlikely to enter service until 2019 or 2020.

The ARJ21 has suffered problems with dodgy wiring, cracks in the wings, faulty doors and its performance in rain. This has led COMAC to proceed more cautiously with the C919 to try to make sure everything is right by the time it enters service. Taking extra care is laudable, but it adds time and that is costing COMAC orders. Most analysts say that by the time the C919 flies, its technology will be that much older so that its fuel efficiency will lag newer versions of Boeing's 737 and Airbus's A320. Foreign buyers have therefore steered clear. Although COMAC has received more than 570 orders from 23 customers for the C919, and more than 400 for the ARJ21, virtually all of these are from Chinese airlines and leasing companies, which presumably have been subjected to some patriotic arm-twisting.

Still, the Chinese are pressing on. At the air show COMAC announced a joint venture with Russia's United Aircraft Corporation to build a wide-bodied jet to carry around 280 passengers. Although it is due to enter service in 2025, analysts believe it, too, will arrive much later. The Chinese government also wants to make more of the sophisticated systems that it currently buys from Western firms for its aircraft, such as engines and avionics. In August, China set up a state-owned engine maker with \$7.5bn of capital to produce engines for COMAC's future programmes.

At present, Western suppliers see the rise of Chinese aerospace as a boon. If COMAC produces all the C919s on its books, Honeywell, an American engineering group, would make \$15bn from supplying it with parts. CFM International, a joint venture between General Electric and Safran of France, stands to earn \$16bn from the list price of its engine sales. So far, neither Airbus or Boeing see COMAC as much of a threat to their sales outside China. But the Chinese have made it clear that both companies will be expected to help build China's aerospace industry if they want to win future orders for larger aircraft.

That means working with the Chinese without giving away too much technology. Airbus has built two final-assembly plants in northern China for planes which China has purchased. Boeing has just entered into a similar collaboration with COMAC to complete work on 737s. Boeing also buys some basic parts from Chinese firms, like the rudder for the 787. But so far trickier tasks—including those involving a bit of secret sauce, such as wing assembly—have stayed at home. It is not clear how much all of this will help the Chinese. If it comes together, the C919 just might fly at Zhuhai's next air show in 2018. ■



中国的航空业

我们抱歉地通知您

中国在航空业的志向很远大，但其航空梦仍不知何时才能腾飞

隐形战斗机就是要尽可能地行迹诡秘，能在雷达的追踪下潜行而不被捕捉到行踪。11月初举行的珠海航展上，中国新一代隐形战斗机歼-20首次公开亮相。它轰鸣着从观众上方掠过，引起多方瞩目。这其中透露出的信息十分明确：中国对航空业有着宏伟而远大的目标。不过，中国的雄心并不仅限于战斗机，对商业飞机也有着同样高的企望。此次航展上一个机型的缺席尤为引人注目：C919，一款中国正在研发、用以对抗空中客车和波音的单通道短途客机。

欧洲和美国的航空巨头都预测，中国将在接下来的二十年里成为它们最大的单一市场，原因是中国的航空公司迫切需要购置新飞机，以满足日渐崛起的中产阶级在航空旅行上的需求。据波音估计，在此期间中国将需要6810架客机，价值一万亿美元（见图表）。国有企业中国商用飞机有限公司（COMAC，简称中国商飞）热切地希望能够提供当中的一部分客机。这就使得空客和波音面临一个棘手的局面。正如咨询公司贝恩的麦克·戈德堡（Michael Goldberg）总结的那样：“它们遇到的问题是，它们最大的客户想成为它们最大的竞争对手。”

中国在航空业上的抱负并不只仅仅事关国家尊严。中国一心想要跻身制造业价值链的上游。不过，制造军用飞机是一回事，掌握复杂的生产系统以生产出相对大批量的民航客机，而且这些飞机还必须满足国际航空公司极高的质量及可靠性标准——却完全是另外一回事。更重大的博弈是，如果中国得以攻克这一难题，从中所获得的经验便可应用于其他领域。

| 吹噓！

中国商飞成立于2008年，目的是为了研发一系列客机。仅仅两年，该公司就已在上海成立了一家工厂、兴建了若干办公楼，员工超五万人。这其中展现出的决心令人钦佩。不过随后它便遭遇了“湍流”。公司首架飞机——

支线客机ARJ21，今年6月才交付给成都航空公司，比原计划晚了八年。而更大型的、意欲与广受欢迎的短途机型波音737和空客A320展开正面竞争的C919——眼下也比预期进度晚了三年。虽然其首个实体模型已于去年11月在上海举行的一次盛会上揭幕，这次在珠海却只展出了一个比例模型。看来，这款飞机在2019年或2020年以前是不太可能交付了。

ARJ21已出现各种问题，如布线系统有毛病，机翼有裂纹，舱门存在故障，另外在雨天的表现也不尽人意。这就使得中国商飞在继续推进C919的研发时更加谨慎，以确保待其服役时万无一失。如此格外小心值得称道，但这也会耗费更多时间，进而影响到中国商飞的订单。大多数分析人士认为，等到C919升空之时，它的技术将早已过时，以至于其燃油效率会落后于新版本的波音737和空客A320。于是，众多外国买家选择了绕道走开。尽管中国商飞已从23个客户那里得到了570多个C919的订单，ARJ21也获得了400多个订单，但这些客户其实都来自中国的航空公司和租赁公司。这很可能是因为它们不得不屈从于某种爱国主义的强大压力。

不过，中国公司仍在步步推进。在此次航展上，中国商飞宣布将与俄罗斯联合航空制造集团（United Aircraft Corporation）共同研发一款能够运送约280名乘客的宽体客机。虽然该客机计划将在2025年投入使用，但分析人士认为，其交付日期同样将会大大推迟。中国政府还想生产出更多的精密系统，如发动机和航空电子设备——目前，中国还是在向西方公司采购这类系统，用于自己所生产的飞机。8月，中国斥资75亿美元成立了一家国营发动机制造厂，为中国商飞今后的项目生产发动机。

目前，西方国家的供应商尚将中国航空事业的崛起视为一个福音。如果中国商飞要生产出全部订单，美国工程集团霍尼韦尔将会从供应给中国的零部件中赚得150亿美元。如果按标价计算，通用电气与法国赛峰集团（Safran）的合资公司CFM国际（CFM International）也将从其发动机的销售中赚取160亿美元。到目前为止，不管是空客还是波音都还没觉得中国商飞已对它们在中国以外的销售构成太大威胁。但中国已明确表示，如果这两家公司还想在将来获得大型飞机的订单，它们就应帮助中国发展其航空业。

这就意味着，它们得同中国合作，同时又不至于转让太多技术。空客已在华北为中国向其购买的飞机建造了两家总装厂。波音也已同中国商飞展开了类似的协作，为737成立了完工中心。波音还从一些中国公司那里购买了某些基本部件，如787的方向舵。但到目前为止，那些更为复杂的任务（其中包括涉及些许“独门秘笈”的项目，如机翼组装）都还是在其本国完成。中国的航空事业能从上述情形中获得多少帮助，目前尚不明确。但情况如果能渐入佳境，下次于2018年举办的珠海航展上，天空中也许会出现C919的身影。■



Johnson

Doing by talking

People can change the world with “mere” words—especially powerful people

POLITICIANS like to promise action, not words. But this is odd: when was the last time a political leader did anything important with a physical action? Monarchs no longer lead armies into battle on horseback. Modern politicians stay safely at home. They give speeches, which they hope will make people vote for them. Once elected, their job is to give yet more speeches, have private meetings, engage in debates and maybe write the occasional opinion article.

In other words, a lot of words. It is fair to say that pretty much the entire job of a politician, unlike that of a woodworker or surgeon, is to talk, not to perform what might traditionally be called “action”. But this does not mean that politicians do nothing. There is a particular kind of speech that philosophers and linguists call “speech acts”, described by J.L. Austin in his book “How to Do Things with Words”, published in 1962.

Austin distinguished “locution”, the act of speaking itself, from “illocution”: the thing done in the world by that act. A classic distinction is a request phrased in the form of a question: “Can you shut the window?” It seems to be about the listener’s ability to shut the window, but the illocutionary act tells the listener to shut the window. Speech acts come stronger than that, too. People can commit themselves to a proposition, or promise a future action: “I promise I didn’t steal it” commits the speaker to being branded a liar if something else turns out to be the case. And “I swear to tell the truth, the whole truth and nothing but the truth” commits the speaker in court to accepting charges for perjury for doing otherwise.

Some people are authorised to change the state of the world itself through

speech. A minister can marry two people with the words, “I now pronounce you man and wife.” A judge can say, “I sentence you to three years in prison.” A traditional test is that if you can insert “hereby” into a sentence, you are performing a kind of direct-effect speech act.

But one group of people can perform an especially powerful kind of speech act. Heads of government do so when they speak about the policies of their countries. Since they set those policies, everything out of their mouths can be taken as something between the promise of an ordinary person, and a speech act with direct effect. These are taken by listeners as “I hereby commit my country to the following course of action.”

The world has been shaken by the election of Donald Trump to the American presidency because he has been saying things for a year and a half that seem to commit America to radical new policies: an abandonment of NATO allies who do not pay more for their protection, an end to free trade and the killing of terrorists’ family members. Many such things will be under his direct control as president.

The more level-headed supporters of the president-elect like to defend him by saying that he often speaks with a hidden wink. In other words, don’t take these as literal promises—speech acts—at all. He was a successful reality-show entertainer, after all. Another philosopher has described what might be considered Mr Trump’s signature style: Harry Frankfurt’s book “On Bullshit” described speech that, distinct from lying, is a kind of performance in which the speaker isn’t even concerned about the truth of what he says. Mr Trump himself used this “locker-room talk” defence after a video showed him bragging about groping women.

Now he is the president-elect. His first act was to give an unusually measured speech in which he promised reconciliation at home, and said that “we will get along with all other nations willing to get along with us.”

As he assembles his administration, he needs to know that the world has already taken a lot of what he has said as terrifying promises. Which Donald Trump will take office in January? The one who continually went off on reckless and damaging tangents during campaign speeches? Or the one who gave his victory speech?

It was reported that Mr Trump's staff had taken control of his Twitter account from him late in the campaign. He also stopped committing major outrages in speeches and, probably not coincidentally, he soon began to close in the polls. His staff seems to have convinced him that his spontaneous speech was his own worst enemy. It is far from clear he will take that lesson to the White House, where the world will take his words as deeds, and respond accordingly. ■



约翰逊

以言代行

人们“动动嘴皮子”就能改变世界，尤其是手握权力之人

政客喜欢承诺行动，而不是夸夸其谈。但这也很奇怪：谁还记得最近一次政治领袖亲自践行重要事务是什么时候？君主不再骑着战马率领军队冲锋陷阵。现代政治家们也都安全地呆在家里。他们发表演讲，希望能说服人们把票投给他们。一旦当选，他们的工作便是发表更多的演讲，参加私下会晤，参与辩论，也许偶尔也写篇评论。

换言之，就是要不停地发言。可以这么说，政治家与木工或外科医生不同，他们几乎全部的工作内容就是说话，而不是采取传统意义上所谓的“行动”。但这并不是说政治家都是光说不练。有一种哲学家和语言学家称之为“言语行为”的特殊言语，奥斯汀（J.L. Austin）在1962年出版的《如何以言行事》（How to Do Things with Words）一书中曾经对其有过描述。

奥斯汀将“言内行为”（说话这一行为本身）与“言外行为”（因说话而实际实施的行为）加以区分。一个经典的例子就是以问题的形式表达请求：“你能关上窗户吗？”——这句话似乎问的是听者关窗的能力，但言外行为是让听者去关窗。除了表达意图，言语行为还有更大的作用。人们可以接受一项提议，或承诺未来的行动。“我保证我没偷”这个言内行为让说话人必须承担后果，一旦事实与其所说不符，便要贴上说谎的标签。“我发誓说出真相，全部真相，绝无半点虚言”这句话在法庭上说出后，一旦被发现说谎，说话者必须承担作伪证的指控。

有些人被授以权力，通过言语就能改变世界的状态。牧师说一句“现在我宣布你们结为夫妻”就可以让两人合法结婚。法官说一句“我判你三年有期徒刑”就可让犯人入狱。看一句话否是言语行为，一般的验证方法是如果能在句中插入“特此”一词，那么这就是一个能产生直接效果的言语行为。

但有一群人可以执行一种影响重大的言语行为，政府首脑谈论国策时即是

如此。因为政策是由他们制定，他们所说的一切便会被视为介乎一个普通人的承诺和一个有直接影响的言语行为之间的东西。听者会将首脑们的话解读成“特此我将带领国家朝着以下方向发展”。

特朗普当选美国总统之所以震撼了世界，便是因过去一年半的时间里他说了很多话，似乎是在承诺美国将实施激进的新政策：放弃不愿付更多的钱就想寻求保护的北约盟国，结束自由贸易，以及处死恐怖分子的家人。当选总统后，许多这样的政策问题将会由他直接定夺。

头脑更冷静的当选总统支持者倾向于用一种说辞为特朗普辩护，即他说话时常常是另有玄机。换句话说，压根不要把这些话当做是真正的承诺（即言语行为）。毕竟，他是一个成功的真人秀艺人。另一个哲学家所谈论的可能算得上是特朗普的标志性风格。哈里·法兰克福（Harry Frankfurt）在《论扯淡》（On Bullshit）一书中描述了一种有别于撒谎的言语，如此讲话的人甚至并不关心其话语的真实性。特朗普侮辱女性的视频曝光之后，他说这只是“更衣室闲聊”，借此为自己开脱。

如今他的身份是当选总统。他做的第一件事就是发表了一篇异常字斟句酌的讲话，承诺寻求国内和解，并说“我们将与所有有相同意愿的国家友好相处”。他在组建政府时，需要明白世界各国已将他表达的众多观点都当作可怕的承诺。将于明年一月就职的会是哪一个唐纳德·特朗普？是在竞选演讲中屡屡说话不计后果、偏离正题的那个，还是发表胜选演说的这位？

据说，特朗普的竞选团队在竞选后期已经接管了他的推特账户。他在演讲中也不再触犯众怒，而且他很快就在民意调查中缩小了与希拉里的差距，这可能并非巧合。他的竞选团队似乎已经让他意识到他那些信口开河的演讲是其最大的敌人。特朗普是否会将学到的教训带到白宫还远未可知，但在那里，全世界都会把他的话当作行动，并采取相应对策。■



Samsung buys Harman

Amp my ride

In its biggest deal yet, Samsung bets on connected cars as a driving force

“THE car is the ultimate mobile device,” said Jeff Williams, an executive at Apple, last year. It was taken as another sign that the maker of iGadgets would be deepening its interest in the automotive sector (among other projects, it is developing an in-house smart car that is codenamed Project Titan). Now Samsung Electronics, its big rival in the smartphone world, is following. On November 14th the South Korean company said it would pay \$8bn for Harman, a firm based in Stamford, Connecticut, that makes internet-connected audio, information and security systems for cars. The deal is Samsung’s largest ever, and the first big transaction for its vice-chairman and heir apparent, Lee Jae-yong, grandson of the firm’s founder.

Though it is best known for its sound systems, Harman is one of the world’s largest supplier of smart parts for “connected cars” that help owners to drive by linking to the internet and to chip-enabled devices. It made \$7bn in revenue in the year to September, two-thirds or so of it from the car sector, and has over three times that in new orders. Its products are the first step towards autonomous vehicles. Over 30m cars use Harman’s audio and other kit, in offerings from real-time traffic reports to augmented-reality alerts on braking distances. By 2022 revenue from this “connectivity” will rise to \$155bn from \$45bn now, according to Strategy&, a consultancy.

The deal thus gives Samsung a firm foothold in the futuristic end of the automotive market. It had already edged into the sector with investments in Vinli and nuTonomy, two startups that make software for connected cars. Last year it set up a team to work on special parts for autonomous ones. Samsung SDI, a battery-making affiliate, already supplies lithium-ion batteries that power electric cars.

Harman's software skills and relationships with 30-odd global car brands opens doors for Samsung, says Kim Kyoung-you of the Korea Institute for Industrial Economics and Trade. It will be hoping to build a combined offering, of hardware parts and software know-how, that it will be able sell directly to automakers.

But it joins some technology rivals that are already moving fast in an area where Samsung's record is minimal. In the late 1990s Samsung Motors, a foray into carmaking, went bust (Renault of France bought it). Google has been testing self-driving cars since 2009. As well as Project Titan, Apple has CarPlay, a connected-car app that it started selling in 2013. Xiaomi, a Chinese smartphone maker that is a direct rival of Samsung, filed nine patents on internet-connected cars last year.

For a firm that has resisted big acquisitions, the scale of the deal with Harman suggests Samsung is counting on it for its next growth spurt. The company's smartphone division, the crown jewel of its empire, is suffering: last month it killed a new line of Galaxy Note phones after dozens exploded due to faulty batteries, incurring billions of dollars in losses. Under Mr Lee's leadership, Samsung has been using part of its cash pile (around \$70bn) to do overseas deals (though none as big as this one).

Whether his tenure at the firm is seen as a success will largely depend on the outcome of last week's deal. The car business may prove difficult to navigate once more. It is unclear which route to wholly connected vehicles the industry will take. Car firms may develop the technology alone (Ford, for example, has made purchases that suggest it is going down this road), in partnership with tech titans such as Google, or, as Samsung and Harman hope, they may buy it off-the-shelf. Mastery of one sort of mobile technology does not ensure success in others. ■



三星收购哈曼 助我前行

三星通过其最大一笔并购押注互联汽车，望其助力公司发展

去年，苹果的一位主管杰夫·威廉姆斯（Jeff Williams）表示，“汽车会是终极移动设备。”在外界看来，这番言论也许是iGadget的开发者苹果对汽车行业兴趣日益加深的又一迹象（除其他一些项目外，苹果还正在内部进行智能汽车的研发，代号为“泰坦项目”）。眼下苹果在智能手机领域内的一大竞争对手三星电子也正步步紧随。11月14日这家韩国公司称将以80亿美元的价格收购哈曼。哈曼总部位于美国康涅狄格州的斯坦福（Stamford），专事生产互联网车载音响、信息及安全系统。这次并购是三星历史上最大的一宗，也是其副总裁李在镕主导的首笔重大交易。李在镕是三星的法定继承人，也是公司创立者的孙子。

虽然哈曼最为知名的是其音响系统，但该公司同时也是世界上最大的“互联汽车”智能部件供应商之一。通过接入互联网，并与内置芯片的设备相连，这类智能部件可辅助车主驾驶汽车。截至九月，哈曼上一年的销售额达70亿美元，其中约三分之二都来自汽车行业。此外，新订单的规模更是上述收入的三倍多。它的产品是实现自动驾驶汽车的第一步。超过3000万辆汽车都在使用哈曼的音响及其他设备，其产品提供的功能涵盖了从实时交通状况报告到测定刹车距离的增强现实警报。根据咨询公司Strategy&的研究，到2022年，由这种“连通性”带来的收入将从当前的450亿美元升至1550亿美元。

因此，此次并购使得三星有望在未来的汽车市场站稳脚跟。此前，通过投资于Vinli及nuTonomy这两家生产互联汽车软件的创业公司，三星已经缓步进入了这一行业。去年，三星还组建了一个团队以研发自动驾驶汽车专用的特殊部件。其子公司、电池生产商三星SDI也已在供应驱动电动汽车的锂电池。

韩国产业经贸研究院（Korea Institute for Industrial Economics and

Trade)的金炯友(音)认为,哈曼在软件方面的技能以及与全球三十多个汽车品牌的关系将为三星打开机会之门。三星希望能够打造出涵盖硬件和软件的组合产品,直接出售给汽车制造商。

然而,三星的技术对手正在这一领域内快速行进,而三星在该行业内的业绩却可谓微不足道。20世纪90年代末,涉足汽车制造的三星汽车

(Samsung Motor)遭遇破产(被法国雷诺收购)。而谷歌自2009年起就一直在测试自动驾驶汽车。苹果除泰坦计划外,还推出了互联汽车应用CarPlay,并已于2013年开始销售。三星的直接竞争对手、中国智能手机制造商小米,也在去年申请了九项与互联网汽车相关的专利。

对于一家向来抗拒大规模并购的公司来说,此次交易手笔之大,表明三星期望能够借此实现下一轮的快速增长。该公司的智能手机部门是这家企业帝国皇冠上的宝石,如今却正遭受重创:由于电池故障,盖乐世Note系列手机发生了多起爆炸事件,迫使公司于上个月停产该款手机,损失达数十亿美元。在李在镕的领导下,三星已开始利用其庞大现金储备(约700亿美元)的一部分进行海外并购(不过没有哪一笔比眼下这桩交易更大)。

他在任期内是否会被视为成功,将在很大程度上取决于上周的这场交易会有怎样的结果。也许汽车行业会再一次被证明很难开拓。目前尚不清楚行业将采取何种方式实现车辆的全面联网。整车厂也许会自己开发这项技术(例如从福特完成的收购来看,它可能会走这条路),或者与谷歌这类科技巨头合作,还可能像三星和哈曼所希望的那样,直接从零部件商那里采购。不过,掌握了移动技术中的一类并不能保证在其他门类中也能成功。





The music business

Change of tune

Once enemies of record labels, Spotify and Apple are now spinning profits for them

IT WAS an eventful summer in the business of streaming music. Taylor Swift and other artists attacked YouTube over rampant free streaming. Frank Ocean and Katy Perry cut exclusive deals with Apple Music, to the dismay of executives at Spotify, a Swedish rival. Behind the scenes, Pandora, a radio-like service, and Amazon, an e-commerce giant, stepped up their efforts to take on Spotify and Apple. Then in September Spotify began talks to buy SoundCloud, another streaming firm.

All this drama obscures two emerging realities. The first is that subscription streaming is now the future of the music business. The industry suffered a catastrophic collapse in sales from 1999 onwards before beginning to recover last year. Selling music to own, whether via iTunes downloads or CDs, is still a declining business globally.

But American record labels and music publishers are now on track for a second consecutive year of growth. Recent reports on sales of music from Europe, where some countries are experiencing double-digit increases in revenues, suggest that the recovery will also continue in other parts of the world.

Most of that rebound is due to growth in subscription-streaming revenues. In the first half of 2016 subscription streaming in America reached a retail value of \$1 billion, up by over \$500m in just one year, putting it on a par with digital downloads. Retail revenues from radio-like services such as Pandora, and from ad-supported on-demand streaming such as YouTube and Spotify's free service are faring much less well—they grew in America by less than a tenth, to \$600m.

The second reality is that since Spotify and Apple have close to two-thirds of the world's nearly 90m paying subscribers to streaming services, they are the ones shaping the future. If Spotify acquires SoundCloud, a mostly free service that claims to have 175m monthly listeners, its position would be stronger still. In September Daniel Ek, the co-founder and chief executive of Spotify, tweeted that his company had surpassed 40m subscribers—adding 20m since June 2015, as many as it had acquired in its first seven years in operation. Spotify reached this milestone despite intense competition from Apple Music, which has won 17m subscribers since its start in 2015. The smaller firm hands over close to 70% of its revenues to the music business in royalties, says an industry executive.

| *Hogging the mic*

Indeed, peel back the figures and the industry's reliance on Spotify and Apple's paid services becomes even clearer. The number of subscribers to all others combined shrank slightly—from 31m to 30.5m—in the year after Apple launched its service, notes MIDiA Research, a London-based consulting firm. Artist-backed services such as Tidal, which is co-owned by Jay Z and other performers, and which claims 4.2m subscribers, aren't getting anywhere.

As a result, music companies are keenly watching what Apple Music and Spotify might do next. The industry remains nervous of Apple, since its size and multiple lines of activity may at some point allow it to force down royalty payments. In other words, the music industry knows that it needs Apple more than the other way around. Spotify, on the other hand, is a lossmaking firm with only one string to its bow. Record labels have their niggles about Spotify but are eager for it to succeed.

The change in attitude is striking. Once the bête noir of the industry for not paying recording labels enough in royalties, Spotify is fast becoming their most reliable moneymaker. The firm recently disclosed that it has paid \$5

billion to the music industry to date. Apple, once vilified for decimating album sales with iTunes, is the second-biggest earner. If the music industry is singing a new and catchier tune, it has some erstwhile enemies to thank. ■



音乐行业 变了调

Spotify和苹果曾是唱片公司的敌人，如今却在为它们生财聚富

对于流媒体音乐行业来说，今夏可谓好戏频出。泰勒·斯威芙特（Taylor Swift）和其他一些艺人声讨YouTube上猖獗的免费流媒体音乐。弗兰克·奥申（Frank Ocean）和凯蒂·派瑞（Katy Perry）与Apple Music签订了独家合约，令其瑞典对手Spotify的高层失望不已。在幕后，一个类似电台的服务商潘多拉（Pandora）和电子商务巨头亚马逊都加大了对抗Spotify和苹果的力度。九月Spotify开始就收购另一家流媒体公司SoundCloud进行谈判。

这一出出戏模糊了两个逐渐显现的现实。其一，如今流媒体订阅才是音乐行业的未来。自1999年以来，这一行业在销量上经受了灾难性的崩溃，直到去年才开始恢复。将音乐直接出售的业务，无论是通过iTunes下载还是CD，在全球仍在不断下滑。

但是美国唱片公司和音乐出版商目前正处于连续第二年的增长之中。关于欧洲音乐销量的最新报告显示，有些国家这一行业的收入正经历两位数的增幅，表明该行业在世界其他地区也将继续复苏。

这样的反弹大多归功于流媒体订阅收入的增长。2016年上半年美国的流媒体订阅零售额达到10亿美元，仅仅一年就增长了5亿多美元，与数字下载规模相当。像潘多拉这样类似电台服务的零售额，以及靠广告支持的点播流媒体（如YouTube和Spotify的免费服务）的收入则远没有这么风光——它们在美国的增长还不到十分之一，为6亿美元。

另一个现实是，由于Spotify和苹果拥有全球近9000万流媒体订阅付费用户的将近三分之二，它们才是行业未来的塑造者。如果Spotify收购了SoundCloud这个声称有1.75亿月用户、基本免费的服务商，那么它的地位将进一步得到巩固。九月Spotify的联合创始人及CEO丹尼尔·埃切

(Daniel Ek) 发推文称他的公司已经拥有超过4000万订阅用户，比2015年6月多了2000万。这一增幅相当于公司运营头七年积累用户的总和。尽管与Apple Music之间竞争激烈，Spotify仍然达到了这一里程碑，而Apple Music自2015年推出以来已赢得1700万订阅用户。一位业内主管表示，小型公司收入的近70%都作为版税交给了音乐公司。

| 霸住麦克风

的确，仔细研究这些数据便会发现，该行业对Spotify和苹果付费服务的依赖性愈加清晰。位于伦敦的咨询公司MIDIa Research指出，在苹果推出服务一年后，其他所有服务的订阅用户总数稍有下降，从3100万降至3050万。由艺人支撑的服务则未成气候，如Jay-Z和其他艺人共同拥有、宣称有420万订阅用户的Tidal。

因此，音乐公司都密切关注Apple Music和Spotify下一步的动向。这一行业对苹果仍颇为忌惮——以它的规模和多线业务，说不定什么时候就会强制压低版税。换言之，音乐行业明白，是它更需要苹果，而不是苹果更需要它。另一方面，Spotify一直在亏损且只有这一项业务。唱片公司对Spotify吹毛求疵，但也渴望看到它获得成功。

这种态度上的变化显而易见。Spotify曾因没有向唱片公司支付足够的版税而被视为业界大患，现在却正快速成为它们最可靠的摇钱树。公司最近披露，至今已向音乐行业支付了50亿美元。苹果曾因iTunes严重损害专辑销售而遭诽谤，现在则已成为行业第二大收入来源。如果说音乐行业正唱着一曲琅琅上口的新歌，那么它要感谢一些往日的仇敌。■



Advertising

Gold posts

Social-media endorsements are the latest thing in advertising

HAVING just received the latest PlayStation console from Sony, Dele Alli, an English footballer, posts a photo of it to his Instagram account. He dutifully thanks his benefactor and concludes the message: “#ad”.

It is the latest frontier of a rapidly growing industry. Since January, more than 200,000 posts per month on Instagram, a picture-sharing app owned by Facebook, have been tagged with “#ad,” “#sp” or “#sponsored”, according to Captiv8, a firm that connects brands to people like Mr Alli. Most are reaching Instagram users via such celebrities. Hiring “influencers”, as they are known, connects brands to a vast network of potential customers. Kim Kardashian West, a reality-TV star, for example, reaches 160m people across Facebook, Instagram and Twitter.

Consumers love the unprecedentedly deep access to the lives of the rich and/or famous that platforms offer. DJ Khaled, a music producer and prolific poster on Snapchat (another picture-messaging app), delighted millions of his followers with live video updates of himself lost at sea at night on a jet ski. He is also an influencer for a brand of vodka. Paul Pogba (pictured), who became the world’s most expensive footballer when he joined Manchester United, often shares videos of himself and friends practising dance routines at home, which all translates into valuable social-media exposure for Adidas, his sponsor.

Advertisers thus build a relationship with potential customers that traditional methods cannot reach. Sponsors value that highly (and whether the celebrity or their social-media manager does the posting seems not to matter).

Yet as media agencies and brands have piled in, the grey area between voluntary celebrity endorsements and paid advertisements has grown murky. Not all influencers label their posts clearly with “#ad”. Consumer watchdogs are crying foul. One, Truth in Advertising, recently accused Ms Kardashian and her sisters of running “deceptive marketing campaigns”.

Regulators have little choice but to respond. This summer America’s Federal Trade Commission (FTC) successfully pursued Warner Brothers, a film studio, for failing adequately to disclose that it paid online influencers to give computer games rave reviews (the firm settled its case). The FTC plans to bring more. Media agencies say defining right and wrong practice would help. The FTC first raised concerns about social-media endorsements in 2009, but the rules are unclear.

The reaction from celebrities has also been swift. High-profile influencers on Instagram and Snapchat quickly began labelling their sponsored content with “#paid” and “#sponsored”. The Kardashians amended their social-media feeds to say “#ad”, or deleted posts. Nevertheless, social media is likely to remain a powerful enabler of the soft sell. ■



广告

招财贴

社交媒体代言成为广告界新时尚

英格兰球员德勒·阿里（Dele Alli）收到索尼最新款的PlayStation游戏机后，随即在自己的Instagram上贴出照片，竭诚感谢赠送礼物的商家，并加上“#广告”的标签。

这是一个膨胀迅速行业的最新前沿。今年一月以来，Facebook旗下的图片分享应用Instagram上每月有超过20万个帖子带有“#广告”或“#赞助”之类的标签，这是为品牌企业和阿里这类名人牵线的公司Captiv8所统计的数据。大部分品牌正通过这些名人向Instagram用户宣传，聘用所谓的“网络红人”将品牌与广大潜在客户连结起来。例如，通过真人秀明星金·卡戴珊·威斯特（Kim Kardashian West）的Facebook、Instagram及推特帐号，宣传信息可触及1.6亿受众。

消费者乐于通过这些平台前所未有地深入了解富人名流的生活。活跃在Snapchat（另一图片消息应用）上的音乐制作人DJ哈立德（DJ Khaled）发布自己夜里驾驶水上摩托艇在大海上乱闯的视频，令数百万粉丝大为开怀。他还代言了一个伏特加品牌。保罗·博格巴（Paul Pogba，见图）转会曼联后成为世界上身价最高的足球运动员，他经常分享自己和朋友在家中日常练舞的视频，这一切对其赞助商阿迪达斯来说都是宝贵的社交媒体曝光机会。

广告主藉此与潜在顾客建立起传统方法无法达致的关系。赞助商非常珍视这一机会，至于是名人自己还是他们的社交媒体管理者在发布那些广告帖子似乎并不重要。

但随着媒体代理公司及品牌企业纷纷加入这一大军，名人自行发布的赞赏帖子和付费广告之间的灰色地带变得越来越模糊。并非所有“网络红人”都会以“#广告”清晰标注广告帖。消费者权益机构正大力揭发违规现象。“广

告真相”（Truth in Advertising）最近指控卡戴珊及其姐妹在进行“欺骗性营销活动”。

监管机构不得不做出回应。今年夏天，美国联邦贸易委员会（FTC）成功追究了电影公司华纳兄弟（Warner Brothers）的责任，指其没有充分披露聘请网络红人为其电脑游戏发布好评信息（公司最后与FTC达成和解）。FTC计划对更多个案发出起诉。媒体代理表示，明确对错之分会有助于解决问题。FTC早于2009年便对社交媒体代言提出质疑，但相关规范一直没有明晰。

名人们的反应也很迅速。Instagram和Snapchat上的高调名人开始在代言帖子上标注“#有偿帖”及“#赞助内容”。卡戴珊姐妹们在自己的社交媒体帖子标注“#广告”，或干脆删掉那些广告帖。然而，社交媒体很可能仍是软推销的强大推动者。■



China's corporate debt

State of grace

With the government on their side, China's state firms borrow cheaply

IN ITS never-ending quest to rein in profligate local officials, China in November ordered its indebted cities and provinces to draw up detailed repayment plans. But for these rules to work, the central government must prove that it is willing to let the miscreants default. Creditors doubt its resolve and expect it to go on bailing out the spendthrifts. As a result, they systematically give more generous lending terms to state-owned enterprises (SOEs) than to their private peers.

The bias is not immediately obvious. Looking at interest costs, China seems to have a level playing field. A 2011 survey, for example, revealed that the median interest rate on bank loans to private firms was 7.8%, just above the 7.5% average at the time. Borrowing rates for both SOEs and private firms have remained in line with each other since then, declining in tandem.

But this appearance of parity is superficial. Borrowing costs only tell half the story. The other half is the borrower's quality. When investors assess the risk of lending to Chinese companies, they price in the assumption that the state will stand behind SOEs. How much is this assumption worth? One way to measure this is to compare credit ratings. Rating agencies grade SOEs according to two standards: a stand-alone rating (based on the company's own balance-sheet) and a state-backed rating (factoring in government support).

This chart illustrates the extent to which SOEs benefit. The horizontal axis shows their original rating (based on a blended average from Fitch, Moody's and S&P, the three big international rating agencies). The vertical axis shows their final rating after state support is added to the equation. The

size of the bubble indicates the size of the debt. When ratings are unchanged, as is the case for most private companies, the bubbles incline upwards along a 45-degree angle. But when ratings are boosted, the bubbles migrate above the 45-degree line: virtually all SOEs are in this category.

Take, for instance, Beijing Infrastructure Investment Co Ltd, which operates the city's urban rail system. With a hefty debt load, its initial credit rating would be BB-, a risky junk bond, according to S&P. But thanks to government support, S&P gives it a final rating of A+, eight notches higher, a solid investment-grade bond. By contrast, JD.com, a leading e-commerce company, earns a BBB-rating from S&P, just one notch above junk status. As a private company, it receives no ratings uplift.

The impact of the rating changes is big. In the onshore Chinese bond market, if the stand-alone ratings applied, SOEs would face annual interest rates of more than 10% instead of the roughly 5% they are used to. Even in the Hong Kong bond market, average annual borrowing rates for SOEs should be 3.5%, based on their stand-alone profiles; that, however, falls to roughly 2% after state support is included. That amounts to a two-fifths discount on interest costs—quite the subsidy.

Creditors are, of course, not doing this out of the goodness of their hearts, but rather in the belief that the state will prop up SOEs if necessary. This guarantee, though, is not ironclad. As the economy slows, the government has let a few smaller SOEs default this year. With the announcement this month, it seems to be setting the stage for more delinquency. The task for rating agencies and investors, then, is to try to gauge the extent of state backing for different SOEs.

If an SOE is controlled by the central government, the presumption of support is still strong. But as Ivan Chung of Moody's says, the calculations are more nuanced for SOEs controlled by provinces or cities. First, analysts

examine company finances. Next, they look at the balance-sheet of the government that theoretically stands behind it. Finally, they consider the company's strategic importance: a water utility fares better than a property developer. It is a lot to weigh—and as SOE debts pile up, these nuanced judgments will become only weightier. ■



中国的企业债 政府恩泽

有政府撑腰，中国国企借贷成本低廉

中国仍在不懈努力，以管束其大手大脚的地方官员。11月，中央责令各负债省市制定详细的还款计划。但是为了使这些规定发挥效用，中央政府必须证明它愿意让那些无力还债的企业违约。债权人对政府的决心表示怀疑，他们估计政府会继续为败家子企业纾困。因此，他们系统地向国企贷款，条件比对私企更为宽松。

对国企和私企的不平等待遇并不是一下就显而易见。如果只看利息成本，中国似乎有一个公平的竞争环境。例如，2011年的一项调查显示，银行对私企的贷款利率中位数为7.8%，仅比当时7.5%的平均利率高一点。国企和私企的贷款利率自那时以来始终保持一致，并一同呈下降趋势。

但是这种平等只是表象。借贷成本只讲了故事的一半，另一半则是借款人的质量。投资者评估对中国企业贷款的风险时，会考虑国家会支持国有企业这一假设。这个假设有多少价值？衡量这点的一种方法是比较信用评级。评级机构根据两个标准评级国企：独立评级（基于企业自己的资产负债表）和国家支持评级（考虑政府支持因素）。

这幅图表说明了国有企业受益的程度。水平轴显示其初始评级（基于来自三大国际评级机构惠誉、穆迪和标准普尔的混合平均值）。纵轴表示将国家支持加入考量后的最终评级。气泡的大小表示债务的规模。评级水平不变时，如大多数私营公司的情况，气泡沿45度角向上倾斜。但评级提高时，气泡在45度线上方移动：几乎所有的国有企业都属于后一种情况。

以运营北京城市轨道交通系统的北京市基础设施投资有限公司为例，标准普尔的数据显示它债务负担很重，其初始信用评级应是BB-，属于高风险的垃圾债券。但是得益于政府的支持，标准普尔最终给予它A+评级，比初始信用评级高出八档，成为稳健的投资级债券。相比之下，领先的电子商务企

业京东从标准普尔获得了BBB评级，仅比垃圾级高出一档。作为一家私企，它没有获得评级提升。

评级变化的影响很大。在中国境内债券市场上，如根据独立评级，国企将要支付超过10%的年利率，而不是它们习惯的大约5%。即使在香港债券市场，基于国企的独立评级，它们的贷款年利率应为3.5%；不过，纳入国家支持这一因素之后，贷款年利率下降到大约2%。这相当于利息成本打了六折——一笔可观的补贴。

债权人这么做当然不是出于好心，而是相信国家会在必要时扶持国企。不过这一保证也不是铁板钉钉。随着中国经济放缓，今年政府已经让一些较小的国企违约。随着本月这一决定的宣布，政府似乎正在定下基调，放手让更多的企业违约。因此，评级机构和投资者的任务是尝试弄清楚国家对不同国企的支持程度。

对于中央政府控制的国企，政府支持的推定依然有力。但正如穆迪公司的钟汶权所说，对于由省市控制的国有企业来说，计算过程会更加微妙。首先，分析师会研究企业财务状况；然后看看理论上支持这个企业的政府的资产负债表；最后，考量企业的战略重要性（比如水务公司要比地产开发商重要）。要考虑的方面很多，随着国企债务不断积累，这些细微的判断在计算中将更为重要。■



Free exchange

That Eighties show

Donald Trump's attempt at Reaganomics will prove costlier than the original

FOR the moment, the policy priorities of the Trump administration-in-waiting are a basket of unknowables. Plans to scrap Obamacare or re-deregulate America's financial sector, though dear to Republican hearts, are easier to champion on the campaign stump than to implement. A step away from globalism—Donald Trump's most consistent campaign theme—could make for an awkward opening gambit given pockets of Republican resistance to overt protectionism. Tax cuts and infrastructure spending, on the other hand, look like an easy and unifying win for the new administration. And indeed, market moves since Mr Trump's victory seem to imply an expectation of a Ronald Reaganesque turn in American fiscal policy; government-bond yields have risen, seemingly in expectation of bigger deficits, faster growth and higher inflation. Yet any resemblance that Mr Trump's plans may bear to Reaganomics is as much a cause for concern as for optimism.

The president-elect's tax proposals are easily the boldest since Reagan's. Mr Trump's plan would slash the highest marginal income-tax rates, cut rates of tax on corporate income and on capital gains, and eliminate federal inheritance and gift taxes entirely. According to an analysis by the Tax Policy Centre, a think-tank, the plan would reduce annual federal-tax revenue by about 4% of GDP. In contrast, in the first four years after its implementation the tax reform act of 1981 reduced annual revenue by almost 3% of GDP. At the same time, Mr Trump seems keen on new government spending; his transition-team website refers to \$550bn in desired new infrastructure investment. Even if the legislation to emerge from Congress is more moderate, as seems likely, a big dose of tax cuts and

new spending appears to be in the offing.

Stimulus would have its benefits. Higher inflation would be a welcome change from the spectre of deflation that until recently stalked the rich world. Some economists reckon that running the economy “hot”, to the extent that demand outstrips its productive potential, could nurture growth in America’s economic capacity: by bringing workers on the margins of the labour force back into employment, for example. Yet a Reaganomics rerun would almost certainly do more harm than good. The experience of the 1980s suggests three big causes for concern.

The first is financial instability. American interest rates in the 1980s were remarkably high: thanks initially to Paul Volcker’s efforts to bring down inflation, and later on to faster American growth and heavy government borrowing (see chart). High interest rates attracted money from abroad, pushing up the value of the dollar: it rose, on a trade-weighted basis, by roughly 40% from 1980 to 1985. As a result, developing economies, including many in Latin America, found themselves with unpayable dollar-denominated loans. Sovereign-debt woes crippled the affected countries’ economies; meanwhile, debt defaults and restructurings saddled big American banks with large losses, pushing some to the brink of insolvency. Today, most emerging economies hold far less dollar-denominated public debt. Yet vulnerabilities remain. The Federal Reserve has prepared markets for a gradual pace of monetary tightening. Should higher inflation convince the Fed that more interest-rate hikes are needed sooner, many investors in emerging markets could be caught off guard. A bout of chaotic capital flight could threaten shakier banks or induce governments to adopt capital controls. America, which eventually intervened to help manage the Latin American debt crisis, will probably be slower to lend a hand under Mr Trump.

| *Trumped-up trickle-down economics*

American generosity might be in especially short supply as a result of a second side-effect of Trumpian Reaganomics. As the dollar soared in the early 1980s, America's current account flipped from a small surplus into sizeable deficit. American firms howled. Efforts early in the 1980s to cajole trading partners into limiting exports gave way to more serious interventions later on. In 1985 James Baker, then treasury secretary, negotiated the Plaza accord with Britain, France, Japan and West Germany to bring down the value of the dollar. And in 1987 Reagan slapped economic sanctions on Japan for its failure to meet the terms of an agreement on trade in semiconductors.

Mr Trump, no instinctive free-trader, might face a similar dynamic. Faster growth and higher interest rates might attract foreign capital and place upward pressure on the dollar, which has indeed been rising since the election. That will help exporters to America and hamper a manufacturing revival in the struggling towns that helped Mr Trump win. In fact, the Mexican peso has fallen by about 10% against the dollar since the election, boosting the competitiveness of Mexican firms relative to their American counterparts. Yet Mr Trump will find responding to these shifts to be trickier than did Reagan. Sprawling supply-chains mean that punitive tariffs are less obviously useful to domestic firms than they once were. A battle over exchange rates between America and China could prove far more dangerous, both economically and geopolitically, than Mr Baker's negotiations.

Perhaps most important is a third lesson: that the boost to growth provided by tax cuts and liberalisation need not be spread evenly across the economy. Prescriptions which made sense a generation ago look inappropriate now. Top marginal tax rates are far lower than they were then; further cuts may deliver a smaller boost to growth as a result. Meanwhile, inequality is far higher now than it was in the early 1980s;

slashing tax rates on the rich while unravelling recent financial regulation could push economic divisions to unprecedented, politically toxic levels. The global economy could use more fiscal stimulus. A raft of regressive tax cuts from a protectionist-minded American administration is, to put it mildly, a risky way to provide it. ■



自由交流

那一出80年代秀

特朗普实施里根经济政策最终会付出比当年更高昂的代价

目前看来，特朗普候任政府的政策重点还是一篮子未知数。无论是废除奥巴马医改，还是再次放宽对美国金融部门的监管，尽管都颇合共和党的心意，但真正实施起来却并不像在竞选演说上表态那么容易。“离全球主义远一步”是特朗普最为一以贯之的竞选主题，但考虑到小部分共和党人拒绝过于明显的贸易保护主义，这可能会是一步拙劣的开局。另一方面，减税且增加基础设施开支对于新政府来说看似一场简单而又聚拢人心的胜利。其实自特朗普获胜以来，市场动向似乎意味着美国有望转向里根式的财政政策；政府债券收益已经上涨，似乎预计赤字更大、增长更快、通胀更高。但是特朗普的计划与里根经济政策的每一点相似之处都既让我们担忧，也令我们乐观。

当选总统的税收计划无疑是自里根政府以来最大胆的。特朗普的计划将大幅削减所得税的最高边际税率，削减企业所得税和资本利得税的税率，并且彻底取消联邦遗产税和赠与税。根据智库税收政策中心（Tax Policy Centre）的分析，该计划会令年度联邦税收降幅约达GDP的4%。与此相比，1981年税改法案实施之后的首个四年，年度联邦税收降幅大致为GDP的3%。而与此同时，特朗普似乎还热衷于增加政府支出，其过渡团队网站上公布拟投资5500亿美元用于兴建新的基础设施。即便经国会通过的立法会更为温和（似乎很有可能会是这样），大规模减税和新的支出看起来也正在酝酿之中。

财政刺激有其好处。通货紧缩直到最近仍在富裕世界阴魂不散，因而更高的通胀率会是一项值得欢迎的转变。有些经济学家认为让经济“热”起来，热到需求超过其生产潜力的程度，这样能够培养美国经济实力的增长：让处于劳动大军边缘的工人重新就业就是个好例子。但是再次实施里根经济政策几乎必然会弊大于利。上世纪80年代的经历反映出人们担忧的三大理由。

首先是金融不稳定。上世纪80年代美国利率非常高：起初是因为保罗·沃尔克（Paul Volcker）降低通货膨胀的努力，后来则是由于美国经济增长加快、政府债务沉重（见图表）。高利率吸引了海外资金，推高了美元价值：从1980年至1985年，以贸易加权计美元升值约40%。结果，包括很多拉丁美洲国家在内的发展中经济体发现自己已无力偿还以美元计价的贷款。主权债务危机损害了受影响国家的经济；与此同时，债务违约和重组也让美国大型银行背负了极大的损失，甚至将其中一些推向了破产边缘。今天大多数新兴经济体持有的以美元计价的公共债务都要比那时少得多，但仍十分脆弱。美联储已经让市场对逐步收紧的货币政策有所准备。如果更高的通胀水平让美联储确定需要更快加息，那么新兴市场的很多投资者也许会措手不及。一轮资本混战可能会威胁到摇摇欲坠的银行，或是促使政府采取资本管制。之前美国最终介入，帮助管理拉美债务危机，而如今在特朗普领导下，美国很可能会更慢才伸出援手。

| 特朗普鼓吹的涓滴经济学

特朗普式里根经济政策第二个副作用的结果是美国的慷慨或许会尤为稀缺。20世纪80年代初期美元飙升，美国的经常账户从略有盈余转而成为赤字严重。美国公司发出了怒吼。80年代初劝诱贸易伙伴限制出口的尝试被之后更严重的干预措施取代。1985年，时任财政部长的詹姆斯·贝克（James Baker）与英国、法国、日本和西德协商签订了《广场协议》，以使美元贬值。1987年因日本在半导体贸易中未能履行一项协议的条款，里根对日本实施了经济制裁。

特朗普，作为一个并非天生的自由贸易主义者，他可能要面临类似的时局。增长更快、利率更高可能会吸引国外资本，推动美元升值，而大选之后美元的确在上涨。这将有助于对美国出口，却阻碍了那些帮助特朗普获胜、现正苦苦挣扎的城镇里制造业的复苏。其实大选之后墨西哥比索兑美元已经下跌了约10%，这提升了墨西哥公司相对于美国公司的竞争力。但是特朗普会发现应对这些变化比里根时期要棘手得多。四处扩展的供应链意味着惩罚性关税对国内公司的帮助不会像之前那么明显。中美之间的汇率战可能最终会比贝克时期的磋商更危险，无论是在经济上还是地缘政治

上。

也许最重要的是第三个教训：由减税和自由化带来的增长推动力不需要均匀分散到整个经济当中。一代人之前合乎情理的良方现在看来并不合适。现在最高的边际税率比那时低得多；再减税可能最后对增长的助力更小。而且，现在的不平等程度比上世纪80年代高得多。大幅降低富人的税率，同时放宽近来的金融监管，可能会将经济差距推向空前的水平，在政治上危害巨大。毫不夸张地说，全球经济可以有更多的财政刺激。由倾向贸易保护主义的美国政府提出的大规模递减税削减来提供刺激可谓是一招险棋。 ■



European banking jobs

Career breaks

A grim new world, one with fewer bankers

FRANK LLOYD WRIGHT quipped that “the modern city is a place for banking and prostitution and very little else.” Little did the early 20th-century architect know how banks would flourish, hoovering up much of the world’s talent by the early 2000s. But this golden age is ending: bankers’ jobs are at risk from the digital revolution on the one hand, and falling profits on the other.

Nowhere have bankers fallen from grace with such a bump as in Europe. Early October, ING, the Netherlands’ largest bank, announced that up to 7,000 jobs would be cut in the next five years. Commerzbank, Germany’s second-largest bank, had already reported it would cut its workforce by 9,600, nearly a fifth.

Across Europe, bankers are packing up. In Britain more than 10% of bank jobs were cut between 2011 and 2015; in Germany the workforce has shrunk by around 20% since 2001. Since the start of the year Credit Suisse has got rid of nearly 5,000 jobs and Barclays has shed 13,000. In Spain Banco Popular is cutting about one-fifth of jobs. “Desperate times call for desperate measures,” notes Naeem Aslam, of Thinkmarkets, a broker. With today’s low interest rates, slow growth and rising regulatory costs, it is much harder for banks to be profitable.

In such a choppy environment, costs are one of the few things a bank can control and these come primarily from the workforce. By cutting headcount and branches, frugal Scandinavian banks have brought their cost-to-income ratio, a measure of efficiency, down to the mid-40s. The European average is around 60%. But at Commerzbank the ratio is 79% and at

Deutsche Bank 89%.

Brexit complicates matters further. A report in October by Oliver Wyman, a consultancy, estimated Britain might lose 35,000 jobs in financial services. Thorsten Beck of Cass Business School in London thinks some jobs will move to the euro zone. But others might be gone for good because of rigid labour laws and because some might be less worthwhile inside the euro area than in London.

Young people have heard enough: whereas in 2007 around 28% of MBA graduates from INSEAD, a European business school, chose a career in finance, last year only 15% did. Within that group fewer are opting for investment banking. That is good news for talent scouts at tech companies; bad news for tailors of bespoke pinstripe suits. ■



欧洲的银行业职位 事业中断

一个严峻的新世界，银行从业人员更少了

弗兰克·劳埃德·赖特（Frank Lloyd Wright）曾调侃道：“现代城市是银行业和卖淫活动的地盘，其他的活动很少。”这位二十世纪初的建筑师并不知道，银行会在二十一世纪初蓬勃发展，吸引世界上的大批人才。但这个黄金时代正在结束：在数字革命和利润下滑的双重夹击之下，银行业的职位正岌岌可危。

银行业人士从未像在欧洲这样突然失宠。十月初，荷兰最大的银行荷兰国际集团（ING）宣布将在未来五年内削减多达7000个职位。德国第二大银行德国商业银行（Commerzbank）已宣布将裁员9600人，接近员工总数的五分之一。

在欧洲各地，银行从业人员都在卷铺盖准备走人。在英国，2011年至2015年间共裁减了超过10%的银行职位；在德国，2001年以来银行从业人数也减少了20%左右。今年以来，瑞信银行（Credit Suisse）已经裁减了近5000个职位，而巴克莱银行则已裁员1.3万人。在西班牙，大众银行（Banco Popular）正在削减约五分之一的职位。经纪公司Thinkmarkets的纳伊姆·阿斯莱姆（Naeem Aslam）表示：“危急时刻需要孤注一掷。”由于现今的低利率、增长缓慢及监管成本上升，银行要盈利更加困难。

在如此动荡的环境下，成本是一家银行所能控制的少数几件事之一，而这又主要来自员工。通过裁员和减少分行数量，节俭的北欧银行将其成本收入比（对效率的一种衡量方法）降至45%左右。欧洲的平均水平约为60%。但德国商业银行达到79%，德意志银行更是高达89%。

英国脱欧使问题变得更为复杂。咨询公司奥纬（Oliver Wyman）十月的一份报告预测，英国可能会失去3.5万个金融服务业职位。伦敦卡斯商学院（Cass Business School）的索斯滕·贝克（Thorsten Beck）认为，一些工

作将转移到欧元区。但其他的职位则可能会从此消失，因为劳动法规太过死板，而且相比伦敦，一些工作在欧元区内可能更不值得去做。

年轻人已经听够了：2007年，英士国际商学院（INSEAD）大约28%的MBA毕业生选择从事金融业，去年只有15%。这群毕业生里选择投资银行的人减少了。这对科技公司的猎头来说是好消息，但对定做细条纹西装的裁缝来说则是个坏消息。 ■



Schumpeter

The great divergence

A group of elite firms has established a sustained lead. This is not a good thing

ONE of Joseph Schumpeter's best-known observations was that successful businesses stand on ground that is "crumbling beneath their feet". A danger is that standing still and resting on your laurels can precipitate a swift tumble. Rivals, meanwhile, can draw on the available stock of knowledge and technology to catch up with the leaders. To stay ahead, front-runners must keep inventing new things. This means that capitalism is inherently unforgiving: today's leader is tomorrow's failure. But it also means that it is inherently progressive, since clever ideas are quickly spread through the economy.

Some striking new research suggests that this Schumpeterian mechanism may have broken down. The leaders are staying ahead much longer than is desirable. A group of researchers at the OECD, a club of mostly rich countries, examined the performance of a representative set of companies in 24 of its 35 member countries between 2001 and 2013. They discovered that the top 5% of them, dubbed "frontier firms", have continued to increase their productivity while the other 95% (the laggards) have been stagnant in this regard.

Plenty of economists have noted what they call a "great stagnation" in the global economy in recent times. The OECD researchers, Dan Andrews, Chiara Criscuolo and Peter Gal, show that beneath the stagnation lies a deeper pattern: rising productivity at the frontier and a widening gap between the leaders and the laggards. Three-quarters of the gap emerged before the global financial crisis of 2008. The divergence varies between sectors: in manufacturing, for example, top-tier firms saw their labour productivity increasing by 2.8% a year, against 0.6% a year for the rest. The

gap was even bigger in services: 3.6% compared with 0.4%.

The frontier firms appear to have certain things in common.

Unsurprisingly, they are ahead of the pack in technological terms, and they make much more intensive use of patents. Perhaps the most striking difference is that frontier firms are always citizens of the world. They are frequently part of multinational groups and they constantly benchmark themselves against other frontier companies across the globe. So technological innovations from the frontier are spreading more rapidly across countries than they are within them. The gap between an elite British firm and an elite Chinese firm is narrowing even as the gap between an elite British firm and its laggardly compatriot is expanding.

The emergence of frontier firms is in many ways surprising. Management gurus have been arguing for years that the balance of advantage is shifting from incumbents to challengers. Small firms can easily buy computing power that used to be reserved for corporate giants. Valuable MBA graduates are now being minted by the million and are waiting to be hired. If that is the case, why are the elite pulling ahead in so many different countries at the same time?

An obvious explanation is that digital technology is unleashing a phenomenon of “winner-take-most” markets thanks to a combination of low marginal costs (which allow first movers to expand quickly) and network effects (which make popularity its own, profitable, reward). The OECD notes that the information-technology industry is producing a class of super-frontier firms: the productivity of the top 2% of IT companies has risen relative to that of other elite firms. Other studies show that this is not because the top tier are investing more in technology (everybody is throwing money at it) but because they are investing more intelligently to enable their workers to do new things and to reinvent their business models.

A second explanation is that frontier firms (the 5%) have each discovered their own secret sauce. Some have learned how to foster management techniques that are largely inimitable. This seems to be so at 3G Capital, a Brazilian private-equity group, which takes over mature businesses and squeezes out costs that no one else can. Some are combining skills in unusual ways: Amazon mixes digital prowess with just-in-time logistics. Some have devised rare material inputs. BMW, a carmaker, is using a special carbon fibre, stronger and lighter than steel, for its i3 and i8 electric cars. The material starts life in a Japanese rayon factory, goes to America to be carbonised and is then sent to Germany, where the strands are woven into sheets.

| *The chosen ones*

Third, technological diffusion has stalled: cutting-edge ideas are not spreading through the economy in the way that they used to, leaving productivity-improving ideas stuck at the frontier. Such diffusion may be harder in a knowledge-intensive economy because frontier firms can hire the most talented workers and cultivate relations with the best universities and consultancies. But it is also made worse by bad policy. The OECD notes that divergence in productivity is particularly marked in sectors which have been sheltered from competition and globalisation, most notably services.

Can anything be done to fix the diffusion problem? One approach is to try to get frontier firms to spread their best practices to the laggards. In Britain, which is dogged by a long tail of poorly performing firms, a group of businesspeople, led by Charlie Mayfield, chairman of the John Lewis Partnership, a retail group, have formed an initiative to encourage them to improve their productivity. Another tack is for policymakers to try to open protected areas of the economy to more competition: the European Union has been eyeing the service sector for years. There are problems with both approaches. Frontier companies will certainly not share all their secrets

with the laggards. The EU will become more unpopular than it already is if it tries to take on the continent's coddled service firms. But policymakers nevertheless need to find a way of addressing this problem if the rich world is to stand any chance of getting out of its productivity funk. ■



熊彼特

大分流

精英企业持续领先，实非好事

熊彼特最著名的见解之一便是成功企业的立足之地总是“摇摇欲坠”。若躺在功劳簿上停步不前，恐有迅速跌坠的风险。与此同时，竞争对手们运用已掌握的知识和技术就能赶上领军企业。为保持领先地位，业界翘楚们必须不断创造新品。这表明，资本主义本质上是残酷无情的：今天的胜者会是明日的输家。但这也意味着，资本主义本质上是进步的，巧妙的点子可迅速在整个经济中扩散。

一些令人瞩目的新研究显示，这种“熊彼特机制”可能已经失效。领先企业雄霸市场时间之长，远超理想状态。成员主要为富裕国家的“经合组织”（OECD）的一群研究人员审视了35个成员国中24个国家的代表性企业在2001年至2013年间的表现。他们发现排名前5%的“前沿企业”生产力不断得到提升，而余下95%的落后者则在这方面停滞不前。

许多经济学家已注意到近年来全球经济出现的所谓“大停滞”现象。经合组织的研究员丹·安德鲁斯（Dan Andrews）、基里亚·克里斯库洛（Chiara Criscuolo）和彼得·加尔（Peter Gal）指出了“停滞”背后更深层的模式：领先者生产力不断提高，而且与落后者之间的差距日益扩大。有四分之三的差距是在2008年全球金融危机前浮现的。在不同行业中，差距大小不一：例如在制造业，顶级企业的劳动生产率每年提升2.8%，其余企业为0.6%。服务业的差距则更大：顶层企业为3.6%，其余为0.4%。

位居前列的公司似乎有某些共同点。不出所料，它们在技术方面拥有领先优势，而且更密集地运用专利。也许最显著的区别在于，这些前沿公司全是世界公民。它们经常是跨国集团的一份子，并以其他全球顶尖企业为基准不断提升。所以，领先企业的技术创新在国家之间的传播比在国家内部要快。英国精英公司与中国精英公司之间的差距正在收窄，而在英国国内，精英企业和落后企业之间的差距反而在扩大。

前沿企业的出现在许多方面都出人意料。管理学大师们多年来一直认为，优势会从既有大企业转向挑战者。小公司可以轻易买到以往仅为企业巨头专享的计算能力。每年有数以百万的优秀MBA毕业生进入市场求职。假如真是这样，为何在众多不同国家却同时出现这么一些独步业界的精英企业？

一个明显的解释是，得益于低边际成本（使先行者得以迅速扩张）和网络效应（使“普及”本身成为有利可图的回报），数字技术引发了“赢家基本通吃”的市场现象。经合组织指出，信息技术行业正制造出一群超级前沿公司：相对其他精英公司，排名前2%的IT企业生产力提升更多。其他研究显示这并非因为这些顶尖企业在技术上（人人都在往这方面砸钱）投资更多，而是因为它们投资更明智，能让员工做出新尝试，并重塑商业模式。

第二个解释是，顶尖企业（排名前5%）纷纷发明出自己的独门秘技。有些学会了造就别家无法效仿的管理技术。巴西私募股权集团3G资本（3G Capital）似乎就是如此：集团收购成熟企业，并以他人无法企及的方式压缩其成本。有些则以非常规方式融合专长：亚马逊把数字技术能力与即时物流相结合。也有一些企业创制稀有材料投入生产。汽车制造商宝马公司正运用一种比钢材更坚固也更轻盈的特制碳纤维材料来生产其i3及i8电动车。该材料先是在日本的人造丝工厂开始制造，然后运往美国进行碳化处理，再送到德国的工厂将股线编织成碳纤维板。

| 救世者

第三，技术扩散已经停滞：前沿的点子已不像过去那样能在经济体中扩散传播，促进生产力的创意为领先企业垄断。在知识密集型经济中，这类传播可能更加困难，因为前沿企业可以聘请最具才华的员工，并与顶尖学府及咨询机构打造合作关系。但不良政策也使情况变得越发糟糕。经合组织发现，被挡在竞争及全球化之外的某些行业，特别是服务业，企业之间的生产力差距尤为明显。

可以采取什么行动解决这一“扩散停滞”的问题？一个方法是让前沿公司将其最佳实践传播给落后企业。在英国，鉴于大批企业表现不佳，由零售集

团约翰·刘易斯合伙公司（John Lewis Partnership）董事长查理·梅菲尔（Charlie Mayfield）带领的一群企业家已采取行动，帮助这些后进企业提升生产力。另一方案是让政策制定者开放经济中受保护的领域，引入更多竞争：欧盟已经盯上服务业很多年了。这两种方法都存在问题。前沿企业肯定不会跟后进者分享自己所有秘诀。欧盟如果对欧洲那些受到偏袒的服务业公司下手，其不受欢迎的程度将更甚目前。但如果富裕世界要走出生产力低下的泥沼，政策制定者还是得想办法处理这一问题。 ■



Indian furniture makers

Turning the tables

Rajasthan's furniture-makers ride the unpredictable waves of globalisation

WALK through the workshop of Vinayak Home, a furniture-making outfit based in the outskirts of Jodhpur in the state of Rajasthan in north-west India, and the results of globalisation are evident. Sleek hardwood furniture that would suit Scandinavian interiors is being readied for shipment; carpenters distress the paint on a newly-made chest of drawers to make it look as if it has come straight from a flea market in Brooklyn. But the company's order book suggests that globalisation is fading. Vinayak Home is one of a cluster of Rajasthan furniture-makers that used to do nothing except export to Europe and America, but nearly all of what they make today they ship into Indian living rooms.

Jodhpur, on the edge of a desert with few trees to feed sawmills, is an unlikely woodworking hub. But when tourists came to survey the arid landscape and the 15th-century fort that overlooks the city, many also admired the hardwood carvings by skilled artisans (pictured). When India liberalised its economy in the early 1990s, a small group of European exporting agents encouraged independent furniture-makers. Then volumes grew, cheap power tools came from China, furniture fashions changed, and latticework made way for those Scandinavian, minimalist designs.

Globalisation continued to spur growth. Like labour-intensive footwear and textiles, furniture-making has in recent decades shifted relentlessly from rich to poor countries. A skilled carpenter in India makes around 500 rupees (\$7.50) a day. Large orders from companies such as Laura Ashley, a Malaysian-owned firm, or Crate & Barrel, an American interior-furnishings chain, poured in to Jodhpur's craftsmen.

But what the global market gave, it gradually took away. Foreign shipments have see-sawed since 2008, but are now flat or falling. Western economies are growing slowly and there is competition from other Asian manufacturers. Globalisation has brought rival opportunities, too. What the world wanted from Rajasthan a few years ago wasn't tables and stools but an obscure crop called guar. Once a niche bean, producing gum used to thicken sauces and ice cream, it somehow became a key ingredient for fracking (hydraulic fracturing) shale oil in America. Around two-thirds of the world's guar gum comes from Rajasthan, and the boom in production created a new class of farmer-millionaires. The riches to be made from farming drained furniture workshops of labour for a while.

Luckily for Rajasthani workers, by the time the guar boom ended, global trends had inflated a new bubble. Firms such as Goldman Sachs, an investment bank, Sequoia, an American venture-capital company, and Rocket Internet, a German startup factory, were throwing money at Indian e-commerce sites dedicated to furniture. Three such young firms, Pepperfry, Urban Ladder and FabFurnish, have raised over \$250m in funding in the past five years. Along with mainstream e-commerce sites, they now ship goods from Rajasthan and elsewhere within India worth over \$200m each year, or roughly the same as Jodhpur's furniture-makers are believed to export. The home market is booming.

Just over half of Jodhpur's furniture production still ends up overseas, notes Devashish Banerjee, a veteran of the export trade who now works at Pepperfry. But it was only five years ago that the proportion going abroad was 90%, and in another five years the domestic market will claim four-fifths of the desert city's output, he says. Many middle-class Indians are moving out of homes that they used to share with their parents or other relatives, spurring rapid growth in property and furniture sales.

The new e-commerce players may displace local mom-and-pop

manufacturers, and the rise in domestic demand will benefit other woodworking clusters as well, such as Bihar and Kerala. But Rajasthan has geographical advantages: it is arid in an otherwise humid country, so furniture made there doesn't warp so much. It also takes just a day in a lorry to get to Delhi and two to reach Mumbai, India's biggest cities.

Sukesh Bhandari, one Jodhpur entrepreneur, thinks of the domestic furniture market as a continuation of the export trade. "We are globalising and Indianising simultaneously," he says. There are concerns that the venture-capital money sustaining the furniture websites may run out, even before all of them turn a profit, but for now the funds are flowing.

As for globalisation, it will soon bring a new rival for Jodhpur's vibrant domestic market. Next year a certain Swedish purveyor of mainly softwood and laminate furniture, IKEA, will open the first of 25 stores it plans for India. That will be competition, but potentially an opportunity, too: Indian rules stipulate it must source 30% of its inventory locally, and that could well include furniture. Jodhpur's manufacturers may soon be carving a new, but strangely familiar, product range. ■



印度家具制造商

扭转局面

拉贾斯坦邦家具制造商乘着难以预测的全球化之风出击

家具制造公司维纳雅克家居（Vinayak Home）的总部位于印度西北部拉贾斯坦邦（Rajasthan）焦特布尔市（Jodhpur）郊区。走入其车间，全球化效应显而易见。北欧家装风格的时髦实木家具正准备装运；木匠把新制斗柜上的油漆部分磨掉，让它看上去就像刚从布鲁克林的跳蚤市场买回来似的。但该公司的订货簿显示，全球化的热潮正逐渐冷却。维纳雅克家居是拉贾斯坦邦原本只做欧美出口订单的家具制造商之一，而现在它们制造的产品几乎全都进入了印度本地家庭。

焦特布尔位于沙漠边缘，几乎没有可供应木材厂的树木，本不大可能成为木工制造业的枢纽。但游客来到此地饱览其干旱景观及俯瞰该市15世纪城堡的同时，许多人也特别欣赏出自能工巧匠之手的硬木雕刻（如图）。上世纪90年代初，印度对外开放经济，在一小部分欧洲出口代理的扶持下，独立家具制造商发展壮大。之后，随着订货量加大，家具制造商开始使用从中国进口的廉价电动工具；继而又迎来了家具风尚的转向，雕花格纹渐为北欧极简风取代。

全球化继续刺激增长。像劳动密集型的鞋类和纺织品制造业一样，近几十年来，家具制造业也不断从富裕国家向贫穷国家转移。在印度，一个熟练木工的日薪为500卢比（7.50美元）。马来西亚品牌Laura Ashley及美国连锁家饰品牌Crate & Barrel等公司的大订单向焦特布尔的工匠源源涌来。

但全球市场带来的，又逐渐被它夺回。自2008年以来，出口出货量起伏不定，如今则基本持平或下降。西方经济体增长缓慢，同时其他亚洲制造商也加入了竞争。全球化也带来了其他类似的机遇。几年前，世界市场想从拉贾斯坦邦得到的并非桌椅板凳，而是一种鲜为人知的作物，名为瓜尔（guar）。这种豆类作物本来只是一种小众原料，其分泌的豆胶可用于制作调味料及冰激淋，起增稠作用，不知何故后来在美国成了压裂开采（水

力压裂）页岩油的关键成分。全球约三分之二的瓜尔胶都来自拉贾斯坦邦，这股种植热潮造就了新一批农民富翁。这股种豆致富的风潮甚至曾一度导致家具工厂劳动力流失。

拉贾斯坦邦的工人是幸运的，到瓜尔豆热潮终结时，一个新的泡沫又随全球化进程膨胀起来。投资银行高盛集团、美国风投公司红杉

（Sequoia）、德国创业孵化平台火箭网路（Rocket Internet）等企业纷纷向印度的家具电商网站大举投资。三家受惠的新创公司Pepperfry、Urban Ladder、FabFurnish在过去五年融资超过2.5亿美元。加上主流电子商务网站，这些公司每年从拉贾斯坦邦和印度其他地方发出的货物总值达两亿美元，大致等于焦特布尔的家具商所能出口货物的总值。国内市场一片兴旺。

目前在印度家具电商Pepperfry任职的一名资深出口贸易人士德瓦施·班纳吉（Devashish Banerjee）指出，焦特布尔的家具制品仍有略超一半销往海外。但就在五年前，出口比例还高达90%。他表示，再过五年，这一沙漠城市的家具成品将有五分之四供应本地市场。印度许多中产人士正逐渐迁出以往与父母或其他亲戚合住的房子，从而刺激了房地产及家具销售快速增长。

新登场的电商可能将取代本地的家族式制造商，本地市场需求的上升也将有利于其他木制品产地，例如比哈尔邦（Bihar）和喀拉拉邦（Kerala）。但拉贾斯坦邦拥有地理优势：印度是个潮湿的国家，而拉贾斯坦邦却是一片干燥的地区，所以在此生产的家具不大会弯曲变形。而且从这里用货车发运，一天能到德里，两天能到孟买——印度最大的两个城市。

焦特布尔的一位企业家苏凯什·班达利（Sukesh Bhandari）认为印度国内家具市场是出口贸易的一种延续。他说，“我们正同时经历全球化和印度化的进程。”有人担心，在所有家具电商都能盈利前，其赖以生存的风投资金也许就已消耗殆尽，不过目前资金仍然充裕。

全球化进程也将很快为焦特布尔充满活力的本地市场带来一个新对手。主

要销售软木和板式家具的瑞典家居品牌宜家计划在印度开设25家分店，首家店铺将于明年开幕。这既是竞争，也可能是机遇：按印度法规的要求，宜家的货源必须有30%采购自本地市场，这里面很可能就包含家具。也许很快，焦特布尔的家具厂商又要开始精制一系列全新但出奇地似曾相识的产品。 ■



Schumpeter

Techno wars

An earlier sunny mood about technology and innovation has given way to pessimism

THE most striking battle in modern business pits the techno-optimists against the techno-pessimists. The first group argues that the world is in the middle of a technology-driven renaissance. Tech CEOs compete with each other for superlatives. Business professors say that our only problem will be what to do with the people when the machines become super-intelligent. The pessimists retort that this is froth: a few firms may be doing wonderfully but the economy is stuck. Larry Summers of Harvard University talks about secular stagnation. Tyler Cowen, of George Mason University, says that the American economy has eaten all the low-hanging fruits of modern history and got sick.

Until recently the prize for the most gloom-laden book on the modern economy has gone to Robert Gordon of Northwestern University. In “The Rise and Fall of American Growth”, published in January, Mr Gordon argues that the IT revolution is a minor diversion compared with the inventions that accompanied the second industrial one—electricity, motor cars and aeroplanes—which changed lives profoundly. The current information upheaval, by contrast, is merely altering a narrow range of activities.

Now a new book, “The Innovation Illusion” by Fredrik Erixon and Bjorn Weigel, presents a still more pessimistic vision. Messrs Erixon and Weigel write that the very engine of capitalist growth, the creative destruction described by Joseph Schumpeter, is kaput. Aside from a handful of stars such as Google and Amazon, they point out, capitalism is ageing fast. Europe’s 100 most valuable firms were founded more than 40 years ago. Even America, which is more entrepreneurial, is succumbing to middle-aged spread. The proportion of mature firms, or those 11 years old or more,

rose from a third of all firms in 1987 to almost half in 2012, and the number of startups fell between 2001 and 2011.

People who extol free markets often blame such stagnation on excessive regulation. That has certainly played its part. But the authors argue that stagnation has most to do with the structure of capitalism itself.

Companies are no longer actually owned by adventurous capitalists but by giant institutions such as the Vanguard Group (with more than \$3 trillion under management) which constantly buy and sell slivers of ownership for anonymous investors. These institutions are more interested in predictable returns than in enterprise.

It is not all Mark Zuckerbergs at the top, the authors posit. Most big firms are answering the call for predictability by hiring corporate bureaucrats. These people shy away from risky investments in new technology. After rising relentlessly as a share of GDP in 1950-2000, investment in IT began declining in the early 2000s. Instead of shaking up markets, bureaucratic CEOs focus on squeezing the most out of their sunk costs and fight to defend niches. They hoard cash, buy back their firms' shares and reinforce their positions by merging with former rivals.

The gloomsters' case is true to some extent but it is overstated. Mr Gordon is right that the second industrial revolution involved never-to-be-repeated changes. But that does not mean that driverless cars count for nothing. Messrs Erixon and Weigel are also right to worry about the West's dismal recent record in producing new companies. But many old firms are not run by bureaucrats and have reinvented themselves many times over: General Electric must be on at least its ninth life. And the impact of giant new firms born in the past 20 years such as Uber, Google and Facebook should not be underestimated: they have all the Schumpeterian characteristics the authors admire.

On the pessimists' side the strongest argument relies not on closely watching corporate and investor behaviour but rather on macro-level statistics on productivity. The figures from recent years are truly dismal. Karim Foda, of the Brookings Institution, calculates that labour productivity in the rich world is growing at its slowest rate since 1950. Total factor productivity (which tries to measure innovation) has grown at just 0.1% in advanced economies since 2004, well below its historical average.

Optimists have two retorts. The first is that there must be something wrong with the figures. One possibility is that they fail to count the huge consumer surplus given away free of charge on the internet. But this is unconvincing. The official figures may well be understating the impact of the internet revolution, just as they downplayed the impact of electricity and cars in the past, but they are not understating it enough to explain the recent decline in productivity growth.

| *Back-seat producers*

Another, second line of argument—that the productivity revolution has only just begun—is more persuasive. Over the past decade many IT companies may have focused on things that were more “fun than fundamental” in Paul Krugman’s phrase. But Silicon Valley’s best companies are certainly focusing on things that change the material world. Uber and Airbnb are bringing dramatic improvements to two large industries that have been more or less stuck for decades. Morgan Stanley estimates that driverless cars could result in \$507 billion a year of productivity gains in America, mainly from people being able to stare at their laptops instead of at the road.

The real question is not whether the IT revolution has run out of steam or whether creative destruction is grinding to a halt. In fact, the IT revolution is probably gathering pace and Google and Amazon are two of the most innovative firms to emerge in the past 50 years. Rather it is whether the

new economy can counteract the forces ranged against it: ageing populations; a political class responding to populism by restricting trade and by over-regulating business; and education systems that in many places are failing. The big danger is that, while optimists and pessimists battle it out, the world becomes ever more divided between islands of high productivity surrounded by a vast ocean of stagnation. ■



熊彼特

技术发展之争

先前对科技和创新的阳光论调让位于悲观情绪

现代商业中最引人注目的战斗在技术乐观派与技术悲观派之间展开。乐观派认为世界正处于科技推动的复兴发展期。各科技公司的CEO也纷纷对此竞相称颂。商学教授认为我们唯一的问题将是当机器都变得超级智能后，人该怎么办。悲观派反驳说这都是瞎扯：可能有几家公司表现卓越，但经济已裹足不前。哈佛大学的拉里·萨默斯（Larry Summers）大谈长期经济停滞。乔治梅森大学（George Mason University）的泰勒·科文（Tyler Cowen）称美国经济实现了现代历史上所有唾手可得的的目标，已陷入困境。

目前为止，关于现代经济最悲观的著作是由西北大学（Northwestern University）的罗伯特·戈登（Robert Gordon）所著。在1月出版的《美国经济增长的兴衰》（The Rise and Fall of American Growth）一书中，戈登提出的观点是，相较于第二次工业革命过程中深刻改变人类生活的发明（电力、汽车和飞机），IT革命不过是小打小闹。相比之下，目前的信息浪潮只是改变了人类生活的一小部分。

现在一本由弗雷德里克·埃里克松（Fredrik Erixon）和比约恩·魏盖尔（Bjorn Weigel）合著的新书《创新幻像》（The Innovation Illusion）则呈现了一个更为悲观的未来。埃里克松和魏盖尔在书中写道，资本主义经济增长的动力本身——即约瑟夫·熊彼特（Joseph Schumpeter）所描述的创造性破坏——已经走到尽头。他们指出，除了谷歌和亚马逊这样为数不多的明星企业之外，资本主义正在快速衰老。欧洲100家最有价值的企业都成立于40多年前。即使是更具创业精神的美国也不得不受制于“中年发福”。成熟企业（或成立11年或以上的企业）占总企业数的比重从1987年的三分之一上升到2012年的近一半，且2001至2011年之间创业企业的数量有所下降。

颂扬自由市场的人经常把这样的发展停滞归咎于监管过度。监管过度自然是一部分原因，但两位作者认为与发展停滞关系最为密切的是资本主义本身的结构。企业不再属于富有冒险精神的资本家，而是属于像先锋集团（Vanguard Group，其管理的资产规模超过3万亿美元）这样经常为匿名投资者分散买卖股权的机构。这些机构更在乎可预见的回报，而不是企业自身的发展。

两位作者的假设是，大企业的领袖不都是像马克·扎克伯克这样的人。为确保可预见的回报，大多数大公司都会聘请企业官僚，而这些人一般会回避对新技术的风险投资。1950至2000年间，IT投资占GDP的比重一直在持续增加，21世纪最初的几年里则开始下降。官僚的CEO们非但没有给市场带来大变动，反而关注如何从沉没成本中榨取最大利益，努力保护其利基市场。他们囤积现金，回购公司股票，再通过与前竞争对手合并来巩固自己的市场地位。

悲观派所指的情况在一定程度上是真实的，但也夸大了事实。戈登说第二次工业革命带来的是无法重现的变革，没错；但这并不意味着无人驾驶汽车就不值一提。埃里克森和魏盖尔对近年来西方新成立公司数量大幅减少表示担忧也没错，但有很多老公司并非由官僚管理，而且多次重塑过自身：通用电气至少已经活到第九条命了。而且过去20年中诞生的新巨擘（如优步、谷歌和Facebook）所产生的影响力也不应低估：这些公司都具备熊彼特所言、并为那些作者们欣赏的特征。

悲观派最有力的论据依赖的并不是仔细观察企业和投资者行为，而是生产力的宏观统计数据，而近年来的数字的确惨淡。布鲁金斯学会（Brookings Institution）的卡里姆·福达（Karim Foda）经计算得出，目前富裕国家劳动生产力的增长率是自1950年以来的最低。发达国家的全要素生产力（试图用来衡量创新）自2004年以来仅增长0.1%，远低于历史平均水平。

乐观派有两个反驳的论点。首先，数据一定有问题。一种可能性是这些数据未能涵盖互联网无偿给予的消费者剩余。但这不足以服人。官方数据很

有可能低估了互联网革命带来的影响，就像它们过去曾低估电力和汽车的作用一样，但并没有低到足以解释近年来生产力增长的下降。

| 后座生产者

第二个论点是生产力革命才刚刚开始，这更具有说服力。在过去十年里，很多IT公司可能更多关注的是美国经济学家保罗·克鲁格曼（Paul Krugman）所说的“好玩而非根本”的东西。但硅谷最好的公司确实是在专注于改变物质世界。优步和Airbnb显著改进了在过去数十年里多多少少裹足不前的两大行业。摩根史丹利估计无人驾驶汽车在美国可能带来每年5070亿美元的生产力提升，这一提升主要来自于那些因不需要盯着路面而可以把精力放在笔记本电脑上的人。

真正的问题并不是IT革命是否已经失去了动力或创造性破坏是否即将止步。实际上IT革命很可能正在加速，谷歌和亚马逊也跻身过去50年里所出现的最具创新力的公司之列。真正的问题在于新经济是否能够抵住不利于其发展的力量：人口老龄化、通过限制贸易和过度监管商业来响应民粹主义呼声的政治阶层，以及在很多国家都正在失败的教育体系。真正的危险是，在乐观派与悲观派血拼的同时，世界会变得更为分化——几个生产力高的孤岛，被广阔的停滞之海环抱。■



Tata Group

Clash of the Tatas

India's biggest firm adds internal strife to its long list of problems

COMPANY bosses who get the sack react in different ways: some quietly leave, others graciously wish their successor luck, most try to nurse hurt pride as best they can. Not Cyrus Mistry, who on October 24th was ousted as chairman of the Tata Group, India's biggest conglomerate. Bemused and angered at having his predecessor, Ratan Tata, suddenly seize back control, he has refused to go. The schism at the heart of Tata has drawn attention to what made it possible in the first place: an overly complex structure trying to oversee too many businesses, deficient corporate governance and a penchant for opacity. Whether these problems are addressed, and how, will shape the group and its reputation for decades to come.

Tata's reasons for sacking Mr Mistry are unclear. He is from a family that has had a nearly 20% shareholding in the group for decades (most of the other shares are controlled by charities that are chaired by Mr Tata). Allies say that after four years in the job, Mr Mistry had got to grips with the inner workings of the company. He was ready to start changing it.

His critics, on the other hand, never believed that any executive could hope to turn around a conglomerate that has multiple misfiring subsidiaries in industries ranging from fertilisers to luxury hotels, cars and power generation. Mr Mistry had a team that many considered unimpressive. Few who know Tata were surprised that he made only plodding progress.

Yet not even the firm itself seems to know exactly why it dumped him when it did. It has accused him of paying too little heed to Tata's reputation for doing business in a socially responsible fashion, but also of doing too little to change things to boost profits. He also stands charged with being

overly controlling; yet Tata Group has briefed that he gave its subsidiaries too much freedom. Most Tata companies are independent, listed firms in which Tata has only a 25-30% shareholding. All of these allegations of various kinds of incompetence on the part of Mr Mistry sit awkwardly with glowing performance reviews accepted by Tata Group's board in June, according to minutes seen by *The Economist*.

All sides now at least seem to agree about how the group is performing. Two businesses, Jaguar Land Rover (JLR), a maker of high-end cars, and Tata Consultancy Services (TCS), an IT services company, are generating enough profits and dividends to keep the group buoyant. But at least five businesses—steel, Tata's Indian-made cars and trucks, power generation, an upscale hotel group and a smallish mobile-telephony arm—either lose money or soak up capital without producing good returns.

Mr Mistry has a point when he says he inherited the problems from his expansion-minded predecessor. And some progress came on his watch. He sold part of the British steel business (to Tata old-timers' deep chagrin, apparently, despite its steep losses). The telecoms operation was overhauled, ready for some form of industry consolidation, new bosses were brought in and so on. But he shied away from a radical redrawing of the boundaries of a sprawling group. Still, it is plausible that Mr Tata and his allies would in any case have stopped him. Mr Tata is now only an interim boss—he has promised to find a successor to take over the chairmanship of the holding company by the end of February—but he will continue to wield sway from atop the charities that control it.

Regardless of the true reasons for his ousting, Mr Mistry has befuddled his adversaries. They had expected him to depart in "the Tata way": quietly and without fuss. He had not granted a single interview to the media during his time as chairman. Instead he wrote to the board alleging several instances of improper conduct around accounting and other matters. Three weeks

on, none of the substantive charges Mr Mistry laid out has been conclusively addressed. The securities regulator is reportedly taking an interest. Even though not formally announced, it is a humiliation for the company and for the business grandees on its various boards.

Broad failures of corporate governance emerge from Mr Mistry's claims. Mr Tata, who has no children and was the first Tata to have a non-family member succeed him, appears to have found a way to get more and more important decisions sent to the board. Here, his allies apparently agreed to do his bidding, including Mr Mistry's sacking. A cheap-car project that Mr Tata had launched, for example, would have been ended had it not been for his intervention, and it continued making losses. Most seriously, Mr Mistry has suggested that the company has avoided taking write-downs required by accounting rules, of a whopping \$18bn, notably in the steel business. The firms involved say that their numbers are correct.

Mr Mistry is trying to stay on as chairman of the operating companies even after his removal from the group. The boards of some of the large subsidiaries, such as Tata Motors (owner of JLR) and the hotels division, have defied Tata and given their support to Mr Mistry. The parent firm did manage to evict him from TCS's board, because it owns a majority of it, unlike most of its other big group companies.

| *The accidental activist*

Some people would welcome his continued presence. "He's like an activist shareholder in a group that badly needs it, good luck to him," says a senior Mumbai banker. But he may not be able to hang on for much longer than a few weeks. Even if the various companies' directors have so far let him stay on as chairman, Tata can use its stakes in the firms, with the help of its allies, to boot him off boards entirely. There are plans to do just that in a series of extraordinary general meetings.

And Tata has plenty of levers to get its way. It could strip the subsidiaries of the right to use its valuable brand—it has done this at least once in the past. Although the group is loth to admit it, the central holding company implicitly guarantees the debts of the operating entities that are listed. The troubled ones, such as the telecoms or power-generation units, would pay far more to borrow without its support. In one of its letters, Tata alludes none too subtly to the extra creditworthiness it gives. But kicking out subsidiaries in a sort of break up would please no one but Tata's rivals.

A compromise is possible. Some businesspeople in Mumbai reckon that the government will not stand by idly for much longer, and that it could force a truce. Mr Mistry won't get his job back, but the group might agree to ease out Mr Tata not only from the chairmanship of the holding company but also from his position on top of the charities through which he appears to control Tata Group.

No less may be necessary to attract a successor to the top job. Few in Mumbai expect that Tata will bring in an outsider to grapple with its problems. Many reckon that Natarajan Chandrasekaran, who is thought to have done well running TCS since 2009, is a likely candidate. Then Mr Tata will have to decide how to treat his successor. The experience of Mr Mistry's last weeks, during which the mild-mannered Indian executive turned into something like an American-style corporate raider, might just be enough to persuade him to let the new chairman lead. ■



塔塔集团

塔塔之争

印度最大公司麻烦不断，如今又添内讧

公司老板被炒，反应的方式各有不同：一些安静地离开，另一些大度地祝继任者好运，大多数都会尽力呵护受伤的自尊。塞勒斯·密斯特里（Cyrus Mistry）可不是这样。今年10月24日他被印度最大的企业塔塔集团撤销了董事长职务。他的前任拉坦·塔塔（Ratan Tata）突然夺回大权，让密斯特里既困惑又恼火，因而拒绝离任。塔塔集团领导核心分裂的根本原因已经引发关注：集团结构过于复杂并试图管理太多企业，公司治理存在问题，以及一贯缺乏透明度。这些问题是否能够解决、以及如何解决，将在未来几十年里影响集团及其声誉。

塔塔解雇密斯特里的原因不明，他的家族几十年来一直拥有塔塔近20%的股份（其他大部分股份由塔塔担任董事会主席的慈善机构控制）。密斯特里的盟友说，在担任董事长四年之后，密斯特里逐渐了解了公司内部的运作方式，已经准备好开始改变。

另一方面，密斯特里的批评者从来不相信任何高管能有望扭转局面，因为集团在化肥、豪华酒店、汽车和发电等行业都有多个业绩不佳的子公司。很多人也不看好密斯特里的管理团队。了解塔塔集团的人很少会对他的缓慢进展感到意外。

然而，即使集团本身似乎也并不确定自己到底是因为什么决定炒掉密斯特里。集团指责他不关注塔塔在经营过程中对社会负责的声誉，也没采取什么举措来改变现状以增加利润。他还被指过度揽权；但塔塔集团又提到他给子公司太多自由。大多数塔塔集团的子公司都是独立的上市公司，集团只持有它们25%至30%的股份。《经济学人》看过塔塔集团六月份董事会的会议记录。这份记录显示，董事会对集团优异的业绩评价表示认可，这与所有这些关于密斯特里不称职的各种指控背道而驰。

至少各方现在对集团表现的看法似乎都很一致。集团旗下的两大公司——高端汽车制造商捷豹路虎（JLR）和IT服务公司塔塔咨询服务公司（TCS）产生了足够的利润和股息以保持集团的活力。但集团至少有五块业务——钢铁、塔塔在印度的汽车和卡车制造、发电、高档酒店集团和一个较小的移动电话公司——都是要么亏钱，要么占用了大量资金却没有获得良好的回报。

密斯特里说他的前任一心扩张，他继承了很多的遗留问题，这不无道理。集团在他的领导下还是取得了一些进展。他出售了部分英国钢铁业务（尽管该业务亏损巨大，但此举显然还是令集团元老深感懊恼）。他对电信运营进行了全面改革，准备好进行某种形式的行业整合，还引入了新老板等等。但他回避了对集团庞杂业务的边界重新进行划定。不过，就算他有此打算，塔塔及其盟友可能无论如何也会阻止他。塔塔现在只是临时老板，他已承诺在明年二月底之前找到继任者接任控股公司的董事长，但他将继续通过控制集团的慈善机构施加影响。

不管密斯特里下台的真正原因如何，他都让对手走了眼。他们以为他会以“塔塔的方式”离任：安安静静、不惹麻烦。在担任董事长期间，他从未接受过一次媒体采访。然而，这次他却写信给董事会，指控董事会在会计和其他事务方面的若干不当行为。三周过去了，密斯特里提出的实质性指控没有一个得到明确答复，不过有传闻称这引起了证券监管机构的关注。即使并没有正式宣布，这对集团和各公司董事会里的大佬们来说也是一次羞辱。

密斯特里声称集团在公司治理方面存在诸多问题。塔塔没有子女，是塔塔家族第一个让非家庭成员继任的人，但他似乎找到了一种方式，把越来越多重要的决定传达给董事会。他在董事会的盟友显然对他惟命是从，包括解雇密斯特里一事。举例来说，如果不是因为他的干预，塔塔集团推出的廉价汽车项目早就会中止了，然而目前该项目还在继续亏损。密斯特里最严重的指控是集团没有按照会计准则的要求进行减值（本应大幅减值180亿美元），这一情况在钢铁业务上尤为突出。有关公司称它们的财务数字是准确的。

即使被集团解除职位，密斯特里仍试图保留他在集团下属公司的董事长职位。一些大型子公司的董事会——如塔塔汽车（Tata Motors，JLR的所有者）和酒店部门，违抗了集团的决定，选择支持密斯特里。母公司把密斯特里驱逐出了TCS董事会，因为与集团的大多数其他大公司不同，母公司拥有TCS的多数股份。

| 意外的维权分子

有些人欢迎密斯特里继续留在集团内。一名孟买的资深银行人士说，“他就像一个集团急需的维权股东，祝他好运。”但他也许最多只能撑几个星期了。即使各子公司的董事迄今仍允许他继续担任董事长，塔塔仍可以在盟友的帮助下，利用其在子公司的股份，将他完全挤出董事会。为达到这一目的，集团已有召开一系列股东特别大会的计划。

塔塔集团有很多办法来达到目的。它可以剥夺子公司使用其珍贵的品牌的权利——在过去它至少这样做过一次。尽管集团不愿意承认，但中央控股的集团暗中对其上市经营实体给予债务担保。像电信或发电这样面临经营困境的公司，如果没有母公司的担保，借贷成本将会更高。在一封信中，塔塔集团毫不掩饰地提及了其给予的额外信誉支持。但是，与子公司决裂只会让塔塔集团的对手高兴。

妥协是可能实现的。孟买的一些商界人士认为，政府不会袖手旁观太久，可能会强行要求双方和解。密斯特里不会夺回他的工作，但集团可能会同意不久之后就解除塔塔所担任的控股集团董事长职务，还会把他从似乎可以借以控制集团的慈善机构的领导位置赶下台。

为这一高位吸引接班人一事可能同样重要。孟买很少有人认为塔塔会引入一个局外人来解决集团的问题。纳塔拉詹·钱德拉塞卡兰（Natarajan Chandrasekaran）自2009年掌管TCS以来被认为表现出色，许多人认为他可能会是一位候选人。不过塔塔必须决定如何对待他的继任者。密斯特里最近几个星期里从一名温和的印度高管变成了一位美国式的企业狙击手，这样的经历可能足以说服塔塔让新任董事长独立掌权。■



Europe's single currency

France v Germany

THE euro crisis that first blew up in late 2009 has revealed deep flaws in the single currency's design. Yet in part because it began with the bail-out of Greece, many politicians, especially German ones, think the main culprits were not these design flaws but fiscal profligacy and excessive public debt. That meant the only cure was fiscal austerity. In fact, that has often needlessly prolonged the pain. Later bail-outs of countries like Ireland and Spain showed that excessive private debt, property bubbles and over-exuberant banks can cause even bigger problems for financial stability.

That is one early conclusion of "The Euro and the Battle of Ideas", by three academics from Germany, Britain and France. They describe thoroughly the watershed moments of the crisis, how power shifted to national governments (especially in Berlin) and the roles played by the IMF and the European Central Bank (ECB). They blame euro-zone governments for failing to sort out troubled banks more quickly, for not realising that current-account deficits matter when public debts are in effect denominated in a foreign currency, for not making the ECB into a lender of last resort and for not pushing through structural reforms in good times.

Such complaints are often heard, not least from Britain and America. But more originally, the authors find the roots of these failings not in stupidity but in clashing economic ideas. Simplifying a bit, they focus on Germany and France. The Germans like rules and discipline, and fret about excessive debt and the moral hazard created by bail-outs. The French prefer flexibility and discretion, and worry about large current-account surpluses and the lack of a mutualised debt instrument. The Germans favour budget austerity even in hard times; the French favour fiscal stimulus on Keynesian lines.

German policymakers are often lawyers, French ones more frequently economists.

Examples of such ideological clashes run throughout the book. They range from the design of the Maastricht treaty and the later stability and growth pact to the constitution of the ECB and the application of the fiscal compact. Throughout the crisis the French tended to see bank or national-debt woes as cases of illiquidity whereas the Germans usually viewed them as signs of insolvency. Similar divides have emerged in rows over Eurobonds (backed by France, opposed by Germany) and over accountability and democratic control at supranational level (backed by federal Germany but not by centralised France).

As the authors note, such differences in ideas are not party-political (they persist regardless of whether the two countries have centre-left or centre-right governments). Nor, interestingly, are they fixed forever in history: in the 19th century, and even more in the 1930s, it was France, not Germany, that favoured rigid rules, big surpluses and the discipline of the gold standard. Only after 1945 did that change.

The authors end on an optimistic note, with proposals for a Europe-wide insurance mechanism built on a form of Eurobonds designed to please both France and Germany. But their analysis might equally lead to pessimism. The euro crisis is far from over, with Greece needing more debt relief, Italy mired in banking problems and chronic slow growth and high unemployment almost everywhere. Britain's Brexit vote will not help the mood, even if it was greeted by some as one more reason to push towards deeper fiscal and political union in the euro zone.

The trouble is that, as the book shows, France and Germany still have huge differences over the direction of travel. The French want debt mutualisation and more fiscal flexibility first, and are only then ready to

talk about more discipline and deeper integration. The Germans are the reverse, pushing for discipline and integration before being ready even to think about debt mutualisation. After next year's elections in both countries, such deep differences are likely to cause continuing problems for the single currency. ■



欧洲的统一货币

法德之争

2009年年底开始爆发的欧元危机已经反映出这个单一货币在设计上的重大缺陷。由于危机在某种程度上始于纾困希腊，很多政治家，尤其是德国领导人，都认为罪魁祸首不是这些设计缺陷，而是财政挥霍和超额公共债务。这就意味着唯一的解药是财政紧缩。其实，这通常是无谓地延长了痛苦。之后对爱尔兰和西班牙等国的纾困表明，超额私人债务、房地产泡沫和过度活跃的银行才会给金融稳定带来更大的麻烦。

这是《欧元和观念之战》一书早早就得出的结论，该书由来自德国、英国和法国的三位学者合著。他们详尽地描述了在危机的重要关头，权力是如何移交给了各国政府（尤其是在柏林），以及国际货币基金组织（IMF）和欧洲央行（ECB）所扮演的角色。他们指责欧元区各国政府未能更快地处理陷入困境银行的问题；同时批评政府没有意识到如果公共债务实际上以外币计价，那么经常账户的赤字就关系重大；他们还指责政府没能让欧洲央行成为最终贷款人，也没有在经济状况较好时推进结构性改革。

我们经常听到这样的抱怨，尤其是来自英国和美国。但是更具独创性的是，作者发现这些失败的根源不是愚蠢，而是经济理念的冲突。为了简化说明，他们拿德国和法国举例。德国人喜欢规则并讲求原则，会为纾困带来的超额债务和道德风险而忧心。法国人则喜欢灵活和自由裁量，他们所担心的是巨额经常账户盈余，以及缺乏共同的债务工具。即便是在艰难时刻德国人也偏爱预算紧缩；而法国人则奉行凯恩斯主义，更喜欢财政刺激。德国的决策者多是律师，而法国则多为经济学家。

诸如此类意识形态冲突的范例贯穿全书——从《马斯特里赫特条约》（Maastricht treaty）的设计及之后的欧盟《稳定与增长公约》，直到欧洲央行的组建以及“财政条约”的实施。整个危机中，法国人倾向于将银行或国家债务危机视作流动性不足的个案，而德国人通常认为这些是破产的征兆。类似的分歧林林总总，所涉及的除欧洲债券外（法国支持，德国反

对），还有超国家层面的问责制和民主控制（联邦制的德国支持，而中央集权的法国反对）。

作者指出，这样的观念差异并不是出于党派政治（他们坚称，无论这两国是中左翼还是中右翼执政，这一现象都会持续存在）。有趣的是，这些差异在历史上也并非一成不变：在19世纪，甚至近至20世纪30年代，是法国而非德国更偏爱严谨的法规、巨额盈余以及金本位制。这一状况直到1945年后才改变。

作者以乐观的评注收尾，建议在欧洲范围内以欧洲债券的形式建立保险机制，既讨好法国，也取悦德国。但是他们的分析也许同样会带来悲观情绪。欧元危机还远未结束：希腊需要更多的债务减免，意大利的银行业麻烦重重，几乎各国都面临长期增长缓慢和高失业率。英国脱欧公投对形势并无帮助，尽管它受到某些人的欢迎，成为推动欧元区更深层财政和政治联盟的又一个原因。

正如书中所述，麻烦在于法国和德国对下一步的发展方向仍存在巨大分歧。法国人首先想要债务共担以及更高的财政灵活度，只有这样才肯去谈更多的规章制度及更深层的整合。而德国人恰恰相反，他们要先推进规章制度和整合，对债务共担连想都不愿去想。明年两国大选之后，这样深层的分歧可能会导致单一货币面临接连不断的问题。■



Taxis take on Uber

African potholes

The ride-hailing startup faces a bumpy ride

“I WAS lucky my customers were three big white guys,” says Themba, an Uber driver in Johannesburg recounting a close call with taxi-drivers who tried to block him from collecting passengers at the airport that serves South Africa’s economic hub. “They pushed them out the way and we managed to drive off.”

The ride-hailing app has made a splashy if slow start in Africa. Of the 529 cities in which Uber connects riders with drivers, just 14 are on the continent. Yet Africa is fertile ground for a firm offering cheap and safe transport. Most passengers have to spring for overpriced cabs or catch a white-knuckled ride on the back of a motorcycle taxi.

In Abuja, locals have long used a low-tech version of ride-sharing. Many folk simply stick out a hand at the roadside to hail any passing car before negotiating a fare. Yet locals warn that fake taxis cruise the streets with robbers hiding in the boot, ready to jump out at a traffic light. In Lagos some taxi-drivers are even thought to be in cahoots with kidnappers. Not surprisingly, Uber seems to be growing quickly in the few cities where it has launched. In many places rides cost less than a quarter of the fare charged by taxis. And it is adapting to local markets too. In cities such as Nairobi, where few have credit cards, customers can choose to pay for rides using mobile money on their phones, or in cash.

Yet the firm is also facing some potholes quite unlike the regulatory barriers erected elsewhere in the world (such as, in Paris and Frankfurt, rules that stop it using unlicensed drivers). Instead of lobbying the

government or going to the courts, taxi-drivers in some African cities have taken matters into their own hands.

At the airport and main railway stations in Johannesburg cabbies crowd around commuters, looking intently at their smartphones before trying to manhandle those who seem to be getting into Uber cars. Shots have been fired in some of these clashes. In Cape Town and Nairobi, Uber cars have been torched and their drivers attacked. The firm has responded by hiring burly security guards to watch over the main flashpoints in Johannesburg and is testing a panic button that calls armed guards. ■



出租车挑战优步

非洲那道坎

这家叫车出行创业公司前路崎岖

“我很幸运，我的客人是三个大块头白人，”约翰内斯堡的优步司机滕巴（Themba）这样讲述他的一次惊险经历：在这个南非经济中心的机场，一些出租车司机试图阻止他载客。“客人推开了他们，我们才算开走。”

这款召车应用在非洲虽然启动较晚，但颇为引人注目。在优步连接乘客与司机的529个城市里，只有14个位于非洲大陆。然而，对于一家提供廉价而安全交通服务的公司来说，非洲是一片沃土。在这里，大多数乘客都不得不忍受定价过高的出租车，或者坐在摩的后座心惊胆战。

在尼日利亚首都阿布贾，当地人一直采用一种技术含量较低的拼车方法。许多人都是直接在路边扬手叫停任意一辆过往汽车，然后再商议车费。但当地人警告说，假出租车流窜街头，而劫匪则藏身于后备箱，遇到红灯就会跳出来。在拉各斯，人们甚至认为一些出租车司机与绑匪串通一气。因此毫不出奇，优步似乎在它业已推出服务的几个城市里成长迅速。在许多地方，优步的车费还不到出租车车费的四分之一。而且，优步也正在适应当地市场。在肯尼亚首都内罗毕等城市，很少人有信用卡，乘客可以选择在其手机上用移动货币或者用现金来支付车费。

然而，该公司也面临着一些困难，但不同于世界其他地方的监管壁垒（如在巴黎和法兰克福，有法规禁止其聘用无照经营的司机）。非洲一些城市的出租车司机不是游说政府或者走上法院，而是亲自动手解决问题。

在约翰内斯堡的机场和主要火车站，出租车司机围着旅客，紧盯着他们的智能手机，然后试图推搡那些似乎要进入优步车的旅客。这些冲突中有几次开了枪。在开普敦和内罗毕，有优步车被焚烧，司机也遭到袭击。作为回应，优步聘请了身材魁梧的保安来守护约翰内斯堡的主要危险区域，并

正在测试一种可以呼叫武装警卫的紧急呼救按钮。 ■



Money in India

Taking notes

The government transforms base money into nothingness (and gold)

NOT much distinguishes a valuable banknote from any old piece of printed paper, as Indians discovered in early November. In a surprise televised address on November 8th, Narendra Modi, the prime minister, announced that the country's two highest-denomination notes, worth 500 and 1,000 rupees (\$7.50 and \$15), were to be legally worthless with near-immediate effect. This odd variant of alchemy is the latest in a series of moves to curb illicit income; economists hope long-term gains will justify a chaotic spell as India adapts.

The idea is not as barmy as it might first appear. Mr Modi has implemented a flurry of schemes to flush out "black money", the term Indians use for cash which is both unaccounted for and outside its formal financial system. Piles of ill-gotten income have long been easy to launder into gold or property, where using notes for at least part of a purchase is the norm. "Demonetising" high-value tender means existing notes must be traded in at banks and post offices before the end of the year. That will force those with suitcases of cash either to come clean or to renounce their loot.

Still, it is dramatic: central banks usually balk at moves that call into question the legal worth of the notes they issue. The hastily discontinued tender represents 86% of all the currency in circulation (equivalent to 11% of GDP) in a country where cash remains king. Many Indian residents found themselves with little still-legal cash on hand ahead of a forcibly imposed bank holiday and a two-day shutdown of ATMs. A senior bank executive in Mumbai admitted to raiding his daughter's piggy bank to pay for tolls on his way to work.

The prospect of life with little or no cash, at least for a few days, cheered those who think Indians should be switching to smartphone apps and card-based payments, which are easier for the authorities to track and tax. That laudable aim will take time in a country where nine out of every ten workers still toil in the informal sector. Though the number of Indians with bank accounts has risen sharply thanks to a government financial-inclusion scheme, most savings are still held outside the banking system. One-fifth of total economic output is said to be informal.

Banks are among those who should gain from the scheme: much cash now secreted under mattresses should make its way into their coffers or into the mutual funds they offer. Against that, the black-money crackdown will probably dent (or worse) already-fragile property prices, especially in big cities—and so the value of the collateral the banks lend against.

Most economists expect the dislocation to dampen growth in the short-term. Households will probably put off big-ticket purchases such as motorbikes or white goods. Jewellers, doctors and others in professions where cash still rules will also be hard hit. Political parties hoarding cash for election-time handouts to voters will have to tidy up their finances. Even e-commerce sites like Amazon will be affected: over two-thirds of their sales are settled by the buyers in cash on delivery.

A new, shady line of work is already emerging: opportunists are said to be snapping up 1,000-rupee notes at a deep discount from those with too much stashed cash to declare. They will profit handsomely if they can find smaller savers willing to swap the old notes for new ones on their behalf, for a fee. The government has indicated it is gunning for those with suitcases full of rupees rather than merely a few stapled or elastic-banded wads.

Some aspects of the plan are difficult to fathom. Prominent economists,

such as Kenneth Rogoff of Harvard University, are keen to scrap big-denomination notes altogether. But India will merely replace them. Worse, it will add a 2,000-rupee series—introducing a note that will have few conceivable uses other than mattress-stuffing, smuggling or gambling (getting change for even a 500-rupee note is already close to impossible).

The timing is also odd. India has recently introduced a system that makes it easy for anybody to make or receive payments from their mobile phone, whether they be businesses or individuals. But the Unified Payments Interface, as it is known, is still in the early stages of implementation, so cannot really help overcome the current cash-crunch. Mr Modi also took the cash out of circulation just as polls opened in America, eventually roiling markets.

Cancelling banknotes is usually the work of desperate or misguided regimes. This looks different. Indeed, the assault on black money is justified and overdue. But governments change the rules on the world's simplest financial instrument—the humble banknote—at their peril. Gold is already favoured by those who want to keep their savings beyond the reach of government and taxman. Gold bugs may feel vindicated; others will have taken note. ■



印度现钞

钞票去向，密切关注

政府令基础货币化为乌有（和黄金）

印度人在11月初发现，一张大额钞票几乎无异于一张印有图案的老旧废纸。印度总理莫迪在11月8日突然发表电视演说，宣布将立即废止本国最高面值的两种纸币——500及1000卢比（价值7.50美元和15美元）。这一近乎炼金术的怪招是印度遏制非法收入的连串行动中的最新手段；经济学家们希望，尽管印度会因此经历一段混乱的调整期，但最终应能获得长远的利益。

这一想法也许并不像第一眼看上去那么幼稚。莫迪已实施一系列计划铲除“黑钱”——印度人用以指称那些未纳入核算、存在于正式金融体系之外的资金。长期以来，大量非法收入可轻易通过黄金或房产洗白，因为按照惯例，购买过程中至少会部分使用现钞。“废止”大额货币意味着现有钞票必须在年底前通过银行及邮局系统交易。这将迫使那些藏有成箱现金的人要么坦白黑钱来源，要么就此放弃战利品。

然而，此举来得非常突然：中央银行通常不会轻易废止自己发行的货币。在印度这个依然是“现金为王”的国度里，此次被仓促废止的纸币占了其流通货币总额的86%（相当于印度GDP的11%）。许多印度居民发现手头的合法现金所剩无几，而命令宣布之后银行却受命停业一天，ATM也停用两天。孟买的一位银行高层人士承认，为了支付上班路上的过路费，他不得不掏空了女儿的存钱罐。

眼看着至少好些天都要面对现金短缺的生活，有些人却满心欢喜。他们认为印度人应趁机转用智能手机应用及银行卡支付，如此一来政府便更容易追踪资金往来和征税。要实现这一值得称颂的目标仍有待时日，毕竟在印度人们十有八九仍在非正规部门劳碌。虽然因政府推行金融普惠计划，拥有银行账户的印度人口已经激增，但大部分储蓄依然在银行体系之外。据称，印度总经济产出有五分之一来自非正规部门。

银行按理应从该计划中获益：床垫下私藏的大量现金如今应该会流向银行的金库或其提供的共同基金。反过来说，这番打压黑钱的行动将可能有损（或恶化）本已脆弱的房价，尤其是在大城市。银行贷款抵押品的价值也将因而下降。

大多数经济学家预计这种失调将在短期内抑制增长。家庭也许会推迟购置大件商品，比如摩托车及白色家电。珠宝商、医生及其他主要收取现金的行业也将深受打击。为选举拉票而囤积现金的政党必须理清账本。连亚马逊这类电子商务网站也将受到影响：其销售额中超过三分之二是买家收货时以现金结算的。

一门新的黑市生意已然浮现：据说，投机者正竞相以高折扣从握有过多现金而无法洗白的人手上收购这些钞票。如果能找到小储户愿意收费替他们把旧钞换成新钞，这些投机者便可大捞一笔。政府已经表明，打击的目标是那些藏有一箱箱卢比的黑钱大户，而非只攒了几叠几捆钞票的小户。

该计划的一些方面令人难以捉摸。哈佛大学的肯尼斯·罗格夫（Kenneth Rogoff）等著名经济学家热衷于提倡完全废除大面额钞票，但印度仅是把旧钞换掉。更糟糕的是，政府还将新增面额为2000卢比的钞票，其用途无非是方便人们在床垫下藏钱、走私或赌博（面额为500卢比的钞票都已几乎无法破开找零）。

时机也很奇怪。印度最近刚推出一套系统，使得无论是企业还是个人都可通过手机轻松支付或接受款项。但名为“统一支付接口”（Unified Payments Interface）的这一系统仍处于应用初期，无法真正帮助应付目前的现金短缺问题。莫迪废止这些现金流通也恰逢美国大选结果揭晓之际，最终导致市场大乱。

废止钞票通常是政府在走投无路或受到误导时才会采取的行动，而这次则看似不同。事实上，打击黑钱理由充分且早已刻不容缓。但各国政府针对“卑微的钞票”这一世界上最简单的金融工具改变规则却是自陷险境。希望储蓄不受政府及税务人员监管的那些人早已转向黄金。黄金投资者也许会

心安理得；其他人将关注事态的发展。■



Taxation in India

Lost in transition

India's tangled system of taxes will be simplified rather than overhauled

AIR-CONDITIONING doesn't feel like much of a luxury in parts of India, but the taxman begs to differ. Cooled restaurants are deemed posher. Their patrons are liable to additional taxes the unventilated masses do not bear. Luckily for sweat-prone diners there is a catch: the tax only applies to the service and not the food, so only part of the tab incurs the extra levy. In their wisdom, India's bureaucrats once decided that 60% of a restaurant's offering is food, and so air-conditioning triggers a service tax payable on just 40% of the bill.

Indirect taxation in India often seems the product of a micromanaging bureaucracy run amok. The result of combined taxes levied by its 29 states, union territories and the central government is that the same products in different regions, or different products in the same region, are taxed at different rates. This makes it difficult to trade between states. Tariffs are enforced by internal borders at which lorries languish for hours. It also distorts the economy in favour of goods and services taxed at lower rates (usually as a result of energetic lobbying). The agreement in August to subsume all manner of national and regional levies into a single goods-and-services tax (GST), applicable nationwide, was hailed as a historic opportunity to rid the economy of both problems, potentially adding two percentage points of GDP growth a year.

Since then, as so often happens, politics seems to have got in the way of sound economics. Whereas it had once been assumed the GST would be levied at a single rate, with a few exemptions (eg, for food, health care, etc) and a "sin" rate (tobacco and alcohol), the end result is looking far more complicated. The central government, in negotiations with state

authorities, has put forward a schedule of seven different GST slabs ranging from 4% for gold to 26% or more for middle-class goods, with other goods being taxed at 6%, 12% or 18%, and basic goods remaining exempt.

Economists are aghast: much of the gain from moving to a single tax-rate nationwide came from stamping out the inefficiency of multiple rates, which prod businesses towards providing goods and services favoured by the tax code rather than by consumers. Government officials have justified the newly added complexity by arguing that a sudden move to a single headline rate would have resulted in sudden price surges for goods that are currently taxed at a lower level.

In fact, the central and state governments involved are trying to reduce the costs and risks of moving to a new tax structure, even if it means some of the benefits are lost. The new system has to be agreed by a new “GST council” made up of the finance minister and his counterparts at state level. It is meeting over the course of October and November. The states are concerned they are giving up their right to levy their own consumption taxes and will be inadequately compensated. The central government has had to guarantee states they will be reimbursed if they lose out, at least for the first five years.

Because revenue data are so poor, nobody can precisely gauge the potential impact of moving to new tax rates, much less model it. But bureaucrats in Delhi are said to be fretting that a bold move to a new single-rate system might leave them on the hook at a time when the government has pledged to cut the budget deficit. To avoid losing out, they want the new GST rates to mirror existing taxes, complete with their favourable treatment for unventilated eateries. So biscuits will continue to fall in different bands depending on how luxurious the government judges them to be. Creamy ones, for example, will suffer particular punishment.

Things will be a touch simpler—the seven rates will replace several hundred tax levels nationwide, estimates Neelkanth Mishra of Credit Suisse, a bank. That levies will be the same across India will create a true single market for the first time in its history. And there are fervent hopes that, because businesses will have to register invoices in order to qualify for tax rebates, more will be pushed into the formal economy, so boosting both long-term economic growth and the tax kitty.

A lack of resolve on indirect taxation bodes ill for the next stage of fiscal reform. Praveen Chakravarty of the IDFC Institute, a think-tank, points out that India is far too reliant on indirect taxes, such as those on goods and services, rather than direct levies on income or wealth. Fewer than 50m pay direct taxes in a country of 1.3bn. Shifting the burden to direct taxes would be fairer but involve taking on entrenched interests far more powerful than non-air-conditioned restaurateurs. ■



印度税收

转型中迷失

印度盘根错节的税收制度将被简化而非彻底改革

在印度的一些地方，空调算不上什么奢侈品，但是税务人员对此却持不同看法。带空调的餐馆被认为更豪华时髦。这些店的顾客理应比在无空调餐厅进餐的食客多付些税。幸运的是，对爱出汗的用餐者来说，内中另有玄机：征税只针对服务，不针对食物，所以账单上只有部分项目会产生额外的税。印度官员曾“高明”地认定餐馆所提供的60%是食物，那么空调产生的服务税只针对40%的账单金额。

印度的间接征税常被视为无孔不入的官僚主义胡作非为的产物。由印度29个邦、数个联邦属地以及中央政府征收的税项综合起来的结果便是，同样的产品在不同地区、或不同产品在同一地区会按照不同税率征税。这让邦与邦之间开展贸易困难重重。关税在邦界征收，卡车因此要滞留等待数小时。这还扭曲了经济，令税率较低的商品和服务受益（通常是积极游说的结果）。八月达成的协议是将所有国家级和地区级税费合并成单独一项商品及服务税（goods-and-services tax, GST），在全国范围内征收。此举被誉为解决印度经济两大问题的历史性机遇，可能会使GDP增长率一年提升两个百分点。

自那时起，正如经常发生的那样，政治似乎总在阻碍经济的健康发展。尽管人们曾经设想以统一税率征收GST，只有少数几项免税（如食品、医疗等），外加一项不良产品税（烟酒），但最终结果看起来还是复杂得多。经与各邦当局协商，中央政府已经提出了一套包括七种不同GST税率的方案，从黄金的4%到中产阶级消费品的26%甚至更高。其他商品的税率为6%、12%和18%，但基本必需品仍然免税。

经济学家大为震惊：改为全国统一税率的大部分好处都来自于消除了存在多个税率的低效，并且税率不一只会促使公司追求提供享有优惠税率的商品和服务，而不去迎合消费者的喜好。政府官员为新增的复杂政策辩护，

称突然转向统一税率会导致目前税率较低的商品价格猛涨。

实际上，中央和所涉及的各邦政府想要降低向新税收结构转型的成本和风险，即便这意味着损失部分益处。新体系必须由新的“GST会议”通过，这一会议由财政部长和各邦的财政主管官员组成，于10月及11月期间举行会议。各邦担心它们正逐步放弃自己征收消费税的权利，而拿到的补偿却不够充分。中央政府不得不向各邦承诺，如果它们有损失，至少在头五年会得到补偿。

因为税收数据太差，没人能准确估算出转向新税率的潜在影响，更不用说建立模型。但据说德里的官员担心，在政府已经承诺削减预算赤字的情况下贸然转向新的统一税率体系可能会让他们陷入困境。为了避免损失，他们希望新的GST税率能反映现有税种，包括针对无空调餐馆的优惠待遇。所以各类饼干仍然会按不同税率征税，全凭政府对它们奢侈程度的判定。比方说奶油饼干就会被征以重税。

瑞信银行的尼迦堤·米什拉（Neelkanth Mishra）预测，情况会略微简化：七项税率将取代全国的几百种税率。全印度统一征税将造就该国历史上首个真正的单一市场。还有人热切期望，因为公司将必须登记发票以获得退税，那么更多公司将被推向正式经济，从而促进长期经济增长并利于税收。

在解决间接征税问题上缺乏决心预示着下一步财政改革凶多吉少。智库IDFC研究所的普拉文·查克拉瓦蒂（Praveen Chakravarty）指出，印度过于依赖间接税，例如对商品和服务的税收，而非对收入或财富征收的直接税。在这个13亿人口的国家仅有不到5000万人缴纳直接税。将税负转移到直接税上可能更公平，但这牵涉到与根深蒂固的既得利益较量，它们的力量可比没空调的餐馆老板大得多。■



African airlines

Well-connected

Why one national airline is bucking a continent-wide trend

INSIDE the atrium of a gleaming new building on the outskirts of Addis Ababa, trainee air stewards flit between the classrooms and aeroplane simulators that surround a large indoor swimming pool. The expensive aviation academy belongs to Ethiopian Airlines, and seems a world away from the unrest that on October 9th prompted the government to declare a national state of emergency. The firm's CEO, Tewolde Gebremariam, brushes off the idea that the airline will be affected. "We are not concerned," he shrugs.

He has reason to be confident about the business. Ethiopian is Africa's largest and most profitable airline, earning more than its rivals on the continent combined. Its expansion has been rapid: by 2015 it served 82 international destinations, with 13 more added this year. According to unaudited figures, it nearly doubled its profits in the last financial year (see chart). And that is amid national turmoil.

It helps that its regional rivals are competing only feebly on routes in Africa. According to the International Air Transport Association, African carriers are likely collectively to record a net loss of \$500m this year. Kenya Airways, which has been in the red for four years on the trot, is flogging some of its aircraft and last month announced it would raise more equity. South Africa's national carrier, which Ethiopian overtook in size last year, has been unprofitable since 2011, and could be insolvent without government guarantees.

Ethiopian's lead also comes from its own strengths. It took advantage of its plum location in the Horn of Africa. Mr Gebremariam circles Addis Ababa

on a line connecting China with Brazil via India and the Gulf. It beat rivals who were still fixated on the former colonial routes to and from Europe, and captured Asian traffic. In particular it took an early punt on Chinese demand. In 1973 it was the first African carrier to fly to China. Today a bustling Chinese transit counter at Addis Ababa's Bole airport testifies to the importance the company attaches to the market. And Ethiopian has reduced flights to small African capitals like Brazzaville, in the Republic of Congo, which offer little business, in favour of more flights to the country's booming oil port of Point Noire.

The fact that it is state owned helps keep costs low, but it behaves like an international firm, not a national flag carrier, says Rob Prophet, an aviation consultant. It takes no state subsidies. And although few doubt the closeness of senior executives to the ruling Ethiopian People's Revolutionary Democratic Front, analysts say its management is independent-minded.

Now it wants to be the continent's first pan-African airline. It is opening hubs in Togo and Malawi, and teaming up with smaller rivals. But it is unlikely to be all smooth cruising. Middle Eastern rivals, including Qatar Airways, are expanding across the continent. Poor infrastructure is problematic. A new four-runway airport outside Addis Ababa may improve matters, but few expect it to open on time. And regional instability may hurt sales. Ethiopian was founded in 1945, but it was not until the country's long peace from 1991 that it took off. If the country now nosedives, its national airline will take a hit too. ■



非洲航空公司

四通八达

为何一国的航空公司逆一洲的趋势而行

亚的斯亚贝巴市郊有一座崭新的建筑，其中庭有一个很大的室内泳池，周围都是教室和飞机模拟器，受训的乘务人员穿梭其间。这所造价不菲的飞行学院属于埃塞俄比亚航空公司（埃航）。10月9日的骚乱刚刚让政府宣布国家进入紧急状态，而这里却似乎完全与之隔绝。埃航的CEO高天德（Tewolde Gebremariam）对公司会受影响的说法不屑一顾，耸了耸肩膀说：“我们毫不担心。”

他有理由对公司抱有信心。埃航是非洲最大、最赚钱的航空公司，其收入超过非洲其他各国航空公司收入的总和。公司的扩张速度非常之快：截至2015年，公司共有82个国际通航点，今年又新增13个。未经审计的数据显示，埃航在上一财年的利润几乎翻番，这还是在国内局势动荡的情况下取得的成绩。

非洲地区的竞争对手在非洲航线上竞争力不足是埃航成绩斐然的原因之一。国际航空运输协会的数据显示，今年非洲各航空公司可能总体净亏损5亿美元。连续四年亏损的肯尼亚航空已开始出售一些飞机，上个月还宣布将进行股权融资。埃航去年在规模上超越了南非航空公司，而后者自2011年后一直亏损，没有政府担保的话可能会破产。

埃航的领先地位还源自其自身优势——它善加利用其非洲之角的优势地理位置。高天德在地图上画出了经印度和波斯湾连接中国和巴西的航线，并圈出了经由航线的亚的斯亚贝巴的位置。埃航的竞争对手们依然因循守旧地飞着殖民时代就往返欧洲的航线，埃航击败了它们，并抓住了亚洲客流的机会。埃航尤其把握先机满足了中国的需求。1973年，埃航成为首个通航中国的非洲航空公司。如今，亚的斯亚贝巴博莱机场的中国中转柜台人流熙攘，足见埃航对中国市场的重视。埃航减少了往来非洲小首都城市、业务量小的航班，比如刚果共和国的布拉柴维尔（Brazzaville），而增加

了来往该国兴旺的石油港口城市黑角（Point Noire）的航班。

航空业顾问罗伯·普罗菲特（Rob Prophet）认为，身为国有航空公司有助于埃航将成本控制在较低水平，但埃航的运营完全是国际航空公司的样子，而不像一家国家航空公司。公司不拿任何国家补贴，尽管很少有人怀疑公司高层与执政党埃塞俄比亚人民革命阵线关系密切，但分析人士认为公司的管理是独立的。

现在埃航想成为非洲大陆首个泛非洲航空公司，在多哥和马拉维都设立了航空枢纽，并与众多小一些的竞争对手联盟。但这一过程不会一帆风顺。埃航在中东的竞争对手（包括卡塔尔航空）也都在非洲扩张。基础设施薄弱是个大问题，亚的斯亚贝巴城外新建的四跑道机场也许能改善局面，但没什么人认为这个机场能按时投入运营。地区政局不稳也可能会影响销售。埃塞俄比亚于1945年建国，但直到1991年获得持久和平后国家才得以发展。如果埃塞俄比亚局势现在突然恶化，其航空公司也必然受创。 ■



Tech firms' pay wars

Money honeys

As they battle to hire and hoard talented employees with huge pay packages, tech firms may change Silicon Valley for the worse

LARGE technology firms used to hold on to their high-flying employees by agreeing not to poach them from each other. "If you hire a single one of these people, that means war," Steve Jobs, Apple's then boss, warned Sergey Brin, a founder of Google, in 2005. That was an illegal arrangement, and in 2015 Apple, Google, Adobe and Intel paid a \$415m settlement to engineers whose pay had been held down as a result.

Today wage suppression in Silicon Valley is even more of a distant memory than dial-up internet and mainframe computers. Last year technology companies in America recorded expenses of more than \$40bn in stock-based compensation. Exact comparisons are difficult, but to put that sum in perspective it is roughly 60% more than the bonus pool paid to the New York employees of Wall Street banks.

The money tech firms throw at employees has ballooned as competition to hire and hang on to top talent in engineering, data science, artificial intelligence and digital marketing has soared. Even entry-level engineers can easily earn \$120,000 a year, more than most people their age can make on Wall Street; mid-career executives with technical expertise who choose to work at large public companies such as Apple, Google and Facebook will pocket several million, including stock grants. The boss of one startup complains that he cannot find a competent chief operating officer who will work for less than \$500,000 a year.

All this is driven by a number of elements. The price of housing plays a part in pushing up salaries. The cost of living in the Bay Area is now 41% higher

than the national average and 7% higher than the next most expensive place, New York City, according to Brant Shelor of Mercer, a consultancy. But the biggest spur of change is the enormous appetite for talent. Unlike the best lawyers or doctors, who can see only a limited number of people each day, those with exceptional technical expertise can transform a company because they are capable of creating products that are many times more attractive and thus a lot more lucrative, explains Marco Zappacosta of Thumbtack, a digital marketplace.

| *Come into my parlour*

Google, Facebook and Amazon alone probably hire around 30% of all American computer-science undergraduates, reckons Roelof Botha of Sequoia, a venture-capital firm. These big public companies not only pay handsomely, but also wield a hiring advantage with the huge amount of stock they are willing to hand to promising candidates. Last year Alphabet, Google's parent company, issued around \$5.3bn in stock-based compensation, equivalent to a fifth of its gross profits. That amounts to an average of \$85,000 in stock-based compensation per full-time employee.

Whereas non-tech companies in the S&P 500 give out, on average, the equivalent of less than 1% of their revenues in stock-based compensation, the norm for big technology firms is around five times that (see chart). Last year Facebook, for example, recorded stock-based compensation expenses equivalent to around 17% of its sales; Workday, a software firm, and Twitter had stock-based charges of some 20% and 31% of their revenues, respectively.

Stock-based compensation has its roots in the early days of Silicon Valley, when startups could not afford to pay employees much, if anything, and asked them instead to take a small piece of the company that might rise in value later. What is different today is that many of the Valley's firms are mature with proven track records, so their stock is already valuable and can

be used to greater effect. It is being deployed to “strategically hoard” the best talent, says Patrick Moloney of Willis Towers Watson, a consultancy. Once locked in, that talent is then assigned to important projects. This deters people from going to rivals or launching their own startups.

To maintain their grip on top employees, the tech giants use several tactics in addition to handing out stock. Some provide generous signing-on bonuses that can be clawed back if an employee leaves within three years. Amazon heavily weights stock grants to an employee’s third and fourth year with the company, as an incentive for them to stay and continue to work hard. Another common practice is to offer a “retention” bonus to make employees who are considering going elsewhere reconsider. Apple, Google and Facebook are rumoured to keep a list of companies they do not want to lose talent to, and supervisors are empowered to offer large bonuses to prevent people moving in that direction. A famous example of this occurred in 2011, when Neal Mohan, a senior Google executive, was considering leaving for Twitter. Some say he was offered a bonus of \$100m in stock to stay at Google.

| *The top ten*

“It’s gone too far,” says one venture capitalist among the many bemoaning how large public technology companies suck up so much talent with their lucrative equity packages. The munificence of the large tech firms raises the stakes for others. Word of lavish offers spreads among colleagues. As a result, the top 10% of talent are getting paid what only the top 2% would otherwise fetch, says Richard Lear of Vantage Partners, a consultancy.

Even companies that are not doing well offer financial incentives to keep people. Twitter, whose stock is languishing as it struggles to make money from its social-media platform, has seen many talented people depart. The firm is believed to be offering bonuses of up to \$1m to persuade its top engineers to stay for another few years.

Not surprisingly, startups find it hard to compete in the war for talent. The best positioned are high-flying “unicorns”, Valley-speak for private companies valued over \$1bn. These companies, such as Uber and Airbnb, have raised lots of money and are willing to use it lavishly to lure people out of the large public firms. They can offer high cash salaries, but also try to attract employees by suggesting their stock will look better when they finally go public. After someone has been at a unicorn for around four years, they can receive “refresher” grants of stock to give them an additional incentive to remain.

Lacking the same resources, smaller startups blame the giants for distorting the market for high-flyers. “I get the feeling that I can’t compete for objectively proven, brilliant talent,” says Mike Driscoll, the boss of Metamarkets, an analytics startup. “All I can do is hire diamonds in the rough, who will almost certainly get poached away by larger companies when they start to emerge as very talented.” Smaller fry try to find employees with a different temperament, perhaps those willing to take greater risks or others who find working at a large company dispiriting.

The rising cost of talent has also pushed up the level of funding startups need to raise. The idea that it is cheap to launch a firm is a myth, says Evan Williams, who co-founded Twitter and set up Medium, an online-publishing platform. “It’s harder and more expensive than ever to make a startup successful.” The more money young companies raise from investors to pay their employees, the harder it is for them to break even or become profitable.

The tactics employed by the large tech firms carry risks. One is to the entire ecosystem of Silicon Valley. In the future, entrepreneurs with a world-beating idea for a startup may recoil at the price of a garage to launch it in. Some startups are already moving elsewhere to hire cheaper engineers and reduce other costs. They don’t have to go very far from the Bay Area,

perhaps to southern California or other states. In the long term, there is a risk that the Valley could resemble South Korea: dominated by a handful of giant *chaebol*-like companies that soak up all the talent and squeeze out smaller startups.

Another risk is the wrath of investors and the public. Under generally accepted accounting principles, companies are required to deduct stock-based compensation to calculate profits, but many emphasise alternative measures, and as a result plenty of shareholders have not been paying attention to the vast amounts being doled out. Spencer Rascoff, the boss of Zillow Group, an online property firm, thinks that stock-based compensation should be paid a lot more attention. “When it’s ignored by companies and investors it gives companies the opportunity to use stock compensation like funny money,” he says. “It’s not. It’s dilutive to shareholders.”

Few shareholders question expenses when firms are flying high, but the mood could change swiftly if the stockmarket plunged, or a company’s performance were to falter, as happened this year at Twitter and LinkedIn. Tech bosses may think that because they deliver products and services people like, even adore, they do not have to worry about the kind of backlash against high pay that Wall Street suffered. They shouldn’t count on it. ■



科技公司薪酬战

有钱才有爱

科技公司争相用丰厚的薪酬福利招聘和储备人才，这可能会给硅谷带来不好的转变

大型科技公司之间曾经互相达成协议，不互挖墙脚，以保住各自的精英人才。2005年，时任苹果CEO的乔布斯曾警告谷歌联合创始人谢尔盖·布林（Sergey Brin），“如果你挖走一个我们的精英人才，那就意味着宣战。”但这种做法是不合法的。2015年，苹果、谷歌、Adobe和英特尔支付共计4.15亿美元，与那些因这种协议而被限制薪资水平的工程师达成和解。

如今，硅谷限制薪资的做法已成为比拨号上网和大型机更为遥远的记忆。去年，美国科技公司的股权激励支出超过了400亿美元。要进行准确的比较很难，但换个方式来说，这笔支出比纽约华尔街银行员工的奖金总额还要高出约60%。

为聘用和留住工程、数据科学、人工智能和数字营销领域的顶尖人才，科技公司之间竞争日益激烈，砸在这些员工身上的钱也已激增。即使是初级工程师也可以轻松赚到12万美元年薪，比他们在华尔街工作的大多数同龄人赚的都要多。而那些处于职业发展中期并具有技术专长的高级管理人员，如果是在苹果、谷歌和Facebook这样的大型上市公司工作的话，年薪（包括股权激励）可达数百万美元。一家创业公司的老板抱怨说，他根本找不到一个称职且愿意接受少于50万美元年薪的首席运营官。

多个因素造成了这种情况。住房价格在推高工资水平方面起了一定作用。咨询公司美世（Mercer）的布兰特·薛勒（Brant Shelor）表示，生活在旧金山湾区的成本比全国平均水平高出41%，比生活成本高的纽约市要高出7%。但推高工资水平最重要因素是对人才的巨大需求。线上生活交易平台Thumbtack的CEO马尔科·扎帕科斯塔（Marco Zappacosta）解释说，最好的律师或医生每天只能接待数量有限的人，而顶尖技术人才则不同。他们创造出的产品要诱人得多，并能带来更多的利润，足以改变一家公司。

| 引君入彀

风投公司红杉（Sequoia）的罗洛夫·博沙（Roelof Botha）估计，仅谷歌、Facebook和亚马逊这三家公司就聘用了美国全部计算机科学本科毕业生的30%。这些大型上市公司不仅薪酬丰厚，而且愿意给予有前途的员工大量股票，因而在招聘时享有优势。去年谷歌的母公司Alphabet股权激励支出高达53亿美元，相当于其总利润的五分之一。算下来，每名全职员工平均可获得8.5万美元的股权激励。

平均而言，标准普尔500指数中非科技公司的股权激励支出还不到它们收入的1%。而大型科技公司股权激励的支出大约五倍于这一水平（见图表）。例如，去年Facebook的该项支出大约相当于其销售额的17%；软件公司Workday和推特的这一支出分别占其收入的约20%和31%。

股权激励的做法源自硅谷发展的早期。当时创业公司出不起高工资，便转而让员工接受一小部分公司股份，期待日后可能会升值。和过去不同的是，如今许多硅谷的公司都已发展壮大，创下成功业绩。它们的股票因而也已价值不菲，而且还能发挥更大作用。韦莱韬睿惠悦管理咨询公司（Willis Towers Watson）的帕特里克·莫罗尼（Patrick Moloney）说，股权激励的做法现在被用于“战略储备”顶尖人才。一旦某个人才被锁定，便会被指派去做重要的项目。这可防止他们跳到竞争对手那里或创建自己的公司。

为了能够紧紧抓住顶尖员工，科技巨头们除了分发股票外，还采取了其他几种策略。一些公司会提供丰厚的签约奖金，但如果员工三年内离职，奖金便会收回。亚马逊会在员工工作到第三和第四年的时候增加股权激励的比重，以鼓励他们留下来继续努力工作。另一个常见的做法是提供“留任”奖金，让有意跳槽的员工重新考虑。据传苹果、谷歌和Facebook都有个清单，上面列着他们不想员工跳槽过去的公司。部门主管有权提供高额奖金，以防止人才流向清单上的公司。一个著名的例子发生在2011年——当时谷歌高级主管尼尔·莫汉（Neal Mohan）正考虑跳槽去推特。据说谷歌为了挽留他，向他提供了高达1亿美元的股权激励。

| 前10%的人才

“这种做法太过头了。”一位风险投资家说道。他和许多人一样都在抱怨大型上市科技公司用它们优厚的股权激励吸走了大量人才。这些公司的慷慨手笔抬高了其他公司的用人成本；哪个公司待遇优厚，消息很快便在同事间传开。Vantage Partners咨询公司的理查德·里尔（Richard Lear）说，前10%的人才因此拿到了只有前2%的人才应得的高薪。

即使经营不佳的公司也会提供财务激励来留住人才。推特难于从其社交媒体平台上赚钱，股价走势疲软，已流失很多人才。据称该公司向其顶尖工程师提供了高达100万美的奖金来说服他们再留几年。

创业企业很难在人才争夺战中与那些财大气粗的对手相抗衡，这并不令人意外。在吸引人才方面最具优势的是风头正盛的“独角兽”公司（硅谷对估值超过10亿美元的私人企业的叫法）。这些公司——如优步和Airbnb——筹集了大量资金，也愿意挥洒金钱去挖大型上市公司的墙角。它们可以提供高额现金工资，但也会暗示其股票最终上市后价值将更高，以此吸引人才。独角兽公司为工作满四年左右的人才提供额外的股权激励，吸引他们留任。

较小的创业公司则缺乏这样的资源，它们指责大公司扭曲市场以获得人才。“我觉得我没法抢到经过实战检验的出色人才，”分析创业公司Metamarkets的老板迈克·德里斯科尔（Mike Driscoll）说，“我所能做的就是雇佣像璞玉一样的人。而他们的才干开始显露之后，几乎肯定会被规模更大的企业挖走。”小公司试图寻找具有不同秉性的员工，比如那些愿意冒更大的风险或是那些觉得在大公司工作乏味而令人消沉的人。

人才成本的上升也推高了创业公司所需募集的资金水平。共同创办了推特并建立了在线出版平台Medium的埃文·威廉姆斯（Evan Williams）说，认为无需太多资金就能成立公司的想法是错误的，“现在要成功创建一个公司比以往任何时候都更难，成本也更高。”新建公司越多用募集来的资金支付员工工资，就越难实现收支平衡甚或盈利。

大型科技公司的薪酬策略会带来各种风险。其中一种是对硅谷的整个企业生态系统而言。未来，有了世界一流想法的创业者可能会因在车库创办公司都代价高昂而退却。一些创业公司已经在搬离硅谷，目的是在别处雇佣薪酬更低的工程师，同时降低其他成本。它们不需要搬到离湾区很远的地方，也许到南加州或其他州就可以。长远来看，有一种风险是硅谷的未来有可能步韩国的后尘：由少数“财阀”一样的大型企业主导，吸走所有人才，不给小型创业公司留下任何发展空间。

另一种风险是投资者和公众的愤怒。在公认会计准则下，公司计算利润时必须扣减股权激励，但许多公司往往另立名目，因此很多股东没有注意到大量利润都被当作激励发放掉了。在线房地产公司Zillow集团（Zillow Group）的老板斯宾塞·拉斯科夫（Spencer Rascoff）认为股权激励应该受到更多关注。“如果企业和投资者忽视了这一点，会让企业发放股权激励时把钱不当钱。”他说，“这都是钱，这么做是摊薄了股东收益。”

公司发展扶摇直上的时候，很少有股东会质疑成本问题；但如果股市暴跌或者公司业绩下滑，股东的心情就可能会迅速改变，就像今年推特和领英（LinkedIn）那样。科技公司的老板或许会认为因为他们提供的产品和服务为消费者所喜爱，甚至受到追捧，便不必担心会像华尔街那样，因高薪而遭受强烈抵制。他们并不应就此高枕无忧。■



The dollar and the world economy

The mighty dollar

Why a strengthening greenback is bad for the world economy

THE world's most important currency is flexing its muscles. In the three weeks following Donald Trump's victory in America's presidential elections, the dollar had one of its sharpest rises ever against a basket of rich-country peers. It is now 40% above its lows in 2011. It has strengthened relative to emerging-market currencies, too. The yuan has fallen to its lowest level against the dollar since 2008; anxious Chinese officials are said to be pondering tighter restrictions on foreign takeovers by domestic firms to stem the downward pressure. India, which has troubles of its own making (see separate leader), has seen its currency reach an all-time low against the greenback. Other Asian currencies have plunged to depths not seen since the financial crisis of 1997-98.

The dollar has been gradually gaining strength for years. But the prompt for this latest surge is the prospect of a shift in the economic-policy mix in America. The weight of investors' money has bet that Mr Trump will cut taxes and spend more public funds on fixing America's crumbling infrastructure. A big fiscal boost would lead the Federal Reserve to raise interest rates at a faster rate to check inflation. America's ten-year bond yield has risen to 2.3%, from almost 1.7% on election night. Higher yields are a magnet for capital flows.

Zipper growth in the world's largest economy sounds like something to welcome. A widely cited precedent is Ronald Reagan's first term as president, a time of widening budget deficits and high interest rates, during which the dollar surged. That episode caused trouble abroad and this time could be more complicated still. Although America's economy makes up a smaller share of the world economy, global financial and credit markets

have exploded in size. The greenback has become more pivotal. That makes a stronger dollar more dangerous for the world and for America.

| *Novus ordo seclorum*

America's relative clout as a trading power has been in steady decline: the number of countries for which it is the biggest export market dropped from 44 in 1994 to 32 two decades later. But the dollar's supremacy as a means of exchange and a store of value remains unchallenged. Some aspects of the greenback's power are clear to see. By one estimate in 2014 a de facto dollar zone, comprising America and countries whose currencies move in line with the greenback, encompassed perhaps 60% of the world's population and 60% of its GDP.

Other elements are less visible. The amount of dollar financing that takes place beyond America's shores has surged in recent years. As emerging markets grow richer and hungrier for finance, so does their demand for dollars. Since the financial crisis, low interest rates in America have led pension funds to look for decent yields elsewhere. They have rushed to buy dollar-denominated bonds issued in unlikely places, such as Mozambique and Zambia, as well as those issued by biggish emerging-market firms. These issuers were all too happy to borrow in dollars at lower rates than prevailed at home. By last year this kind of dollar debt amounted to almost \$10trn, a third of it in emerging markets, according to the Bank for International Settlements, a forum for central bankers.

When the dollar rises, so does the cost of servicing those debts. But the pain caused by a stronger greenback stretches well beyond its direct effect on dollar borrowers. That is because cheap offshore borrowing has in many cases caused an increased supply of local credit. Capital inflows push up local asset prices, encouraging further borrowing. Not every dollar borrowed by emerging-market firms has been used to invest; some of the money ended up in bank accounts (where it can be lent out again) or

financed other firms.

A strengthening dollar sends this cycle into reverse. As the greenback rises, borrowers husband cash to service the increasing cost of their own debts. As capital flows out, asset prices fall. The upshot is that credit conditions in lots of places outside America are bound ever more tightly to the fortunes of the dollar. It is no coincidence that some of the biggest losers against the dollar recently have been currencies in countries, such as Brazil, Chile and Turkey, with lots of dollar debts.

| *The eye of providence*

There are lurking dangers in a stronger dollar for America, too. The trade deficit will widen as a strong currency squeezes exports and sucks in imports. In the Reagan era a soaring deficit stoked protectionism. This time America starts with a big deficit and one that has already been politicised, not least by Mr Trump, who sees it as evidence that the rules of international commerce are rigged in other countries' favour. A bigger deficit raises the chances that he act on his threats to impose steep tariffs on imports from China and Mexico in an attempt to bring trade into balance. If Mr Trump succumbs to his protectionist instincts, the consequences would be disastrous for all.

Much naturally depends on where the dollar goes from here. Many investors are sanguine. The greenback is starting to look dear against its peers. The Fed has a record of backing away from rate rises if there is trouble in emerging markets. Yet currencies often move far away from fundamental values for long periods. Nor is it obvious where investors fleeing America's currency might run to. The euro and the yuan, the two pretenders to the dollar's crown, have deep-seated problems of their own. The Fed, whose next rate-setting meeting comes this month, may find it harder than before to avoid tightening in an economy that is heating up.

If the dollar stays strong, might protectionist pressure be defused by coordinated international action? Nascent talk of a new pact to rival the Plaza Accord, an agreement in 1985 between America, Japan, Britain, France and West Germany to push the dollar down again, looks misplaced. Japan and Europe are battling low inflation and are none too keen on stronger currencies, let alone on the tighter monetary policies that would be needed to secure them.

Stockmarkets in America have rallied on the prospect of stronger growth. They are being too cavalier. The global economy is weak and the dollar's muscle will enfeeble it further. ■



美元与世界经济

坚挺的美元

为什么日趋强劲的美元会对世界经济不利

世界上最重要的货币正在展现实力。特朗普赢得美国总统大选之后的三周里，美元兑众多富裕国家货币的汇率经历了史上其中一次最为凌厉的上涨。目前美元相较2011年的低价位上涨了40%。相对于新兴市场货币，美元也表现强劲。人民币兑美元已跌至2008年以来的最低水平；据说焦虑的中国官员正考虑进一步严格限制本国公司的海外收购，以遏制汇率的下行压力。至于自食苦果的印度，该国的货币兑美元已达历史最低点。其他亚洲货币的跌幅也是自1997-1998年金融危机以来前所未见的。

数年来美元一直在逐渐积聚力量。但最近这次飙升的推动力是美国经济政策组合或许会发生转变的大背景。投资者已下注大笔资金，赌的是特朗普会减税，并且将投入更多公共资金整修美国摇摇欲坠的基础设施。大手笔的财政刺激会让美联储更快加息以抑制通货膨胀。美国十年期国债收益率已从大选当晚的1.7%升至2.3%。更高的收益会吸引更多的资本流入。

世界最大经济体强有力的增长听来似乎颇令人期待。一个被广为援引的先例是里根总统的首个任期：当时预算赤字扩大，利率高企，美元同时也在猛涨。那段时期在国外引发了问题，而这一次可能还会更加复杂。尽管美国经济占世界经济的比重缩小了，但全球金融和信贷市场的规模已呈爆炸式增长。美元已经变得越来越关键——这让强劲的美元对世界、对美国都更加危险。

| 世界新秩序

美国作为贸易强国的相对影响力已经逐步减弱：以美国为最大出口市场的国家数量从1994年的44个降至二十年后的32个。但美元作为交易和储值货币的霸主地位仍然无可撼动。美元的力量在某些方面显而易见。2014年的一项估算表明，事实上的美元区（包括美国和货币盯住美元的国家）可能要占世界人口的60%及全球GDP的60%。

其他因素就没那么明显了。发生在美国境外的美元融资数额近年来已飙升。随着新兴市场越来越富裕、越来越渴望融资，它们对于美元的需求也在增长。金融危机以来，美国的低利率已经让养老基金转向他处以寻求更高的收益。它们涌向诸如莫桑比克和赞比亚这样不可思议的地方购买以美元计价的债券，也购买新兴市场里较大的公司发行的债券。这些公司都非常乐于以比国内更低的利率贷到美元。根据央行官员交流平台国际清算银行（Bank for International Settlements）的数据，截至去年这类美元债务已达近十万亿，其中的三分之一在新兴市场。

当美元升值时，偿还这些债务的成本也增加了。但是更强劲美元所带来的痛苦要远远超出其对美元借款人的直接影响。因为便宜的离岸借款在很多情况下已经带来了本地信贷供应的增加。资本流入推高了本地资产价格，进而鼓励更多借款。新兴市场公司借来的美元并不全都用于投资；有些钱最终存入了银行账户（在那里可以被再次借出）或是为其他公司提供融资。

日趋强劲的美元使这一循环发生了逆转。随着美元上涨，借款人需要节约现金来支付不断增长的偿债成本。随着资金流出，资产价格出现下跌。结果是美国以外很多地方的信贷状况与美元的命运绑得更紧。一些货币近来对美元贬值最多的国家正是像巴西、智利、土耳其这样持有大量美元债务的国家，这绝非偶然。

| 全视之眼

更强劲美元对于美国自身也有潜在的危险。强势货币会挤压出口、刺激进口，因此贸易赤字将会扩大。在里根时期，飙升的赤字引发了贸易保护主义。而这一次美国已经存在巨额赤字，且该赤字已经被政治化，尤其是被特朗普政治化了。他认为这一赤字证明国际贸易规则受到操控，偏向其他国家。特朗普曾威胁说要对从中国和墨西哥进口的商品征收高额关税来平衡贸易，赤字扩大会让特朗普更有可能将威胁付诸行动。如果特朗普屈从其贸易保护主义者的本能，其后果对所有人来说都会是灾难性的。

自然，这很大程度上取决于美元的走向。许多投资者都很乐观。美元相对

于其他货币来说开始变得更贵了。如果新兴市场有麻烦，美联储一贯会选择推迟加息。然而外汇市场往往会很长时间大幅背离基本价值。逃离美元的投资者想要转投何处也未可知。觊觎美元皇冠的两大货币欧元和人民币各自都有根深蒂固的问题。本月将召开下一次议息会议的美联储可能会发现，要在这一升温当中的经济体中避免紧缩比以往更困难。

如果美元持续强劲，来自贸易保护主义者的压力会不会被协调一致的国际行动所平息？一些人开始探讨一个堪比《广场协议》（1985年由美国、日本、英国、法国和西德签订）、旨在再次让美元贬值的新协定，这一想法看上去不合时宜。日本和欧洲正在对抗低通胀，对推高本币毫不热心，更不用提要这么做可能需要执行的紧缩货币政策了。

由于看好更强劲的增长前景，美国的股票市场已恢复元气。它们太目空一切。全球经济仍旧疲软，美元的强劲会让它更加羸弱。■



The president and business

America's new business model

Donald Trump is rewriting the rules that govern relations between the president and firms. Not for the better

HIS inauguration is still six weeks away but Donald Trump has already sent shock waves through American business. Chief executives—and their companies' shareholders—are giddy at the president-elect's promises to slash burdensome regulation, cut taxes and boost the economy with infrastructure spending. Blue-collar workers are cock-a-hoop at his willingness to bully firms into saving their jobs.

In the past few weeks, Mr Trump has lambasted Apple for not producing more bits of its iPhone in America; harangued Ford about plans to move production of its Lincoln sports-utility vehicles; and lashed out at Boeing, not long after the firm's chief executive had mused publicly about the risks of a protectionist trade policy. Most dramatically, Mr Trump bribed and cajoled Carrier, a maker of air-conditioning units in Indiana, to change its plans and keep 800 jobs in the state rather than move them to Mexico. One poll suggests that six out of ten Americans view Mr Trump more favourably after the Carrier deal. This muscularity is proving popular.

Popular but problematic. The emerging Trump strategy towards business has some promising elements, but others that are deeply worrying. The promise lies in Mr Trump's enthusiasm for corporate-tax reform, his embrace of infrastructure investment and in some parts of his deregulatory agenda. The dangers stem, first, from the muddled mercantilism that lies behind his attitude to business, and, second, in the tactics—buying off and attacking individual companies—that he uses to achieve his goals.

American capitalism has flourished thanks to the predictable application of rules. If, at the margin, that rules-based system is superseded by an ad hoc

approach in which businessmen must take heed and pay homage to the whim of King Donald, the long-term damage to America's economy will be grave.

| *Helping the few at the expense of the many*

Start with the confusions in Mr Trump's philosophy. The president-elect believes that America's workers are harmed when firms move production to cheaper locations offshore. That is why he wants to impose a 35% tariff on the products of any company that moves its production abroad. Such tariffs would be hugely disruptive. They would make goods more expensive for American consumers. By preventing American firms from maximising their efficiency using complex supply chains, they would reduce their competitiveness, deter new investment and, eventually, hurt workers' wages across the economy. They would also encourage a tit-for-tat response.

Precisely because tariffs would be so costly, many businessmen discount Mr Trump's protectionism as mere rhetoric. Plenty of them see the focus on individual firms as a politically canny (and thus sensible) substitute. If Mr Trump can convince American workers that he is on their side using only a barrage of tweets and a few back-room deals like the one with Carrier, there may be no need to resort to tariffs. To profit from a business-friendly bonanza, the logic goes, clever executives simply have to make sure they stay in the president's good books.

That looks like wishful thinking. Mr Trump's mercantilism is long-held and could prove fierce, particularly if the strong dollar pushes America's trade deficit higher. Congress would have only limited powers to restrain the president's urge to impose tariffs. More important, even if rash protectionism is avoided, a strategy based on bribing and bullying individual companies will itself be a problem.

Mr Trump is not the first American politician to cajole firms. For all its reputation as the bastion of rule-based capitalism, America has a long history of ad hoc political interventions in business. States routinely offer companies subsidies of the sort that Indiana gave to Carrier. From John Kennedy, who publicly shamed steel firms in the 1960s, to Barack Obama, who bailed out car companies in 2009, all presidents have meddled in markets.

And Mr Trump's actions so far are not exceptional relative to his predecessors or by international standards. Britain's prime minister recently made undisclosed promises to Nissan, a Japanese carmaker, to persuade the firm to stay in Britain despite Brexit. The French government is notorious for brow-beating individual firms to keep jobs in France. The most egregious crony corporatists, from Russia to Venezuela, dish out favours to acolytes and punishments to opponents on a scale that would bring blushes even in Trump Tower.

| *Courting the king and currying favour*

Nonetheless, Mr Trump's approach is worrying. Unlike the Depression, when Hoover and then Roosevelt got companies to act in what they (often wrongly) saw as the national interest; or 2009, when Mr Obama corralled the banks and bailed out Detroit, America today is not in crisis. Mr Trump's meddling is thus likely to be the new normal. Worse, his penchant for unpredictable and often vindictive bullying is likely to be more corrosive than the handouts most politicians favour.

If this is the tone of the Trump presidency, prudent businesses will make it their priority to curry favour with the president and avoid actions that might irk him. Signs of this are already evident in the enthusiasm with which top CEOs—many of them critics of Mr Trump during the campaign—have rushed to join his new advisory board. Helping the Trump Organisation or the Trump family might not go amiss either. The role of

lobbyists will grow—an irony given that Mr Trump promised to drain the Washington swamp of special interests.

The costs from this shift may be imperceptible at first, exceeded by the boon from economic stimulus and regulatory reform. And as president of the world's largest economy, Mr Trump will be able to ride roughshod over firms for longer with impunity than politicians in smaller places ever could. But over time the damage will accumulate: misallocated capital, lower competitiveness and reduced faith in America's institutions. Those who will suffer most are the very workers Mr Trump is promising to help. That is why, if he really wants to make America great again, Mr Trump should lay off the protectionism and steer clear of the bullying right now. ■



总统与商业

美国的新商业模式

特朗普正在改写支配总统和公司之间的关系准则——但却不是变得更好

距离就职尚有六周，但特朗普冲击波已经传遍了整个美国商界。首席执行官们及其公司股东被这位当选总统的承诺搞得头晕目眩——他说要大幅减少繁重的监管，要减税，还要通过增加基础设施支出促进经济。蓝领工人们则志得意满，因为特朗普愿意威逼公司保住他们的饭碗。

过去几周里，特朗普已痛斥了苹果没在美国本土生产更多的iPhone部件；喋喋不休地训斥福特搬迁林肯SUV工厂的计划；在波音首席执行官公开对贸易保护主义政策的风险表示忧虑之后不久，他又炮轰了波音。最戏剧化的是，特朗普收买利诱了空调设备生产商开利（Carrier），迫使它改变计划，将800个工作岗位留在印第安纳州而不是转移到墨西哥。一项民意调查显示，十分之六的美国人在这项交易后对特朗普的看法更加正面了。这种强悍做法正受到欢迎。

虽受人欢迎却也问题多多。特朗普对商界的策略逐渐显现，有些因素充满希望，其他的则令人深感忧虑。希望在于特朗普对公司税改革的热情、积极推动基础设施投资，以及放松监管的某些主张。而危险则源自：第一，导致他对商界采取这种态度的混乱的重商主义；第二，他为了达到目的所采取的手段，即收买或攻击某些公司。美国资本主义的繁荣得益于规则贯彻的可预见性。从边际角度看来，如果这个基于规则的体系被代之以即兴的解决方式，商人必须小心听命于特朗普的突发奇想，那么对美国经济的长期损害将非常严重。

| 帮助少数人，牺牲多数人

我们先来看特朗普哲学的混乱之处。这位当选总统相信，如果企业将生产搬到海外更便宜的地方，美国的工人会受到损害。因此他想要对任何把生产迁到国外的公司征收35%的产品关税。如此高的关税会造成巨大的破坏。这会让美国消费者购买的产品变得更加昂贵。高关税让美国公司无法

利用复杂的供应链使效率最大化，从而降低了它们的竞争力，抑制了新的投资，并且最终伤及整个经济领域中工人的工资。高关税还会激起以牙还牙的对策。

正是因为高关税的代价如此高昂，很多商界人士低估了特朗普的贸易保护主义，认为他只是说说而已。不少人认为针对某些公司的措施是一种政治上精明（因而明智）的替代之举。如果特朗普只需接二连三地发推特、和开利之类的公司达成一些幕后交易，便能让美国工人确信他跟他们是一条心，那可能就无需借助关税了。于是他们认为，要从对商业友好的大机遇中获利，聪明的高管就得确保自己待在总统的“好人名单”上。

这看来只是一厢情愿。特朗普的重商主义思想根深蒂固，而且最终可能会非常狂热，如果强势美元推高美国贸易赤字的话将尤为如此。国会仅有有限的权力来限制总统征收关税。更为重要的是，即使轻率的贸易保护主义得以避免，收买和威逼个别公司的策略本身也还是一个问题。

特朗普并不是第一个利诱公司的美国政客。尽管人人皆知美国是基于规则的资本主义桥头堡，但这个国家在对商业的临时政治干预上却历史悠久。各州惯于向企业提供补贴，就像亚利桑那州给予开利的那样。从肯尼迪（在上世纪60年代公开羞辱钢铁公司）到奥巴马（在2009年救助汽车企业），所有总统都曾插手市场。

而且相比他的前任们或是国际标准，特朗普迄今的做法并不算出格。英国首相近期向日本汽车公司尼桑秘密承诺，以劝说该公司即便在英国脱欧后仍留在该国。法国政府因威吓一些公司把职位留在法国国内而声名狼藉。从俄罗斯到委内瑞拉，那些裙带社团主义最为严重的国家党同伐异的规模之大，即使特朗普大厦里的人也会为之脸红。

| 谄媚帝王求恩宠

尽管如此，特朗普的手段仍然令人担忧。现在不同于大萧条时期，当时胡佛和罗斯福号令企业依照他们所认定（经常是错的）的国家利益行动；也不像2009年，当时奥巴马保护了银行并救助了底特律。如今美国并没有陷

入危机，因此特朗普的干预可能会成为一种新常态。更糟糕的是，特朗普行事莫测的倾向且常有报复性的霸道行径，可能比大多数政客偏好的施恩更具腐蚀性。

如果这成为特朗普任期内的基调，精明的企业将会把向总统献媚作为头等大事，并避免可能令其不悦的行为。这种迹象已经很明显——大公司的CEO正竞相加入特朗普新设的顾问委员会，而他们中很多人在竞选时都对他持批评态度。帮助特朗普集团或特朗普家族可能也不会错。说客的作用还将扩大——讽刺的是，特朗普曾允诺要在华盛顿铲除特殊利益。

这一变化的代价最初可能不易察觉，会被经济刺激和监管改革带来的好处所掩盖。而作为世界最大经济体的总统，相比那些较小国家政客过去的所作所为，特朗普将能在更长时间里无所顾忌地欺凌企业。然而损害会逐渐积累：资本错配、竞争力下降，以及对美国体制的信心削弱。受害最深的将正是那些特朗普许诺要帮助的工人。所以说，如果他真的想让美国再次伟大，现在就应抛弃保护主义，避免再欺凌企业。■



Air pollution

Blown away

Retired jet engines could help clear the smog that smothers big cities

TO LAND at Indira Gandhi Airport is to descend from clear skies to brown ones. Delhi's air is toxic. According to the World Health Organisation, India's capital has the most polluted atmosphere of all the world's big cities. The government is trying to introduce rules that will curb emissions—allowing private cars to be driven only on alternate days, for example, and enforcing better emissions standards for all vehicles. But implementing these ideas, even if that can be done successfully, will change things only slowly. A quick fix would help. And Moshe Alamaro, a researcher at the Massachusetts Institute of Technology, thinks he has one.

His idea is to take a jet engine, put it next to one of India's dirty coal-fired power plants, point its exhaust nozzle at the sky and then switch it on. His hope is that the jet's exhaust will disrupt a meteorological phenomenon known as "inversion", in which a layer of warm air settles over cooler air, trapping it, and that the rising stream of exhaust will carry off the tiny particles of matter that smog is composed of.

Inversion exacerbates air pollution in Delhi and in many other cities, from Los Angeles to Tehran. A particularly intense example caused the Great Smog of London in 1952, when four days of air pollution contributed to 12,000 deaths. Dr Alamaro thinks a jet engine could punch through the inversion layer to create a "virtual chimney" which would carry the trapped pollution above it, so that it could be dispersed in the wider atmosphere. He calculates that all the emissions from a gigawatt coal-fired power plant could be lifted away using a single engine with a nozzle speed of 460 metres a second. However, he has not calculated whether a jet engine could disrupt the inversion layer and allow the pollution to escape the city—so he

is now going to test that hypothesis.

Within eight months, Dr Alamaro plans to put one of his updrafters next to a coal-fired power plant and monitor what happens using a fleet of drones. He is in discussions with Tata Group, a conglomerate with an electricity-generating arm, to run it next to one of the firm's power stations. Another good candidate would be a government-run plant at Badarpur, less than 50km from the middle of Delhi. According to the Centre for Science and the Environment, a research and lobbying group based in the Indian capital, Badarpur is one of the most polluting power plants in the country. Earlier this month the government shut it down for ten days as part of a set of emergency measures intended to curb a particularly intense bout of air pollution.

Dr Alamaro has already found some of the decommissioned jet engines he needs to build his first updrifter. Both the Indian and the American air forces have been forthcoming. The Indians have offered six retired engines for nothing and the Americans are in the process of approving a further four engines from the Boneyard, an aircraft-storage facility located on Davis-Monthan Air Force Base in Arizona. They are asking for just \$5,000 per jet to cover the labour needed to prepare the engines, plus shipping.

Some meteorologists are sceptical. They suggest that the engines on offer will not have the oomph to push material through Delhi's inversion layer, especially during daylight hours, when the boundary between warm and cool air sits at an altitude of around a kilometre. They also say that Dr Alamaro's notion of a virtual chimney is too simple. Turbulence and friction will weaken the exhaust stream as it climbs. Moreover, even if the technique does work, using it to attack a citywide inversion layer would require so many jets and so much fuel as to be prohibitively expensive, says Alexander Baklanov, a researcher at the World Meteorological Organisation, in Geneva.

Dr Alamaro, naturally, disagrees—and if he can keep to his timetable it will not be long before it is clear who is right. Even if his ambitions for citywide arrays of virtual chimneys prove too ambitious, they may still work in some of the worst cases of pollution. Andreas Christen, who studies urban meteorology at the University of British Columbia, in Vancouver, notes that the direst episodes of pollution happen when air is cold—at night, for example. This is because the air contracts into a smaller volume at low temperatures, giving warm air above it room to expand downwards. That concentrates airborne gunk, but it also brings the inversion layer within closer range of Dr Alamaro's jets. As Dr Christen observes, some farmers in rich countries already use helicopters to disrupt inversion layers above their fields and thus protect their crops from frost. Dr Alamaro's jets may offer an alternative. ■



空气污染

一吹而散

退役的喷气发动机或许有助清除笼罩大城市的雾霾

飞机要降落到英迪拉甘地机场（Indira Gandhi Airport），就会从如洗碧空落入棕色天际。德里的空气具有毒性。根据世界卫生组织的研究，印度首都的大气污染水平位居世界大城市之首。政府正试图推出法规来遏制排放，例如只允许私家车隔天上路，并对所有汽车实施更严格的排放标准。但即便这些想法能够付诸实施，改善也将非常缓慢。最好能有个速效的方法。麻省理工学院的研究员莫舍·阿勒马洛（Moshe Alamaro）认为自己就有一个。

他的想法是把一台喷气发动机放在印度一座污染严重的燃煤发电厂旁，将排气喷嘴指向天空，然后开启发动机。他希望发动机排出的气流能干扰所谓的“逆温”过程，该气象现象指的是一层温暖气流沉降在较冷的空气上，将其覆裹。而发动机排出的上升气流会把构成雾霾的微小颗粒带走。

逆温现象不光加剧了德里的空气污染问题，从洛杉矶到德黑兰，许多城市都深受其害。尤为严重的一个例子就是1952年的伦敦大烟雾——持续四天的空气污染导致了12,000人死亡。阿勒马洛认为，喷气发动机排出的气流可以穿透逆温层，创造一道“虚拟烟囱”，把困在空气中的污染物往上吹，使其消散于更广阔的大气层中。据其计算，使用喷速为每秒460米的单台喷气发动机便可将容量一千兆瓦的燃煤发电厂所有的排放物吹散。不过，他还没有计算清楚一台喷气发动机是否可以干扰逆温层并把污染物吹离城市上空，所以他正打算测试这一假设。

阿勒马洛计划在未来八个月内将其“上升气流风机”置于一家燃煤发电厂旁，并用一组无人机监测其运作。他正与拥有发电企业的塔塔集团（Tata Group）商议在其一座发电站旁做试验。另一处不错的候选地点是印度巴达尔普尔（Badarpur）的一家国有电厂，距离德里市中心不到50公里。据德里的研究及游说团体“科学与环境中心”（Centre for Science and the

Environment) 称, 巴达尔普尔电厂是印度污染最严重的电厂之一。本月早些时候, 因空气污染异常严重, 政府采取了一系列紧急应对措施, 该电厂被关闭了十天。

阿勒马洛已找到一些退役喷气发动机来打造他的第一台“上升气流风机”。印度及美国空军都乐于出手相助。印度空军无偿提供了六台退役发动机, 而美国空军也计划从亚利桑那州戴维斯-蒙森空军基地 (Davis-Monthan Air Force Base) 的“飞机坟场” (Boneyard) 调出另外四台发动机供阿勒马洛使用, 目前正在审批。他们只要求对每个发动机收取5000美元, 以支付整備发动机所需的劳动力成本外加运输费用。

一些气象学家则持怀疑态度。他们提出, 目前可用的发动机并不具备足够的力量把污染物质轰出德里的逆温层, 尤其是在白天, 那时冷暖空气的锋面处于海拔1000米左右的高度。他们还认为阿勒马洛的“虚拟烟囱”构想过于简单。排气流在爬升时遭遇的大气湍流和摩擦作用将削弱其力量。此外, 日内瓦世界气象组织研究员亚历山大·巴克拉诺夫 (Alexander Baklanov) 表示, 即使这一技术果真能奏效, 对抗覆盖全城的逆温层需要众多喷气发动机及大量燃料, 成本将极其高昂且难以承受。

阿勒马洛当然不同意, 而且假如测试能按其时间表推进, 孰对孰错不久便可见分晓。即便他的“全城虚拟烟囱阵”构想确实野心过大, 在极端污染的情况下也许还是可以派上用场。温哥华英属哥伦比亚大学的城市气象学研究员安德烈亚斯·克里斯滕 (Andreas Christen) 指出, 最严重的污染出现在空气变冷的时候, 比如在晚上。因为温度下降时空气体积收缩, 上方的暖空气得以向下膨胀。这使得空气中的灰霾更为集中, 但也令逆温层更接近阿勒马洛的排气机射程。正如克里斯滕注意到的那样, 富裕国家的一些农民已开始运用直升飞机来干扰自家农田上空的逆温层, 保护作物免受霜冻。阿勒马洛的排气机也许能成为一个替代方案。 ■



Corporate Italy

Seize the day

Italy's business leaders are clamouring for a "yes" vote in December's constitutional referendum

"THE biggest risk in Europe is the Italian referendum," said Gianfelice Rocca, head of Assolombarda, Milan's chamber of commerce, this summer. For corporate Italy, much is at stake in the vote on constitutional reform, which will be held on December 4th. Victory for Matteo Renzi, the business-friendly prime minister, could mean a big fillip for firms of all sizes, whereas a loss would be "a shock in the system", said Mr Rocca.

The national employers' federation, Confindustria, agrees with him. If those campaigning for a "yes" vote are to be believed, firmer government, easier conditions for investors and generally brighter economic prospects would follow. The two main issues to be decided are reform of the Senate's powers—whether to let the lower chamber pass future laws, even when opposed by the Senate—and whether decision-making powers should be brought back from regional governments to the centre.

Francesco Starace, the chief executive of Enel, a giant European electricity company that is one of Italy's more successful firms, sets out a strong case that the proposed changes would bring important benefits to companies, especially if politicians took it as a signal to push for more reforms that would deregulate the economy and encourage competition. Last year labour laws were eased slightly, and a change this July made it easier and cheaper for startups to register with the authorities. Mr Starace hopes that the momentum will continue. "We have been waiting for these reforms for 25 years and it would be a pity to have to wait any longer," he says.

The public currently seems less convinced of the merits of constitutional

change, and opinion polls suggest the outcome hangs in the balance. But the opportunity would be a shame to miss, businesses believe. A “yes” result would send an unambiguously positive signal to investors in Italy, says the boss of one of the country’s big industrial firms. It would show that “we can change laws that for decades held back productivity,” he adds.

Bringing more powers to the central government would reduce costly complexity for firms. Today there are different rules in each region of Italy on water use, waste recycling, pollution control, how to run energy installations and other areas where the authorities require permits, points out Mr Starace. It is costly to manage, especially for smaller companies.

A second gain would directly follow a shake-up in the Senate. Bosses reckon lawmakers would feel able to cut layers of bureaucracy and speed up judicial reforms, notably to improve legal administrative procedures. In the latest ease-of-doing-business rankings from the World Bank, Italy sits in 50th place, among the worst of any economy in the OECD club of rich countries (and six places worse than last year). Mostly that is the result of firms’ misery in dealing with the state, such as in paying tax or getting contracts enforced.

An economist at Intesa Sanpaolo, a bank, estimates that foreclosures on assets take seven years on average to complete in Italy (and as many as ten in the south) compared with two years in Germany or France. The administrative process around construction permits takes an Italian firm an average of 227.5 days to navigate, according to the World Bank, compared with 86 for a British one. A better-run state could improve all this.

If Mr Renzi and other politicians decided they had a mandate to confront incumbent lobbies, such as taxi drivers that have almost choked off Uber and other ride-hailing firms in big cities, including Milan, or which block new entrants to the pharmacy business, then the referendum would mean

even greater improvements. The former boss of Uber in Italy, Benedetta Arese Lucini, received violent threats when she started rolling out its services. Without big changes to the status quo, says Ms Arese Lucini, “it would be stupid [for new firms] to be based” in Milan. But the day that Italy understands that competition is good “we can compete with the world,” she adds.

If politicians really got the reform bit between their teeth, they might even address tax rules that, in effect, punish investors in companies. One reason why Italian firms have been starved of credit is that tax rates heavily favour buyers of government bonds over investors in private equity, for example. Italy attracts a strangely low share of the money going into private equity in Europe, or less than one-quarter of the funds that France attracts and one-fifth of funds into Britain (as a share of GDP).

Nino Tronchetti Provera, head of Ambienta, a private-equity fund (and a cousin of Marco Tronchetti Provera, boss of Pirelli, a big tyre manufacturer), concurs that the vote matters greatly, chiefly because of the downside risk of a “no”. Rejection would mean a return to extreme political uncertainty, since Mr Renzi has talked of resigning if voters spurn him. Yet it is also possible to exaggerate the potential gains for business of a “yes” vote in the referendum, or, indeed, the cost if voters reject Mr Renzi’s plans. Corporate Italy is ailing for many reasons. One intractable problem is a consistently low level of domestic consumption thanks to a rapidly ageing population. A culture of risk aversion discourages entrepreneurs. “Failure means family shame, your mother will be disappointed in you,” says Ms Arese Lucini.

| *Mamma mia*

The shortage of capital for business stems from a troubled banking system and also from a tradition of families funding their own, usually small, businesses. The Italian bourse remains a “stunted” thing, in comparison to

markets in Paris or London, points out Claudio Costamagna, chairman of Cassa Depositi e Prestiti, a state-controlled bank that invests Italy's postal savings. About 70% of Italy's stockmarket capitalisation is made up of the shares of banks, insurance firms, utilities or energy companies such as ENI, a state-controlled oil-and-gas firm. Industrial and manufacturing firms, the backbone of the economy, make up a small part. The referendum will do little to channel more money to the latter kind of company.

And although constitutional reform would help, it will take more to jump-start the economy, which is barely growing today and remains roughly the size it was over a decade ago. Successful Italian companies are those that export to more vibrant overseas markets, such as businesses selling food, fashion, pharmaceutical products, car parts or energy.

Often, Italian firms do not help themselves, either. Few have followed the example of Enel and other leading companies, which have rapidly embraced digitisation to increase efficiency. Some lack basic habits of using computers. An investor describes a visit this year to a southern Italian firm with annual turnover of €50m that manages all of its inventory on a whiteboard in a storeroom.

So the benefits of constitutional change, if it comes, could be unpredictable and felt unevenly. Big business has been most vocal about the desire for a "yes" vote, but large companies, with their channels to foreign markets, would cope pretty well with a rejection; they are accustomed to making do with the state of things now. It is small, nationally oriented businesses that are most at risk from backsliding on reforms. And as Mr Rocca admits, "The finale of the movie is highly uncertain." ■



意大利商界 活在当下

意大利商界领袖呼吁人们在12月宪法公投中投下“赞成”票

今年夏天，米兰商会“伦巴第工业联合会”（Assolombarda）的主席吉安菲利斯·洛卡（Gianfelice Rocca）表示，“欧洲面临的重大风险是意大利公投。”这次宪法改革公投将于12月4日举行，投票结果对意大利商界影响重大。洛卡说道，假如支持商界发展的意大利总理伦齐在这次公投中取得胜利，大大小小的企业都会备受鼓舞；但如果落败，则可能“撼动整个体系”。

全国性雇主协会“意大利工业联合会”（Confindustria）也认同其观点。假如争取“赞成”票的一方所言不虚，随之而来的便会是更为稳定的政府，更便捷的投资环境，以及更光明的经济前景。两大议题有待公投决定：参议院权力的改革——是否赋予众议院立法权（即便议案遭到参议院反对）——以及决策权是否应从地方政府收归中央。

欧洲电力巨头意大利国家电力公司（以下简称Enel）是该国首屈一指的成功企业，其首席执行官弗朗西斯科·斯塔拉切（Francesco Starace）强有力地指出，被提议的宪法改革将大大有利企业发展，尤其是政客们可将此视为推动更多改革的信号，放松经济监管并鼓励竞争。去年，意大利劳动法略有松绑，而今年七月推出的一项改革则简化了创业公司的注册程序并降低了费用。斯塔拉切希望这股势头能够延续下去。他说，“我们盼这些改革已经盼了25年，如果还要再等，那就太让人遗憾了。”

目前，社会大众却似乎对宪法改革的益处不那么确信。民调显示，投票结果难以预测。但商界相信机不可失。意大利一大型工业企业的老板说，假如结果赞成改革，将是向意大利的投资者发出毫不含糊的积极信号。这将表明，“我们可以改革几十年来阻碍生产力发展的法律”，他补充道。

把更多权力收归中央政府将有助企业精简费用高昂的复杂合规。斯塔拉切

指出，目前意大利每个地区都有不同的法规来监管用水、废物回收、污染控制、能源设施运营以及需当局许可的其他事务。企业管理这些事务成本高昂，尤其是对于小公司而言。

第二个好处直接来自于对参议院的重整。雇主们认为，议员将会觉得有能力消减层层繁文缛节，加快司法改革，特别是优化法律执行程序。在世界银行最新发布的营商便利度排名中，意大利位列第50名，在由富裕国家组成的经合组织（OECD）内垫底（而且排名比去年下跌了六位）。原因主要是企业与政府部门打交道时遭遇的艰辛，比如在缴纳税款或执行合同方面。

意大利联合圣保罗银行（Intesa Sanpaolo）的一位经济学家估计，在意大利，法院拍卖断供资产平均需七年才能完成（在南部更是长达十年），而在德国或法国仅需两年。据世界银行的数据，在意大利，企业申请建筑许可证的行政流程平均耗时227.5天，而在英国只要86天。提升政府管理水平将可改善这一切。

假如伦齐和其他政客确定自己有权挑战身为既得利益者的游说团体（比如在包括米兰等大城市几乎将优步和其他网约车公司赶尽杀绝的出租车司机们，或是那些阻碍新进企业打入制药行业的团体），那么这次公投则意味着甚至更长足的进展。优步意大利公司前董事总经理本妮迪塔·阿雷斯·卢希尼（Benedetta Arese Lucini）在推出公司服务时曾受到暴力威胁。阿雷斯·卢希尼说，如果现状不发生重大的改变，那么在米兰“设立（新公司）将是个愚蠢的决定”。她补充道，哪天意大利明白了竞争是件好事，“我们才可以和世界竞争。”

如果政客们真的取得了改革权，也许他们甚至还会改变实际上是在惩罚企业投资者的税收法规。例如，意大利企业之所以信贷短缺，一个原因就是政府债券买家和私募股权投资者之间，税率大大倾向于优惠前者。在欧洲，意大利吸引到的私募股权资金份额（占GDP比例）低得出奇，不到法国所吸引资金的四分之一、英国的五分之一。

大型轮胎制造商倍耐力（Pirelli）的老板马尔科·特隆凯蒂·普罗韦拉（Marco Tronchetti Provera）的表亲尼诺·特隆凯蒂·普罗韦拉（Nino Tronchetti Provera）是私募股权基金Ambienta的负责人，他认同这次的投票事关重大，主要在于“反对”的结果可能带来的负面风险。公投若拒绝改革，便意味着政局会重新回到极不稳定的状态，因为伦齐已表示如果计划遭选民否决，他将辞职。然而，即使公投结果赞成改革，商界的潜在获益或许也不如想象中的那么大。同理，人们也可能夸大了伦齐这一改革计划遭否决而造成的损失。意大利商界的颓势有着多方面的原因。一个棘手问题便是由于人口迅速老龄化，国内消费水平持续处于低位。厌恶风险的文化也打击了企业家的斗志。阿雷斯·卢希尼表示，“失败意味着让家族蒙羞，令母亲失望。”

| 妈妈咪呀

企业资本短缺的问题源于银行系统困难重重，也在于意大利企业（通常是小型企业）多由创始家族自行提供融资的传统。意大利国有银行Cassa Depositi e Prestiti从事邮政储蓄投资，其董事长克劳迪奥·科斯塔麦格纳（Claudio Costamagna）表示，相比巴黎或伦敦的市场，意大利证券市场仍是个“小矮人”。意大利股市市值约70%都是由银行、保险公司、公用事业部门或能源公司（比如像国家控股的油气企业ENI）的股票构成。而作为意大利经济支柱的工业及制造业企业只占据其中的一小部分。这次公投将无助这些企业获得更多资金。

如今，意大利经济发展停滞不前，经济规模与十多年前大致相当。尽管宪法改革会有所帮助，但要振兴经济还需做更多的工作。成功的意大利企业把产品出口到更活跃的海外市场，比如销售食品、时装、药物、汽车零部件或能源。

意大利企业往往也不主动自救。它们很少仿效迅速采用数字化技术以提高效率的Enel及其他领先企业。有些意大利公司甚至根本没有使用电脑的基本习惯。一位投资者称，今年他拜访了意大利南部一家年营业额达5000万欧元的公司，发现其库存管理全靠在库房一面白板上写写画画。

因此，假如公投通过宪法改革，好处也许难以预料，受益也可能不均。大企业一直积极发声希望人们投票“赞成”，但即便改革遭到否决，拥有外国市场渠道的大型厂商也可以应对自如——它们早已习惯随当前状态应付度日。如果改革倒退，承受最大风险的是那些面向国内市场的小型企业。正如洛卡承认的那样，“这台戏，结局实属未知。”■



The Trump Organisation

Deconstructing Donald

Both the president-elect and his critics have exaggerated the scale of his firm

THE NEW Trump Tower in Worli, a buzzing district of Mumbai, looks like any building site but its marketing sells a dream. A golden structure soars to the sky alongside a picture of Donald Trump. He is—potential residents are assured—the gold standard around the globe, a dealmaker without peer who operates across the gateway cities of the world and the man who built the American dream. Until a few days ago the developer, Lodha, carried a message on its website: “Congratulations Mr President-elect”. But now that a storm has blown up over the possible conflicts of interest between the various operations of Mr Trump’s group and his new job, it has been deleted.

The self-embellished legend is of a global tycoon. In a kind of mirror image, outraged suspicion is mounting that the Trump Organisation could morph into a vast global network of cronyism. America has been treated to reports of multi-billion dollar projects across the planet, to photos of Mr Trump glad-handing businessmen and to images of exotic, Trump-branded buildings standing like monuments to the decay of American ethics. Paul Krugman, a left-of-centre economist, has suggested that the Trump family could reap \$10bn while its patriarch is in office.

The president-elect’s unconventional methods mean it is too early to say if that will even begin to come to pass. But understanding the threat requires a sober view of his firm. Far from being a global branding goliath, it is a small, middle-aged and largely domestic property business. If Trump family members are to make a second fortune in the next four years, they will have to reinvent a mediocre firm. It could even be the weakness rather than the potential of their company that is most likely to motivate Mr

Trump to blur the line between politics and business.

Information on the Trump Organisation is mainly limited to Mr Trump's filings with election monitors. *The Economist* has aggregated the financial data of 170-odd entities, which were filed in 2015. For some assets the filings only provide a range of values and revenues, so we have added our own estimates and those of third parties.

Start with size. Trump Inc is worth perhaps \$4bn, with \$490m of annual revenue. Were it listed it would be the 833rd-largest firm in America by market value and 1,925th by sales. Other occupiers of, and contenders for, high political office—including Nelson Rockefeller, Ross Perot, Mitt Romney and Michael Bloomberg—have owned and run more powerful firms.

About four-fifths of that value sits in residential and commercial properties, including golf courses, owned by the Trump Organisation. Half of the group's entire worth consists of five buildings: Trump Tower and two other Manhattan buildings, and passive stakes in two offices in New York and San Francisco that are controlled by Vornado, a real-estate trust that is entirely separate.

The group's branding operation is puny, generating only 11-13% of its asset value and sales. Its largest individual source of fees is Panama, where there is a Trump-branded hotel. The Mumbai project has paid annual fees of about \$550,000 for the Trump brand. Hotels in Toronto and Manila also paid modest sums. It is also a domestic affair: 66% of the Trump Organisation's value is in New York and 93% is in America. Mr Trump created its best assets over a decade ago. His directorships inside the group rose from 235 in 2007 to almost 500 last year, as entities such as China Trademark LLC and Trump Marks Egypt LLC were formed. But few of these vehicles generate income; if anything, they are evidence of disorganisation

and disappointed ambition.

| *Second rate on Fifth Avenue*

The Trump Organisation could now profit from the presidency in two ways. First, the profits of existing assets could rise. *The Economist* has obtained data on hotel-room prices from an online travel agent. If the value of the Trump brand had risen during the election campaign you might expect a surge in prices. During 2016 the average room rate per night for a Trump-branded hotel in America fell by 1%, in line with other 4- to 5-star hotels. True, in November there has been a 12% spike in prices compared with a year earlier (see charts). But even if this is maintained it is unlikely to flow directly to the group's bottom line. Most hotel-franchising fee deals are long term and insensitive to trading conditions. Likewise the tenants of commercial office properties that Mr Trump owns will have long-term leases. So even if the prestige of the brand rises, it may take many years—more than four—for that to translate into higher cashflow.

What has risen fast is the volume of rooms sold in the group's hotels, which is up by an average of 40% in 2016. That is due mainly to the opening of a hotel in Washington, DC which, unusually, Mr Trump owns. And that in turn illustrates a simple fact: to profit from Mr Trump's stint in office, the Trump Organisation will have to rely on a second approach, creating new, majority-owned assets and projects.

Negotiating a rash of new hotel, golf course and skyscraper deals would be hard. The commercial real-estate market in New York is soft: having risen by an average of 9% a year in the past half-decade, rents have been flat in 2016. The number of Americans playing golf has dropped by a fifth since 2005. The global hotel industry is saturated after a 20-year building boom. Trump Inc's record of finishing projects and picking partners is patchy—a big development in Baku, the capital of Azerbaijan, has stalled, for example.

A new problem may be bank finance. Big banks play a vital role in the industry: Lodha, the Indian developer, says JPMorganChase is an investor in its projects; Mr Trump owed over \$120m to Deutsche Bank according to his 2015 filing. If new Trump projects are subject to claims of conflicts and cronyism, global banks that are exposed to litigation and congressional hearings in America may not stump up. Loans from state-owned banks in the emerging world may be prohibited by the constitution's ban on payments to the president from foreign governments.

Poor performance could prompt Trump Inc to try and diversify into less capital-and-debt intensive products sold directly to consumers. Mr Trump's daughter, Ivanka, runs a fashion and jewellery brand. If Mr Trump's children take over management of the firm, as he proposes, they may feel liberated to experiment.

It seems likely that President Trump will inevitably blur the lines between business and politics in potentially disturbing ways—expect grubby deals and murky meetings. But it is less clear that his firm's value will soar. With old assets in mature industries, a patchy record, disrupted management and controversies over conflicts of interest, Trump Inc's value could stagnate or fall. And that, rather than the thrill of fresh billions, could be what really distracts America's new leader. ■



特朗普集团

解构特朗普

当选总统本人及其批评者都夸大了他公司的规模

新建的特朗普大楼坐落在孟买繁忙嘈杂的沃尔利区（Worli），看起来和其他建筑工地没什么不同，但它的营销卖的是梦想。金色幕墙的大楼高耸入云，旁边竖立着特朗普的巨幅照片。未来的住户尽可以放心，特朗普是全球的黄金标杆、无人可及的交易高手（其经营的项目遍及世界各地的门户城市）、美国梦的打造者。直到几天前，开发商罗德哈集团（Lodha）的网站上一直贴有一条消息：“祝贺当选总统”。但由于特朗普集团的各种业务和他的新身份之间可能存在的利益冲突已经引发了一场风暴，这条消息已被删除。

特朗普把自己包装成全球大亨式的传奇人物。与之形成镜像的是，人们越来越怀疑特朗普集团（Trump Organisation）可能会演变成一个庞大的全球性裙带网络，他们对此义愤填膺。在美国，关于特朗普的新闻铺天盖地：特朗普集团在全球开展数十亿美元项目的报道；特朗普高兴地同商界人士握手的照片；被冠以特朗普之名、风格奇异的大楼的图片，这些建筑物如同见证美国伦理衰败的纪念碑那般耸立着。中左翼经济学家保罗·克鲁格曼（Paul Krugman）指出，特朗普家族有可能在其大家长任总统期间收获100亿美元。

鉴于这位当选总统各种非常规的做法，说这种情况会否发生实在为时过早。但是，若要真正了解这一威胁有多大，就需清醒地看待他的公司。特朗普集团远非具备全球品牌影响力的巨头，而只是一个有几十年历史、主营国内地产业务的小企业。如果特朗普家庭成员要在未来四年内斩获第二笔财富，就必须彻底改造一个平庸的公司。而最有可能驱使特朗普模糊政商界限的甚至反而可能是其公司的弱点而非潜力。

关于特朗普集团的信息主要来自特朗普向选举监察机构申报的材料。《经济学人》汇总了2015年提交的170多家实体的财务数据。对于某些资产，

申报材料只提供了一些价值和收入的数据，因此我们加入了自己和第三方的估计。

先从规模说起。特朗普公司估值可能为40亿美元，年收入4.9亿美元。如果上市，它会是美国市值排名第833位、销售额排名第1,925位的公司。其他曾经担任和竞选过高级公职的人——包括尼尔森·洛克菲勒（Nelson Rockefeller）、罗斯·佩罗（Ross Perot），米特·罗姆尼（Mitt Romney）和迈克尔·布隆伯格（Michael Bloomberg）——都拥有和经营过更为强大的公司。

特朗普公司大约五分之四的价值都集中在住宅和商业地产，包括高尔夫球场。集团全部市值的一半集中在五座大厦上：特朗普大厦和另外两座在曼哈顿的大楼，以及对两座分别位于纽约和旧金山的写字楼的被动持股（由完全独立的房地产信托公司沃那多控股）。

集团的品牌运营微不足道，产生的收入只占其资产价值和销售额的11%到13%。集团最大的品牌授权费来源是巴拿马，那里有一家特朗普品牌酒店。孟买的项目为特朗普品牌支付了约55万美元的年费。多伦多和马尼拉的酒店也支付了一定的费用。特朗普集团的经营也主要在国内：其66%的价值在纽约，93%在美国。特朗普在十几年前创造了集团最好的资产。他在集团内兼的董事头衔在2007年有235个，随着中国商标有限公司（China Trademark LLC）和特朗普马克斯埃及有限公司（Trump Marks Egypt LLC）等实体的成立，去年增加到近500个。但这些实体中没有几家有收入；说起来，它们其实是集团组织混乱和雄心壮志破灭的证据。

| 第五大道上的二流企业

特朗普担任总统可以让特朗普集团通过两种方式从中获利。首先，现有资产的利润可能上升。《经济学人》已从一家在线旅行社获得了酒店房间的价格数据。如果特朗普品牌的价值在竞选期间上升了，那么房间的价格也可能会激增。2016年，美国特朗普酒店每晚平均房价下降了1%，与其他四到五星级酒店情况一致。的确，与上年同期相比，11月的价格飙升了12%（见图表）。但即使其酒店房价能维持在这个水平，也不太可能直接

增加集团的利润，因为大多数酒店的特许费协议是长期的，对日常的房价波动并不敏感。同样，特朗普拥有的商业写字楼的租户签订的也是长期租赁合同。因此，即使品牌的声望提高，也可能要许多年——不止四年——才能转化为更高的现金流。

已经实现快速增长的是集团酒店的房间销量——在2016年平均增长了40%。这主要是由于在华盛顿特区开业的一家酒店。不同寻常的是，这家酒店是归特朗普所有。这反过来说明了一个简单的事实：为了在特朗普任职期间获利，特朗普集团必须依靠第二种方法——打造新的控股资产和项目。

谈判一系列新的酒店、高尔夫球场和摩天大楼项目并非易事。纽约的商业房地产市场增长乏力：在过去五年里平均每年增长9%，租金在2016年持平。2005年以来美国打高尔夫球的人数下降了五分之一。在经历20年的建设热潮之后，全球酒店业已经饱和。特朗普公司在完成项目和挑选合作伙伴方面的记录有好有坏——例如，阿塞拜疆首都巴库的一个大项目已经暂停。

银行融资可能是个新问题。大型银行在地产行业发挥着至关重要的作用：印度开发商罗德哈表示摩根大通是其项目的投资者。根据特朗普2015年递交的文件，他在德意志银行的借款超过1.2亿美元。如果新的特朗普项目受到利益冲突和裙带主义的指责，那些在美国面临诉讼和国会听证的全球性银行可能会不愿再投资。新兴国家的国有银行也可能在向特朗普集团贷款时受限，因为美国宪法禁止外国政府借款给美国总统。

业绩不良可能会促使特朗普公司尝试业务多元化，涉足直接销售给消费者、对资本和贷款要求较低的产品。特朗普的女儿伊万卡（Ivanka）就经营着一个时装和珠宝品牌。如果特朗普的孩子们像他打算的那样接管公司的管理，他们可能会觉得摆脱了束缚，可以大胆尝试。

特朗普总统看来不可避免地会以可能令人不安的方式模糊政商界线——必定会有肮脏的交易和见不得光的会面。但他公司的价值是否会飙升还不太

确定。由于旧资产集中在成熟产业，项目记录良莠不齐，管理混乱，又存在利益冲突的争议，特朗普公司的价值还可能停滞不前或是下降。这一点可能会真正让美国的新领袖分心，而不是再赚数十亿美元所带来的刺激。





Global warming

Days of the triffids

More photosynthesis means a slower rise in carbon-dioxide levels—for now

IN 1972, on their way to the Moon, the crew of Apollo 17 snapped what would become one of the most famous photographs ever taken. The “Blue Marble” shows Earth as it looks from space: a blue sphere overlaid by large brown swatches of land, with wisps of white cloud floating above.

But times change, and modern pictures of Earth look different. A wash of greenery is spreading over the globe, from central Africa to Europe and South East Asia. One measurement found that between 1982 and 2009 about 18m square kilometres of new vegetation had sprouted on Earth’s surface, an area roughly twice the size of the United States.

The growth in greenery is a consequence of climate change. As the planet heats up, places that were once too chilly for most plants to grow have become steadily more hospitable. That extra vegetation, in turn, exerts its own effects on the climate. According to a team led by Trevor Keenan of the Lawrence Berkeley National Laboratory, in California, who have just published their findings in *Nature Communications*, the plant growth caused by climate change may also be helping to slow it—at least for now.

In 2014 humans pumped about 35.7bn tonnes of carbon dioxide into the air. That figure has been climbing sharply since the middle of the 20th century, when only about 6bn tonnes a year were emitted. As a consequence, the concentration of CO₂ in the atmosphere has been rising too, from about 311 parts per million (ppm) in 1950 to just over 400 in 2015. Yet the rate at which it is rising seems to have slowed since the turn of the century. According to Dr Keenan, between 1959 and 1989 the rate at which CO₂ levels were growing rose from 0.75ppm per year to 1.86. Since 2002, though, it has

barely budged. In other words, although humans are pumping out more CO₂ than ever, less of it than you might expect is lingering in the air.

Filling the atmosphere with CO₂ is a bit like filling a bath without a plug: the level will rise only if more water is coming out of the taps than is escaping down the drain. Climate scientists call the processes which remove CO₂ from the air “sinks”. The oceans are one such sink.

Photosynthesis by plants is another: carbon dioxide is converted, with the help of water and light energy from the sun, into sugars, which are used to make more plant matter, locking the carbon away in wood and leaves.

Towards the end of the 20th century around 50% of the CO₂ emitted by humans each year was removed from the atmosphere this way. Now that number seems closer to 60%. Earth’s carbon sinks seem to have become more effective, but the precise details are still unclear.

Using a mix of ground and atmospheric observations, satellite measurements and computer modelling, Dr Keenan and his colleagues have concluded that faster-growing land plants are the chief reason. That makes sense: as CO₂ concentrations rise, photosynthesis speeds up. Studies conducted in greenhouses have found that plants can photosynthesise up to 40% faster when concentrations of CO₂ are between 475 and 600ppm.

For delegates at the latest round of UN climate talks, in Marrakech, that sounds like good news. But more vigorous photosynthesis is only slowing climate change. The effect is too small to reverse it. And it will not last, says Dr Keenan. Besides, there is more to growing plants than carbon dioxide. Take water: in a changing climate, wet bits of the world will probably become wetter while drier parts become drier. Extreme events—droughts and deluges—will intensify. Rainfall patterns may change, which could make some places less friendly to plants that now thrive there. And although plants benefit in the short term from extra CO₂, they suffer when

temperatures get too high.

There will be more complicated effects, too. Much of the greening has occurred in cold spots (see map). Yet while ice and snow reflect sunlight, vegetation soaks it up, so more greenery in the north will eventually lead to yet more warming. That, in turn, could release large quantities of methane—a potent but short-lived greenhouse gas—from thawing tundra. Elsewhere, higher temperatures could kill tropical forests. According to one estimate, for every degree of warming, tropical forests may release greenhouse gases equivalent to five years' worth of human emissions.

Indeed, some researchers think the effects of global greening may already be fizzling out. Every few years a climatic phenomenon called El Niño sees the tropical Pacific Ocean warm substantially, which tends to raise temperatures around the world. The most recent Niño, in 2015-16, was a whopper. Corinne Le Quéré, a climate researcher at the University of East Anglia in Britain says that means the world's plants may have, therefore, become a less potent carbon sink than they were in the period studied by Dr Keenan's team. Global greening, then, offers only a little breathing space. Kicking the fossil-fuel habit remains the only option. ■



全球变暖

三脚妖的时光

更多的光合作用意味着二氧化碳水平增长变缓——目前看来是这样

1972年，阿波罗17号的宇航员在飞往月球的途中按下了快门。这张照片日后成为全球最著名的照片之一，被称作“蓝色大理石”。它显示了从太空中看地球的样子：蓝色的星球被大片褐色陆地覆盖，一缕缕白云飘浮其上。

然而随着时代变迁，现代的地球图片看起来已有所不同。从非洲中部到欧洲再到东南亚，一抹绿色在地球上蔓延开来。一次测量结果显示，从1982年到2009年间，约1800万平方公里的新植被在地球表面萌发，面积约为美国国土的两倍。

绿色植被的增长是气候变化的结果。随着地球变暖，那些曾经由于太过寒冷而使大多数植物都无法生长的地方已经逐渐变得更加舒适。而新生长的植被本身又对气候产生了影响。加州劳伦斯伯克利国家实验室（Lawrence Berkeley National Laboratory）的特雷弗·基南（Trevor Keenan）所带领的团队刚在《自然通讯》（Nature Communications）上发表了他们的研究结果。依照他们的观点，气候变化导致的植物增长可能也有助于减缓全球变暖，至少目前看来会是如此。

2014年人类向大气中排放的二氧化碳约为357亿吨。自20世纪中叶开始这一数字已急剧攀升，当时一年的排放量仅为60亿吨。其结果是大气中的二氧化碳浓度不断上升，从1950年的约311ppm升至2015年的略高于400ppm。但是自世纪之交开始，增长速度似乎有所下降。基南称，1959至1989年间，二氧化碳水平的增长速度从每年0.75ppm升至1.86ppm。但是自2002年以来几乎没有变化。换句话说，尽管人类排放的二氧化碳比以往更多，但留存在大气中的仍比预想的要少。

向大气中排放二氧化碳有点像往没有塞子的浴缸里放水：只有从龙头放出的水比排出的水多，水面才会上升。气候科学家把从大气中移除二氧化碳

的过程叫做“碳汇”。海洋就是这样一种碳汇。植物的光合作用也是一种碳汇：在水和太阳光能的帮助下，二氧化碳被转换成糖类，糖类又用于产生更多的植物物质，从而将碳固定在林木和树叶中。到20世纪末期，每年人类释放的二氧化碳有约50%是靠这种方式从大气中移除的。现在这一数字大概接近60%。地球的碳汇看来已变得更加高效，但具体细节尚不清楚。

基南和他的同事们将地面和大气观察、卫星测量以及计算机建模结合起来，得出了这样的结论：增长更快的陆地植被是主因。这一结论言之成理：随着二氧化碳浓度升高，光合作用也会加速。于温室中开展的研究已经发现，当二氧化碳浓度在475ppm至600ppm之间时，植物的光合作用会加速高达40%。

对于在马拉喀什（Marrakech）召开的最近一轮联合国气候变化大会的代表而言，这听起来像是个好消息。但更强健的光合作用只能减缓气候变化，以其效果之有限，根本无法逆转气候变化。而且据基南所说，这样的效果也无法持久。此外，与不断增长的植物相关联的不止有二氧化碳。以水为例：气候不断变化，世界上潮湿的地方就可能会变得更加多雨，而干旱的地方则会愈加干旱。旱灾和洪水这类极端气候事件将会加剧。降雨格局也可能会发生变化，这会让一些现在植被繁茂的地方变得不再适合植物生长。尽管植物短期内会受益于二氧化碳的增加，但是当气温变得太高时它们也会受损。

还会有更加复杂的影响。新增的很多植被都生长在寒冷的地方（见图）。但是冰雪可以反射阳光，而植被却会吸收可见光，因而在地球北部绿色植物的增多最终将导致气候更加温暖。而这样一来，融化的冻土带将释放出大量强效但持续时间短的温室气体——甲烷。在其他地方，温度升高会毁灭热带森林。有预测显示，温度每升高一度，热带森林便会释放出相当于人类五年排放量的温室气体。

实际上，有些研究人员认为全球变绿的作用可能已经在逐渐消退。每隔数年就会产生一波被称作“厄尔尼诺”的气候现象，即热带太平洋海温大幅上升，往往会导致全球升温。2015至2016年的最近一次厄尔尼诺现象极其强

劲。因此，英国东英吉利大学（University of East Anglia）的气候研究员科林·乐凯芮（Corinne Le Quéré）认为，这意味着与基南团队研究的时期相比，全球植物的碳汇能力可能已经减弱。因而全球变绿只是给了我们一丝喘息的空间，抛弃传统的化石燃料才是控制全球变暖的唯一选择。■



The sharing economy (1)

Four walls in China

Airbnb comes late to the Middle Kingdom

“WE HAVE not focused on building our community in China,” reads a peculiar announcement posted recently by Airbnb on its official blog. Despite the firm’s apparent lack of enthusiasm for the Chinese, the world’s biggest group of travellers, intrepid locals have still discovered the American home-sharing site. Tourists from the mainland have used the platform more than 3.5m times; Airbnb members in China have hosted nearly 1m visitors.

Perhaps abashed by this show of grassroots support, Airbnb is now making a big push in China. From December 7th a new legal entity (Airbnb China) will cater to all those neglected hosts and guests. To satisfy Chinese regulators the unit will store their data on local servers. The firm has also struck new agreements with the governments of Shanghai, Shenzhen, Chongqing and Guangzhou, which suggests that these big cities welcome its formal arrival. In addition to these developments, there are rumours that Airbnb is about to take over Xiaozhu, a mid-sized local rival that recently raised \$65m of venture funding.

The mainland is certainly an attractive prize, with a big sharing economy that is projected to grow by 40% a year for each of the next five years. Local travellers made four billion trips inside China last year. The market for individual leisure lodgings inside the country could reach 10.3bn yuan (\$1.7bn) next year, up from 6.8bn yuan this year, reckons iResearch, a market-research firm. Airbnb sees its rivals in China as parochial outfits. None of them have a global network or the means to build one, says Nick Papas, the firm’s spokesman in Washington, DC.

But the American firm is late to the party, and local rivals are by now established. The strongest is Tujia, a venture-backed firm that is valued at more than \$1bn and offers some 440,000 homes in over 300 cities. Unlike Airbnb's model, which connects homeowners with travellers, Tujia's also helps developers let out vacant properties—taking advantage of China's property glut—and also offers services to potential buyers of homes.

Other foreign tech firms have stumbled in China in the recent past. “The past decade has shown that it's very hard for American companies to use their own approach to do business in China,” says Chen Chi, Xiaozhu's chief executive officer. He previously worked at the local divisions of Yahoo and TripAdvisor, two American internet firms which struggled to localise. This year Uber, a ride-hailing firm, had to retreat after spending a fortune trying to compete against Didi Chuxing, a well-funded and inventive local rival.

Even if foreign firms manage to hire savvy mainlanders, they are held back by having to report to faraway bosses with patchy knowledge of the market. “They end up behaving like rabbits, while we are a pack of wolves,” says Mr Chen (in an interview before the news of Airbnb's interest in Xiaozhu). One Xiaozhu customer says he far prefers its cheaper prices and greater array of listings to Airbnb's offering. With over 100,000 listings in about 300 cities across the country (Airbnb has around 70,000 in fewer places), it would be a useful addition to Airbnb's empire.

A combined firm would still have to contend with regulatory confusion. Tujia's boss, Luo Jun, laments that there is “no clear national law supervising this industry.” The requirements for special licences, police checks and identity verification vary widely by region. Doing business often means lengthy one-off negotiations.

Airbnb may reckon it is in the clear with its deals with four cities, but Tujia

has made over 200 agreements with local authorities across the country. One businesswoman who rents out eight grand flats in Shanghai's old French Concession from landlords, and re-lets them on home-sharing sites, says that the police fine landlords as a matter of course every once in a while. A strong relationship with the government is a must for any sharing site, whether local or foreign, she says. It would also help to avoid being dismissive of local companies. Airbnb is still a long way off building its Chinese home from home. ■



共享经济

中国的四面墙

*Airbnb*来中国来晚了

“我们尚未将重点放在打造中国的社区上。”最近在Airbnb的官方博客上贴出了这样一则奇怪的声明。尽管这家公司对中国人这一全球最大的旅游者群体明显欠缺热情，但勇敢无畏的当地人仍然发现了这个美国住宿共享网站。来自中国大陆的游客已经使用该平台超过350万次。Airbnb在中国的成员也已接待了近100万名游客。

一般中国老百姓表现出如此热烈的支持，或许让Airbnb颇感尴尬，该公司现已开始大力进军中国市场了。12月7日起一个新的法律实体（Airbnb 中国）将要迎合所有那些被忽视的房东和房客的需要。为了让中国的监管机构满意，Airbnb 中国将把数据存储本地服务器上。公司还和上海、深圳、重庆及广州的政府达成了新协议，显示这些大城市欢迎它正式入驻。除了这些进展外，有传闻说Airbnb很快将要收购中国的竞争对手小猪，这家中型企业最近已完成了6500万美元的风投融资。

中国大陆当然是一份诱人的奖赏，这里拥有规模庞大的共享经济，预计未来五年内每年增长40%。去年中国本地游客境内游达40亿次。市场调研公司艾瑞咨询（iResearch）估计，中国国内个人休闲住宿市场明年可达103亿元（17亿美元），而去年为68亿元。Airbnb把它的中国竞争对手视为小格局的地方企业。它们无一拥有全球网络或建造这种网络的途径，Airbnb的华盛顿发言人尼克·帕帕斯（Nick Papas）说。

然而这家美国公司姗姗来迟，本地对手已经稳稳立足。其中最强大的是途家网，这家风投支持的公司估值超过10亿美元，在300多个城市提供约44万个住所。与Airbnb连接房东和游客的模式不同，途家网也帮助开发商出租空置的物业——利用中国房产过剩的现状——此外还向潜在的购房者提供服务。

其他外国科技公司近年来在中国步履蹒跚。小猪的CEO陈驰说，“过去十年已经表明，美国公司很难用自己的方式在中国做生意。”他曾在雅虎和TripAdvisor的中国分部任职，这两家美国互联网公司都难以本土化。今年，网约车公司优步在花费了大笔资金试图和滴滴出行这家资金充裕、善于创新的本地对手竞争后，不得不撤出中国。

即便外国公司想办法聘请到能干的本地人，它们仍然必须向对本地市场只有零星片面了解的老板们远程汇报，因而被束缚了手脚。“最终它们行事就像兔子，而我们是一群狼。”陈驰（在Airbnb有意收购小猪的新闻发布前接受采访时）这样说道。一名小猪客户说，相比Airbnb，他更喜欢小猪较便宜的价格和更多的房源。小猪在全国约300多个城市有十万多个房源（Airbnb有约7万个，分布的城市更少），它应该会为Airbnb帝国添砖加瓦。

合并后的公司仍要和混乱的监管作战。途家网CEO罗军叹息“并没有明确的国家法律监督这个行业”。对特殊执照、警方检查和身份证明的要求在各地千差万别。做生意常常意味着漫长的一次性谈判。

Airbnb可能会认为自己和四个城市签下协议后便可以高枕无忧了，但途家网已经和全国各地200多个地方政府签约。一名女商人从房东手上租来位于上海原法租界的八套大公寓，再放到住所共享网站上转租。她说警察每隔一段时间就理所当然地来罚房东一笔。她说，无论来自本地或国外，任何共享网站都必须和政府关系过硬。切勿小看本土企业——这一点也有帮助。Airbnb要用美国的一套在中国安家，还有很长的路要走。■



Globalisation

The third wave

Easier movement of things, then of ideas, fuelled globalisation. Moving people may be the hardest

BILL CLINTON once called globalisation “the economic equivalent of a force of nature, like wind or water”. It pushes countries to specialise and swap, making them richer, and the world smaller. In “The Great Convergence”, Richard Baldwin, a Geneva-based economist, adds an important detail: like wind and water, globalisation is powerful, but can be inconstant or even destructive. Unless beloved notions catch up with reality, politicians will be pushed to make grave mistakes.

In an economist’s dream world, things, ideas and people would flow freely across borders. Reality is stickier, and stuff less mobile—so much so that it trapped humankind’s ancestors into village-level economies. Constraints on trade once bundled consumption and production together, limiting their growth.

Mr Baldwin’s grand theory of globalisation is of a series of unbundlings, driven by sequential collapses in the cost of moving things and ideas across space. From the domestication of the camel around 1,000BC to the first commercial steam engine in 1712, the first great wave of globalisation unbundled production and consumption. From 1820, British prices were set by international demand, and café-goers could sip Chinese tea sweetened with Jamaican sugar.

Though moving goods became cheap, until the very end of the 20th century moving ideas was expensive. Mr Baldwin invites readers over 50 to remember international calls costing \$5 a minute, or the \$50 price of sending a single document by an overnight courier. This encouraged

industries to cluster. The hubs of economic activity emerged in the countries we now know as the G7. In this form of globalisation, national teams of ideas and workers battled for market share, and became richer in the process. Mr Baldwin uses the analogy of two sports teams swapping players to improve their performance.

But since the 1990s globalisation has changed radically, as the internet has lifted the cost of moving ideas, and fuelled a second unbundling. Now that co-ordinating international production is cheaper, faster and safer, supply chains ignore borders to go sprawling across the world. A Canadian aeroplane-maker can direct a team of Mexican engineers. Apple can combine American design with Chinese assembly lines. With many products made everywhere, trade has been, in effect, denationalised.

The pace of change and the new ease with which rich-world companies can outsource work have eliminated the old boundaries around knowledge and created a new, more unsettling trade landscape. Once, textile-mill workers in South Carolina had exclusive access to American technology. Although it might seem that they have lost out to competition from Mexican workers, more accurately they face an altogether more formidable competitor: Mexican workers made more productive by American know-how.

Continuing the sports analogy, Mr Baldwin says that today's trade is like the coach of a top team being allowed to offer his services to underdogs. The coach gets rich from the doubled market for his services, while the better team gets a sudden surprise from the newly skilled competition. Mr Baldwin says that discontent with globalisation stems in part from an "ill-defined sense that it is no longer a sport for national teams".

To placate voters by raising tariffs is to tackle 21st-century globalisation with tools better suited to the 20th (or even 19th) century. Given the new world of global supply chains, a tariff is like erecting a wall in the middle of

a factory. Mr Baldwin's 21st-century policies involve setting common rules and standards to make companies feel secure that their supply chains will work. These are the goals of trade deals like the Trans-Pacific Partnership, or Britain's membership of the European Union's customs union—both under threat. And he says little on how to win over disgruntled voters, save a few lines on support for workers rather than jobs, and a vague plea to share gains between winners and losers.

Mr Baldwin is too sanguine about the politics of globalisation. His rosy vision of the future imagines globalisation unshackled from its third constraint, as labour is made mobile by robots allowing people to offer their services remotely. In a different world, perhaps. A quip from his conclusion, written before America's presidential election, has unintended weight. "Not even the future is what it used to be." ■



全球化

第三次浪潮

先是货物，继而是思想——它们更为便利的流通刺激了全球化的进程。而人员流动可能最为困难

克林顿曾将全球化称为“一种经济界的自然力量，就像自然界中的风或水那样”。它推动各国进行专业分工并相互交换，使国家变得富裕、世界变得更小。在《大融合》一书中，现居日内瓦的经济学家理查德·鲍德温（Richard Baldwin）补充了一个重要细节：就像风和水一样，全球化威力巨大却也变化无常，甚至还具有破坏性。除非政客们钟爱的理念能够跟上现实，否则他们将被迫犯下严重错误。

在经济学家的理想中，货物、思想和人员均可跨越国界自由流动。现实则没那么顺畅，货物的流动性也不够——以至于人类的祖先受困于村落经济。贸易限制曾一度将消费与生产相捆绑，限制了它们的增长。

鲍德温关于全球化的宏大理论涉及一系列的分离，其驱动力是跨越空间交流货物和思想的成本连续下滑。从公元前大约1000年的骆驼驯化到1712年的第一台商用蒸汽机，全球化的第一次大潮使生产与消费分离开来。从1820年起，英国的物价便由国际需求所决定，而且咖啡馆的常客还能品尝到加了牙买加糖的中国茶。

虽然商品流通成本降低，但是在20世纪末之前，交流思想仍然代价不菲。鲍德温请50岁以上的读者回忆一下每分钟5美元的国际电话或是送一份文件就要50美元的次日达快递。这促进了产业集群化。经济活动的中心出现在我们现在所说的“七国集团”的成员国里。在这种形式的全球化中，依靠思想和工人的国家队争夺市场份额，并在此过程中变得更富裕。鲍德温打比方说，这就像两支运动队交换队员来提高各自的表现。

但自上世纪90年代以来，全球化已经彻底改变，因为互联网降低了交流思想的成本，并刺激了第二次分离。现在，统筹国际化生产更为便宜、快捷

和安全，供应链则忽略国界，遍布全球。一家加拿大飞机制造商可以管理一个墨西哥工程师团队。苹果公司能把美国的设计与中国的装配线相结合。许多产品都在全球制造，贸易实际上已没有了国界。

变化的速度以及富裕国家企业能把工作外包的新便利已经消除了阻隔知识传播的旧边界，创造了一个更加令人不安的贸易新格局。曾几何时，南卡罗来纳州的纺织工人还独占美国的技术。然而看起来他们似乎已在竞争中输给了墨西哥工人，更准确地说，他们面对的是整体上更为强大的竞争对手：因美国技术而变得更为高产的墨西哥工人。

继续用体育来打比方，鲍德温认为现在的贸易就像允许强队的教练执教弱队。教练因自己所服务的市场翻了一倍，变得更加富有；较强的球队则惊奇地发现，最近竞争对手的技术能力提高了。鲍德温表示，对全球化的一部分不满源自“一种不确定感，即全球化不再是一项国家队的运动”。

用提高关税来安抚选民，就相当于用更适合20甚至19世纪的工具来解决21世纪的全球化问题。考虑到全球供应链的新世界，征收关税就像在工厂中央竖起一堵墙。鲍德温的21世纪政策需要设置共同的规则 and 标准，让企业感到安心并相信自己的供应链将会运转顺利。这些都是贸易协定的目标，如《跨太平洋伙伴关系协定》（TPP）和欧盟关税同盟中的英国成员国身份等——而这两项都受到了威胁。至于如何说服不满的选民他则言之寥寥，仅有应支持工人而非工作的只言片语，并模糊地呼吁赢家与输家分享收益。

鲍德温对全球化的政治形势过于乐观。在他对未来的美好憧憬中，全球化摆脱了它的第三个限制——机器人使人们能远程提供服务，劳动力变得易于流动。在一个不同的世界里，也许会是这样吧。他的结论中有一句写在美国总统选举前的俏皮话，现在有着意想不到的分量：“甚至连未来都和以前的不同了。”■



Global wealth

The one per center next door

You may be higher up the global wealth ladder than you think

IF YOU had only \$2,222 to your name (adding together your bank deposits, financial investments and property holdings, and subtracting your debts) you might not think yourself terribly fortunate. But you would be wealthier than half the world's population, according to this year's Global Wealth Report by the Credit Suisse Research Institute. If you had \$71,560 or more, you would be in the top tenth. If you were lucky enough to own over \$744,400 you could count yourself a member of the global 1% that voters everywhere are rebelling against.

Unlike many studies of prosperity and inequality, this one counts household assets rather than income. The data are patchy, particularly at the bottom and top of the scale. But with some assumptions, the institute calculates that the world's households owned property and net financial assets worth almost \$256trn in mid-2016. That is about 3.4 times the world's annual GDP. If this wealth were divided equally it would come to \$52,819 per adult. But in reality the top tenth own 89% of it.

That lucky tenth now includes over 44m Chinese, about 4.4% of the country's adult population. A far greater number (almost half of China's adults) cluster in the next three deciles down. Closer to the bottom of the ladder, there is a similar bulge of Indians with wealth between \$30 and \$603.

Below them, the bottom tenth is a peculiar mix. It is populated by poor countries, where many people have nothing, and rich ones, where people can own very much less than that. It includes a surprising number of Americans (over 21m), whose debts outweigh their assets. But most

Americans are much better off. Over 40% belong to the top tenth of the global wealth distribution (and over 18m belong to the global 1%). Some of those railing against the global elite probably do not even know they belong to it. ■



全球财富

隔壁的富豪

在全球财富的阶梯上，你的位置也许比你以为的要高

如果你名下只有2222美元的财产（将你的银行存款、金融投资以及持有房地产相加，再减去债务），你可能并不会觉得自己的境况好极了。不过根据瑞信研究院（Credit Suisse Research Institute）今年的《全球财富报告》，你已经比全世界一半的人都更富有。如果你拥有71,560美元或者更多，那么你就属于全球财富榜上排名前10%的那群人。倘若你足够幸运，拥有的财产超过744,400美元，那么你已经跻身于全球各地的选民都在与之对抗的全球1%的“富豪”了。

与很多关于繁荣和不平等的研究不同，这份报告计算的是家庭资产而非收入。其所搜集的数据并不完整，特别是阶梯顶端和底部的部分。不过在做了一些假设后，瑞信研究院估算，在2016年年中，全球家庭所拥有的房地产和金融资产净额约为256万亿美元。这个数字大致是全球年度GDP的3.4倍。如果将这笔财富均分，每个成年人将会得到52,819美元。但在现实中，这些财富的89%都归顶端十分之一的人所有。

如今这幸运的十分之一中包括4400多万中国人，他们约占中国成年人口的4.4%。往下的三个十分位数所集中的人口则要多得多，中国一半的成人都集中于此。在接近阶梯底端的部分则是集中了大量的印度人；他们拥有的财富在30美元到603美元之间。

再往下走，最底部的十分位数是个奇特的混合，其中既有贫穷国家的人口（在那里很多人一无所有），也有一些来自富裕国家的人（即便在富裕国家中，也会有人境况比一无所有还要差）。这部分人包含数目惊人的资不抵债的美国人，人数超过2100万。但大多数美国人的经济状况要好得多，超过40%的人都属于全球财富分布的前十分之一，超过1800万的美国人更是位列全球最富有的1%。一些对全球精英阶层大加斥责的人可能并不知道自己其实就是其中一员。 ■



Maps

X marks the spot

A new exhibition in London looks at the 20th century through its maps

MODERN cartography began to emerge in the 16th century as an instrument of power for rulers. But it was in the 20th century, with all its wars, revolutions, upheavals and helter-skelter technological change, that maps became truly democratised. In rich countries, near-universal education and the teaching of geography in schools ensured that most people could make sense of them. World wars required maps to be produced by the million. Meanwhile in civilian life the spread of the motor car, along with growing affluence that allowed more people to travel, expanded the private market. Mapmaking technology developed by leaps and bounds, progressing from land-based surveys to aerial photography to the Global Positioning System (GPS).

A new exhibition, “Maps and the 20th Century: Drawing the Line”, at the British Library (BL) in London until next March, examines the history of the past 100 years through maps. It considers their role in war and peace as well as in everyday life, their economic impact and, particularly towards the end of the period covered, their increasingly dynamic quality. Many of the 200 on show are drawn from the BL’s own remarkable collection of 4m maps.

The exhibits are strikingly varied: detailed first-world-war trench maps (with annotations like “badly shelled” and “full of dead”); second-world-war silk escape maps made into a dress; an early sketch for Harry Beck’s famous map of the London underground that was eventually published in 1933; a fascinating map of the Atlantic Ocean floor (pictured), based on research commissioned by the American navy to identify hiding places for its nuclear submarines; and the awe-inspiring photograph of Earth taken

during the Apollo Moon mission in 1968.

Maps have always had to be useful, and most people think of them as objective representations of reality. But “maps are not innocent bystanders,” says Tom Harper, lead curator of the exhibition. “They help shape people’s perceptions.”

That starts with technical points such as the projections that turn a three-dimensional world into a two-dimensional map. Most world maps (including Google’s) use a variant of a projection invented in 1569 by a Flemish mapmaker, Gerardus Mercator, which was handy for navigation but exaggerates the apparent size of the temperate zone where most rich countries are concentrated. An alternative projection now called Gall-Peters, which properly reflects the relative size of continents, was promoted in the 1970s but did not catch on widely.

Maps are also used as propaganda tools, distorting certain features or pushing particular messages. The exhibition offers many examples, including motivational second-world-war maps, Vietnam-war-era protest maps and depictions of environmental pollution and tax havens.

In the past few decades the digital revolution has utterly transformed mapmaking. Instead of being frozen in time, maps can now capture and reflect the constant change taking place in the real world. Thanks to Google Earth, every smartphone owner has the world at his fingertips, and will automatically find himself at the centre of it. The GPS system will make sure he never (well, hardly ever) gets lost.

Mr Harper thinks the next big thing in maps will be virtual reality. But despite all this extraordinary technological change, he reckons there will always be a space for traditional mapmaking techniques. ■



地图

做个X标记

伦敦的一个新展览透过地图回首20世纪

现代制图学始于16世纪，彼时是作为统治者的一种权力工具而存在。尽管20世纪有战争、革命、动荡和仓促的技术变革，但正是这个时候，地图真正开始为大众所用。在富裕国家，全民教育几近普及而且学校里教授地理课，这确保了大多数人能看懂地图。两次世界大战期间需要制作出数以百万计的地图。同时在平民生活中，汽车的普及和财富的增加让更多人可以旅行，扩大了私人市场。制图技术也突飞猛进，从陆地测量发展到了航空摄影和全球定位系统（GPS）。

从现在到明年3月，名为“地图与20世纪：划分界线”（Maps and the 20th Century: Drawing the Line）的新展览将在伦敦大英图书馆举办，透过地图来审视过去100年的历史。该展览考量了地图在战争与和平时期的作用、在日常生活中的角色、其经济影响（特别是在上世纪末的影响）以及地图越来越高的动态质量。参展的200幅地图中，许多都出自大英图书馆本身令人瞩目的400万幅地图藏品。

展品种类之多令人咋舌：详细的一战战壕地图（带有“遭猛烈炮轰”和“到处都是死人”等注解）；制成连衣裙的丝质二战逃生地图；哈利·贝克（Harry Beck）那幅著名的、最终于1933年出版的伦敦地铁早期草图；美国海军为确定其核潜艇的隐藏地点，曾委托他人研究过大西洋海底，据此制作的一幅引人入胜的地图此次也被展出（如图）；此外还有1968年阿波罗登月任务期间拍摄的令人惊叹的地球照片。

地图总得有用，而且大多数人认为它们是现实的客观体现。但“地图不是无辜的旁观者”，展览的主要策划者汤姆·哈伯（Tom Harper）说，“它们有助于塑造人们的观念。”

这开始于技术要点，例如将三维世界变成二维地图的投影法。大多数的世

界地图（包括谷歌地图）都采用佛兰德制图师赫拉尔杜斯·墨卡托（Gerardus Mercator）于1569年发明的投影法的一种变式。这种方法便于航行，但夸大了大多数发达国家所在的温带地区的表观尺寸。另一种方法现在被称为高尔-彼得斯投影，它能正确反映出大陆的相对大小，在20世纪70年代得到推广，但并未广泛流行。

地图也被用作宣传工具，会扭曲某些特点或者宣传特定的信息。展览提供了许多例子，包括激励士气的二战地图、越南战争时期的抗议地图以及展示环境污染和避税天堂的地图。

在过去几十年里，数字革命已经彻底改变了地图的制作。如今地图不再被冻结在时间里，而是可以捕捉和反映现实世界中不断的变化。由于有了谷歌地球，对于每位智能手机用户而言，世界都随手可及，而且能自动把自己置于世界中心。GPS将会让人们不再（嗯，几乎不再）迷路。

哈伯认为，地图界的下一件大事将会是虚拟现实。尽管有这样非凡的技术变革，但他认为传统制图技术还是会占有一席之地。■



Facebook's woes

The Mark of the social beast

Fake news items are not the only problem facing the social network

“MARK ZUCKERBERG, dead at 32, denies Facebook has problem with fake news.” The satirical headline, which made the rounds online last month, nicely encapsulates the most recent woes of the world’s largest social network: its algorithms, critics say, filled users’ newsfeeds with misinformation—and in the process influenced the American election result. But this is not the only problem the firm is grappling with. A volatile share price, privacy policies and advertising metrics have also kept Mr Zuckerberg (pictured) busy.

“News” that the Pope had endorsed Donald Trump or that a pizzeria in Washington, DC, is the home base of a child-abuse ring led by Hillary Clinton, were not confined to Facebook (nor were fake stories only a right-wing phenomenon). They often originate elsewhere, for instance on fake-news websites in Macedonia, which make good money via online ads, and on Twitter. But Facebook’s algorithms give prominence to such misinformation. They are tuned to maximise “engagement”, meaning they present users with the type of content that has already piqued their interest, as outrageous headlines tend to do.

Yet despite all the attention given to fake news, the other problems probably have Mr Zuckerberg just as worried. On November 18th, to the surprise of many, Facebook announced that it would buy back up to \$6bn of its shares. That seemed to be in reaction to a 10% drop in its share price since it warned earlier in the month that growth next year would be slower and margins lower, as ad space on its services gets tighter and it invests heavily in data centres. The buy-back signals that Facebook considers its shares undervalued, says Mark Mahaney of RBC Capital, an investment

bank.

A couple of days earlier, Facebook had to admit flaws in how it measures its traffic (for the second time in just a few weeks, after disclosing that it had overestimated the average viewing time for its video ads). This time it said that other numbers, including the quantity of clicks from Facebook posts to apps or websites, were smaller than previously stated. Although this did not lead advertisers to overpay, they are likely to make new demands of Facebook, for instance to provide more data about exactly how its ads are viewed.

It has also emerged that Facebook has “paused” the ongoing process of merging its data with those of WhatsApp, the messaging app it bought in 2014 for \$19bn in shares. When the takeover was announced, Jan Koum, WhatsApp’s founder, promised users their data would stay apart. In August Facebook reneged on the pledge, which upset various privacy watchdogs in Europe. In September the city of Hamburg’s data-protection commissioner issued an order that stops Facebook collecting data from German users of WhatsApp.

Whether all this will have a discernible impact on Facebook’s finances is a matter of debate among analysts. If advertisers have extra money to spend they do it where they get most bang for their buck, which, Google aside, is Facebook, says Peter Stabler of Wells Fargo Securities. In contrast, Brian Wieser of Pivotal Research recently wrote that the focus on fake news and the concerns over the measurement of advertising could well cut revenue growth by a couple of percentage points.

Whatever happens, Facebook’s heft ensures that it will remain in the firing-line. It has nearly 1.8bn monthly users, or about half of the internet population, and it serves up much of what people read online. Whereas Google dominates the market for ads related to online search, Facebook

rules the one based on consumers' online profiles. Together both firms accounted for all new online ad spending this year, according to Mr Wieser.

With immense size comes intense scrutiny. Yet it is not clear whether Mr Zuckerberg fully grasps this. When first asked about the role of fake news in the American election campaign, he said it was a "pretty crazy idea" to think Facebook had an impact on voters. Only when Google said last month that it would bar fake-news sites from using its ad services, did it take the same step.

In a blog post on November 19th Mr Zuckerberg both set out how the social network would deal with the problem and insisted that Facebook itself does not want to decide whether something is fake or not. But it emerged a few days later that Facebook has already developed a censorship tool, to be used in China should the firm be allowed back into the country, underlining that it knows precisely how to filter its content when it wants to.

Some of these issues are easier to deal with than others. It should be straightforward enough to deal with any suggestion that Facebook is tricking advertisers. Answering the accusation that it is hurting democracy and violating people's privacy raises far harder problems. In America almost half of adults now get their political news on Facebook. No other online firm, not even Google, has more data about consumers. More transparency would improve things across the board. So would an acceptance by Mr Zuckerberg of just what a heavy responsibility he now bears. ■



Facebook的麻烦

社交巨兽的污点

虚假新闻并非社交网络面临的唯一问题

“马克·扎克伯格去世，享年32岁。他否认Facebook存在假新闻这一问题。”上月这条在网络上广为流传的新闻头条颇具讽刺意味，却也确切概括了这家世界上最大的社交媒体近期所遇到的麻烦：有批评者指出，其算法令用户的新闻推送中充斥虚假信息，甚至还影响了美国大选结果。但这并不是公司唯一正忙于应对的问题。让扎克伯格（见图）焦头烂额的还有公司波动的股价、隐私政策以及广告效果的评估。

“教皇支持特朗普”，“希拉里领导着一个虐童组织，大本营在华盛顿特区一家披萨店”——这类“新闻”其实并非Facebook独有（不实的传言也并非只是一种右翼现象）。它们的源头往往都在别处，例如位于马其顿的一个假新闻网站（这种网站通过在线广告赚取大把钞票），或者是推特。但Facebook的算法会优先显示这类虚假信息。其算法要实现的是“参与度”最大化，这就意味着算法向用户提供的内容就是之前已勾起他们兴趣的那类——正如耸人听闻的新闻头条常常会做的那样。

尽管假新闻已引起了广泛的关注，其他一些问题似乎也同样令扎克伯格担忧。11月18日，Facebook宣布将回购最高达60亿美元的公司股份，这令很多人甚为惊讶。11月早些时候，因广告投放量驱向饱和，以及公司对数据中心大手笔的投资，Facebook发出了下一年增长将放缓、利润会降低的预警。这之后，公司股价下跌了10%。回购股票之举看起来像是对这种局面的回应。投行RBC Capital的马克·马哈尼（Mark Mahaney）认为，Facebook此举也许表示，公司自认为其股价估值过低。

在这几天前，Facebook不得不承认其流量测算方法存在缺陷。这已是Facebook在几周内第二次承认存在这一问题，之前它曾披露自己高估了视频广告的平均观看时长。这一次它坦言，从Facebook帖子到应用或网站的点击量等其他数字也比先前声称的要小。尽管这并没有导致广告主多掏腰

包，但他们之后很可能会向Facebook提出新的要求，例如提供更多关于广告观看情况究竟如何的数据。

此外，Facebook还已“暂停”将其数据与WhatsApp的数据合并。2014年，Facebook以190亿美元（包含股票）收购了通讯应用WhatsApp。当初这起收购被公布时，WhatsApp创始人简·库姆（Jan Koum）曾向用户许诺，该应用与Facebook的数据将保持分离。而在8月，Facebook却违背了这项承诺，并因此引起了欧洲各地隐私保护机构的不满。9月，汉堡市的数据保护专员命其停止收集WhatsApp德国用户的数据。

至于以上种种会不会对Facebook的财务状况产生明显的影响，分析人士们则莫衷一是。富国证券（Wells Fargo Securities）的彼得·斯塔普勒（Peter Stabler）认为，如果广告主有闲钱，他们会更愿意把钱花在能带来最大收益的地方，而这种地方除了谷歌，就是Facebook了。相比之下，Pivotal Research的布莱恩·威瑟（Brian Wieser）近日则撰文指出，假新闻所引发的关注以及广告效果测量引起的担忧很可能会令Facebook的营收增长率降低两三个百分点。

不管发生的会是哪种情形，Facebook的影响力必然会令其遭受持续的批评。它的月活跃用户将近18亿，大约相当于整个互联网用户数的一半。人们在线阅读的内容有相当一部分是由Facebook提供。谷歌主导了与在线搜索相关的广告市场，而Facebook则支配着基于消费者在线资料的广告市场。按照威瑟的说法，这两家公司包揽了今年所有的新增在线广告支出。

巨大的规模必然会引致严格的审视，但扎克伯格是不是完全领会了这一点，目前还不太好说。一开始被问及假新闻在美国总统竞选活动中所扮演的角色时，他说，认为Facebook会影响到选民是个“非常离谱的想法”。直到上月谷歌宣布将阻止假新闻网站使用其广告服务时，Facebook才采取了同样的措施。

在11月19日的一篇博文中，扎克伯格既阐述了Facebook将如何应对假新闻这一问题，但也坚称Facebook本身并不想去裁定某件事是真是假。但几天

后的情形表明，Facebook已经开发了一款审查工具，如果公司获准重返中国，这一工具将会在该国使用。这显示，Facebook完全了解该如何过滤其内容——只要它想这么做。

以上种种问题中，某些会比其他的更容易应对一些。在面对有关蒙骗广告主的质疑时，解决方法应该很简单直接。但要回应损害民主、侵犯人们隐私权的指控，要面对的问题则要严峻得多。在美国，如今几乎有一半的成年人都是从Facebook上获取政治新闻。没有哪家互联网公司（甚至包括谷歌在内）拥有的消费者资料会比Facebook更多。更高的透明度会全面改善状况。如果扎克伯格肯承认自己如今责任重大，也会达到同样的效果。■



Companies' dark pasts

Ghosts in the machine

A Dutch case suggests firms should face up to horrible stains on their history

“WE THOUGHT we knew our story, and we knew it wasn’t great,” says Maurice Brenninkmeijer, chairman of COFRA Holding, which owns C&A, a 175-year-old Dutch clothing retailer with over 2,000 stores globally. Yet the full account of how the German branch of his family behaved in the second world war “tore through your heart when you heard it”, he adds. Mr Brenninkmeijer’s ancestors—considered to be genial, virtuous, Catholic and reserved—turned out to have been avid Nazi collaborators. Old letters revealed cosy, corrupt, ties to Hermann Goering. From 1942 onwards C&A and Siemens, a German engineering firm, together exploited forced Eastern European labourers in Germany, keeping them in such a wretched state that malnutrition killed several women and children. C&A profited from “Aryanisation”, grabbing business and property from terrified Jewish owners. Perhaps worst, it used Jewish tailors and leather-workers, corralled in Lodz, a dreadful ghetto in Poland. Of some 200,000 people trapped in inhumane conditions there, only 1,000 survived to liberation.

Such grim details are now public thanks to Mark Spoerer, a historian in Regensburg who specialises in archival research to assess companies’ dark pasts, putting “immoral business behaviour” into historical context. Remarkably, his new book “C&A: A family business in Germany, the Netherlands and the United Kingdom 1911-1961”, was commissioned by the notoriously reclusive family. Mr Spoerer, over five years and with generous funds, was given unrestricted access to private files, conducted interviews freely and had the right to publish all he found.

Being low-profile went from being something worthy, to something strange, and now suspect, says Mr Brenninkmeijer, in a rare interview.

Though some relatives were said to be reluctant to confront old horrors, he says all now agree on the need for a sort of corporate therapy, “so we have an understanding of our history, not as a burden but as a platform”. This, he says, helps the family get a deeper sense of itself. A core of 30 family members are active owners and managers of the firm; around 1,300 Brenninkmeijers form an outer circle.

It is rare for a company to confront an ugly past so openly, especially as C&A faced no looming pressure from victims’ relatives, journalists or other outsiders. Firms are most likely to do so if they have a strong international presence and deal directly with consumers, says Mr Spoerer. Another corporate historian, Lutz Budrass, assessed 100 companies that thrived in Germany in 1938 and still exist in some form today. He suggests that only 30 have yet organised a serious scholarly assessment of their wartime activities, while 40 have done nothing at all, including five companies which, he says, “were very heavily involved” in Nazi crimes.

He points to Deutsche Post, a successor of Reichspost, and much of the German steel industry as particularly hostile to the idea of exploring their pasts. Siemens has made only partial efforts to assess its wartime role. In the car industry, Volkswagen, BMW and Daimler have owned up to their intimately close associations with Nazis, but other firms have not. Mr Budrass is especially dismissive of German aircraft companies. He was commissioned in 2002 by Lufthansa to write part of its 75th anniversary, especially in explaining its use of 8,000 forced labourers in 1944. But the firm refused to publish it, acceding only this year once Mr Budrass brought out a separate book on the airline’s past. He also argues that Airbus, the European aircraft-manufacturing group which incorporated old entities including Messerschmitt (one of the largest users of concentration-camp labour), is “trapped by fear of its past” in failing to commission a proper history.

| *How cleansing is the sunshine?*

Perhaps it is not irrational for firms to shy away from difficult memories. And German firms are more transparent than most. Some 6,000 companies and the German state contributed to a €5.1bn (\$4.5bn) fund created in 2000 to compensate victims of forced labour. By contrast, it took until 2014 for foreign relatives of holocaust victims transported by SNCF, the French railway, to be allowed to seek compensation from the state. Many Japanese firms can trace their histories back to wartime exploits, including the use of slave labour, but are far less likely to assess what went on than German ones. Similarly it is rare for American financial firms to admit to profiting from businesses related to slavery in the mid-19th century, as Aetna and JPMorgan Chase have. Nor is there any serious discussion to suggest firms which made money in apartheid South Africa should today offer compensation.

Mr Brenninkmeijer and the historians say that understanding the past brings deeper strengths—virtues that can help the business today. Finding out the whole story can be liberating and “helps you understand who you are”, he says. The boss of C&A is preparing for members of the sixth generation of his family to run the private firm and wants them to learn how to hold serious discussions of ethical dilemmas, citing as an example his own worry over the firm’s high consumer-credit charges in Brazil in the early 1990s.

He argues, too, that managers must give more thought to their supply chain, as in Bangladesh where 30% of the firm’s goods are made, and consider how best to assess whether child labour or dangerous conditions exist; in 2012 a fire in a Dhaka factory supplying Western firms, including C&A, killed 117 people. If Mr Brenninkmeijer is right, then instead of worrying about skeletons in the cupboard, a firm that squarely faces up to its yesterdays should learn how to behave better today. ■



企业的黑历史

机器中的鬼魅

一宗荷兰的案例显示，有可怕历史污点的企业最好坦然承认

“我们曾以为我们了解自己的过去，也明白那是一段不光彩的历史。”科弗拉控股公司（COFRA Holding）的董事长莫里斯·布伦宁克梅耶尔（Maurice Brenninkmeijer）说道。该公司旗下的荷兰服装零售品牌C&A有174年的历史，全球门店超过2000家。但详尽了解了其家族德国分支在二战时的所作所为后，他补充道：“听完感觉痛心疾首。”布伦宁克梅耶尔的祖辈本来被认为是和蔼正派、保守内敛的天主教徒，如今却被发现实际上曾是狂热的纳粹党羽。旧时信件显示该家族与赫尔曼·戈林（Hermann Goering）关系密切，存在腐败交易。自1942年起，C&A和德国工程公司西门子一同剥削奴役在德国的东欧劳工，强迫他们在恶劣的条件下工作，导致数名妇孺因营养不良丧命。C&A通过“雅利安化”牟利，侵吞备受惊吓的犹太人的家业财产。最糟糕的也许是，当时大批犹太裁缝和皮革工人被集中赶去罗兹（Lodz，波兰一处凄惨可怕的犹太人隔离区）生活，C&A曾利用这些工人进行生产。约20万人陷于这种惨无人道的环境，到被解救时，只有1000人幸存了下来。

这些恐怖细节如今得以公开要归功于雷根斯堡（Regensburg）的历史学家马克·斯波雷尔（Mark Spoerer）。他专门从事档案研究，窥探企业的黑历史，将“不道德商业行为”置于历史背景下进行讨论。值得注意的是，他的新书《C&A：横跨德国、荷兰、英国的家族企业在1911年至1961年的故事》（C&A: A family business in Germany, the Netherlands and the United Kingdom 1911-1961）正是受这一出名低调的家族委托而撰写的。五年来，斯波雷尔获得了充裕的资金，还可以不受限制地查阅私密文件、自由地进行访谈，并有权发表所有发现。

布伦宁克梅耶尔在少有的一次接受采访时说，家族的低调姿态最初曾被视为难能可贵，后来却让人觉得古怪，现在甚至变得令人生疑。据说部分亲属之前并不愿重提可怖旧事，但他表示，现在家族一致认为企业需要某种

形式的心理治疗。“藉此，我们可以了解自己企业的历史，明白它们并非一种负担，而是一个平台。”他认为，这有助家族更深刻地认识自我。家族中有30名核心成员是该公司的活跃股东及管理人员，外围还另有1300名布伦宁克梅耶尔家族成员。

企业能如此公开直面黑历史实属罕见，尤其是在并无受害者亲属、记者或其他局外人对C&A施压的情况下。斯波雷尔表示，有着广泛的跨国经营并且直接与消费者打交道的公司最有可能这么做。另一位企业历史学家卢茨·布德拉斯（Lutz Budrass）评估了德国100家在1938年发展兴旺、且目前仍以某种形式存续的公司。他发现，其中只有30家公司对自己战时的所做所为组织了严肃的学术评估，有40家公司则毫无行动，包括他认为对纳粹罪行“参与甚深”的五家公司。

他指出，前身为纳粹德意志帝国邮政（Reichspost）的德国邮政

（Deutsche Post），以及大部分德国钢铁企业，对探究自己昔日所为这一主张尤为抗拒。西门子倒是对自己的战时角色进行了评估，但做得仍很不充分。在汽车行业，大众、宝马及戴姆勒已承认曾与纳粹关系密切，其他公司则仍未表态。布德拉斯对德国航企的表现尤为不齿。2002年，作为纪念公司成立75年周年的一部分，汉莎航空委托他撰写公司的回顾报告，并着力解释汉莎在1944年使用8000名强迫劳动力的历史。但公司最后拒绝发表该报告。后来布德拉斯就该航空公司的历史出版了另一本书，汉莎才终于在今年同意发表之前的报告。布德拉斯还认为，并购了包括梅塞施密特公司（Messerschmitt，德国飞机制造商，曾大量使用集中营劳工的厂商之一）在内的一些旧厂商的欧洲飞机制造集团空中客车，因为没有委托专家助其正视历史，反而“陷于对昔日所做所为的恐惧”。

| 阳光洗白，效果如何？

企业逃避难堪的回忆也许不无理由。德国公司的透明度也比世界绝大多数企业都要高。约6000家公司以及德国政府已向一个2000年创立的基金捐资51亿欧元（45亿美元），用以补偿强迫劳动受害者。相比之下，至于那些法国国家铁路公司（SNCF）运送的大屠杀受害者，直至2014年，其外国亲属才得以向法国政府申请赔偿。许多日本公司的历史也可追溯至战时

的剥削行径，包括使用奴役劳工，但它们远没有德国公司那样积极审视当年所为。同样地，美国的金融机构也少有像安泰保险（Aetna）和摩根大通那样，承认自己在19世纪中期从参与奴隶生意的企业中牟利。关于在南非利用种族隔离政策赚钱的企业如今应否作出赔偿，也并无任何严肃的讨论。

布伦宁克梅耶尔及文中提及的多位历史学家均表示，了解过去能带来更深层次的优势，有助企业发展今天的业务。他认为，全面了解过往可以令人释怀，“帮助你了解自己是谁”。这位C&A的老板正准备让家族第六代接手管理该私营企业，并希望他们学习如何就伦理困境展开严肃的探讨。作为例子，他提及自己就对上世纪90年代初公司在巴西提供高息消费信贷存有疑虑。

他还认为，管理者必须更仔细地审视供应链，比如，该公司有30%货物在孟加拉生产；还要考虑如何最好地确认是否存在童工或危险情况。2012年在达卡，向C&A等西方公司供货的一家工厂发生火灾，造成117人死亡。假如布伦宁克梅耶尔是对的，直面黑历史的企业今天应该探求如何更好表现，而不是担心家丑外扬。■



The American economy

Full speed a-Fed

The Federal Reserve spent 2016 deferring rate rises. It might now speed them up

AMERICA'S central bank tries to be predictable. When in December 2015 it raised interest rates for the first time since 2006, nobody was much surprised. The central bank had telegraphed its intentions to a tee. Similarly, if the overwhelming consensus in financial markets is to be believed, on December 14th—almost exactly a year later—rates will rise again, to a target range of 0.5-0.75%. Donald Trump's tweets and phone calls may upend trade, fiscal and foreign policy in a matter of minutes, but Janet Yellen, the Federal Reserve's chairwoman (pictured), is tweaking monetary policy at only a cautious annual pace.

Yet in another sense, the Fed has confounded predictions—at least, those it made itself. A year ago the median rate-setter foresaw four rate rises in 2016. None has happened yet. This might seem like a straightforward reaction to events. At the start of the year, stockmarkets sagged on worries about Chinese growth. Then, in June, Britain voted to leave the European Union, sending markets spinning again for a while. But the delay also resulted from a gradual acceptance by Fed officials that low rates have become a longer-lasting feature of the economy. In September most rate-setters expected rates eventually to settle below 3%. This is down from 3.5% at the time of “lift-off” a year ago. Since June Ms Yellen has been saying that low rates are only “modestly” juicing the economy.

Now, though, the Fed is ready to move again. A look at the labour market reveals why. A year ago unemployment was already low at 5%. Since then the economy has created an average of 188,000 jobs per month. At first this helped the labour-force participation of prime-age workers, which fell worryingly after the crisis, to surge. It rose from a trough of 80.6% in

September 2015 to 81.6% by October 2016, a spurt faster than any since 1985. Swelling numbers of jobseekers kept unemployment roughly steady despite robust job growth.

In November, however, participation fell slightly. As a result, job creation is once again pushing unemployment down. It now stands at 4.6%, the lowest rate recorded since August 2007. That is below its long-run sustainable level, according to at least 13 of 16 Fed rate-setters who penned forecasts in September.

Hawks argue that participation has reached its limit, so little slack remains in the labour market. Other thermometers are popping. It now takes 28 days to fill a vacancy, up from 23 days in 2006, notes Torsten Slok of Deutsche Bank. Firms small and large list hiring difficulties among their top concerns. For all the fanfare over Mr Trump's agenda to protect jobs from outsourcing, fewer workers were laid off or fired in September than in any month since data started being collected in 2000.

Doves reckon this is mostly a mirage. Prime-age participation has climbed only a third of the way back to its pre-recession level. Even among those in work, there are still an unusually high number of part-timers who want full-time work.

The ultimate arbiter of this debate is wage and price inflation. If the economy is running hot, both should pick up. As it is, hourly wages are only about 2.5% higher than a year ago. But researchers at the San Francisco Fed have suggested that a slew of retirements by baby-boomers on fat salaries is dragging this average down. Measures purged of this problem show the median hourly pay rise running at fully 3.9%, almost as generous as in 2007 (see chart 1).

As for inflation, it is not yet back at the Fed's 2% target. But it is getting

closer. Excluding food and energy, prices are 1.7% higher than a year ago, according to the Fed's preferred measure, up from 1.4% at the end of last year. Doves console themselves that even after rates rise, monetary policy will remain unusually loose for this point in the economic cycle. That partly reflects the asymmetry of risks before the Fed. Should an some unforeseen shock rattle the economy, there will be little room to cut rates to offset it. This, as Ms Yellen often acknowledges, justifies keeping rates lower than they otherwise would be.

Inflation risk, though, is starting to tilt upwards. Congress will probably cut taxes next year. Higher rates may be needed to stop any fiscal stimulus becoming inflationary. Since the election, markets' inflation expectations have continued on an upward trend that began in September. But Treasury-bond yields, which in large part reflect traders' expectations for Fed policy, have risen dramatically (see chart 2). Rising oil prices and the prospect of Mr Trump's imposing import tariffs also play a role. Both would crimp growth, but would do so in part by pushing prices up.

Surging bond yields and a stronger dollar are already squeezing the economy. So carefully has Ms Yellen managed expectations that a rate rise now will not exacerbate those trends. What would do so would be any hint that the Fed may bring subsequent rate rises forward, not push them back. For the first time in years, that does not look out of the question. ■



美国经济

美联储全速前进

美联储在2016年一直推迟加息，现在有可能会加快加息的步伐

美联储试图让自己变得可被预见。2015年12月，它自2006年以来首次提高利率，没有人感到特别意外。美联储事先已经将其意图全部表露无余。同样，如果金融市场上压倒一切的共识可信的话，在近一年后的12月14日，利率将再次上调，提升至0.5%至0.75%的目标区间。特朗普的推特和电话可能在短短几分钟内就会颠覆贸易、财政和外交政策，但是美联储主席耶伦（见图）谨慎调节货币政策的步伐可是一年才有一次。

但在另一种意义上，美联储还是让预测落了空——至少是美联储自己所做的那些预测。一年前，美联储公开市场委员会过半委员预计2016年会有四次加息，但目前为止一次都还没有进行。这似乎是对一系列事件的直接反应。年初，对中国经济增长的担忧让美国股市下跌。6月，英国公投决定脱离欧盟，让市场再次波动了一段时间。但拖延加息还有一个原因，即美联储官员逐渐接受了一个现实：低利率已成为经济发展一个更长期的特征。9月，大多数委员都预计利率最终将设定在3%以下。而一年前“看涨”之时，预期还是3.5%。自6月以来，耶伦一直说低利率只是“温和地”刺激经济。

然而现在美联储准备好再次调息。劳动力市场的变化能为我们揭示个中原因。一年前，失业率已经低至5%。从那以后，美国经济平均每月创造18.8万个工作岗位。起初，这促使核心年龄工人的劳动力参与率大幅增加（金融危机之后这一比率的跌幅令人担忧）。劳动参与率从2015年9月80.6%的低点上升到2016年10月的81.6%，比1985年以来任何一次上升的势头都要强劲。尽管工作岗位数稳健增长，不断增加的求职人数仍让失业率基本维持不变。

然而，11月份的劳动参与率略有下降。结果，职位增加再次推低了失业率，目前仅为4.6%，是自2007年8月以来录得的最低水平。美联储公开市

场委员会的16位委员于9月发布了预测，其中至少13位认为这样的失业率低于其长期可持续水平。

鹰派人士认为劳动参与率已经达到极限，所以劳动力市场上再没什么空间可压缩了。市场上涌现出许多其他参考数据。德意志银行的托斯腾·斯洛克（Torsten Slok）表示，现在要填补一个岗位空缺需要28天时间，2006年只需23天。公司不论大小，都将招聘困难列入其首要问题之中。特朗普大张旗鼓地宣传自己保护就业岗位、使之不因外包而流失的执政目标，9月被裁员或辞退的工人数比2000年开始收集相关数据以来的任何一个月都少。

鸽派人士认为这些多半都是幻象。虽然核心劳动力参与率攀升，但和经济衰退前水平的差距仅缩小了三分之一。即使在参与就业的人中，希望能全职工作的兼职员工数仍然异乎寻常的高。

最终决定双方争论胜负的是工资增长和通货膨胀。如果经济运行趋热，两者都应上升。就目前来说，平均时薪仅比一年前高出约2.5%。不过旧金山联储的研究人员指出，大批婴儿潮一代高薪人员的退休拉低了这一平均水平。剔除这个因素后的计算显示，中位数的时薪增长率高达3.9%，几乎与2007年时的增长一样（见图表1）。

至于通胀，目前尚未回到美联储2%的目标水平，但也越来越近了。美联储首选的计算方法显示，不包括食物和能源在内的物价比一年前高了1.7%，而去年年底的升幅为1.4%。鸽派安慰自己的说法是，即使在利率上升后，货币政策在经济周期目前这个节点上仍将异常宽松，部分反映出美联储面临的风险不对称。如果一些不可预见的冲击性事件干扰美国经济，便没有什么空间来削减利率以抵消不良影响。如耶伦经常承认的那样，这让联储有理由将利率保持在较低水平。

然而，通货膨胀的风险开始上升，国会可能在明年减税，可能需要更高的利率来避免任何财政刺激导致通货膨胀。市场的通胀预期从9月开始上升，美国大选以来，继续呈上升趋势。但国债收益率却大幅上升（见图表

2)，这一数字在很大程度上反映了交易员对美联储政策的预期。油价上涨和特朗普可能征收进口关税的前景也起了一定作用，两者都会限制增长，但部分是通过推高物价起到抑制作用。

债券收益率大幅上扬和美元走强已经挤压了经济。耶伦一直非常谨慎地管理着预期，即使现在加息也不会加剧这些趋势。而有可能会加剧这些趋势的是美联储会把后续加息提前而非推后的任何暗示。多年来，这种情况第一次看起来并非全无可能。 ■



America's foreign debts

Net debt, big returns

The exorbitant privilege looks greater than ever

AS DONALD TRUMP sees it, America's trade deficit is a sign of economic weakness, proof that lousy trade deals have sent production overseas. But Uncle Sam does not just import goods from the rest of the world and send nothing in return (though that would be a lucrative arrangement). Rather, the net inflow of goods is matched by a net outflow of stocks, bonds and other financial assets.

That makes America a debtor. In theory the interest and dividends paid to foreigners should chip away at national wealth in future. Since 1989 foreigners have owned more assets in America than Americans have owned overseas; in the jargon, the net international investment position (NIIP) has been negative. But America is an unusual borrower. For almost all of that time, it has received more income on its overseas investments than it has paid out to foreigners. This is strange: it is akin to someone's savings earning more than enough interest to service his far bigger debts.

This contrast is getting starker (see chart). In recent years the NIIP has tumbled to -44% of GDP, the lowest since 1976, when the data begin. Yet net primary income—the returns—has held steady at about 1% of GDP. In dollar terms, America's NIIP deficit is almost seven times as big as any other country's. As a percentage of GDP, 11 rich countries have worse NIIPs; only one—Greece—earns net positive returns (probably thanks to its bail-outs).

The disparity between America's balance-sheet and its earnings is sometimes attributed to the "exorbitant privilege" of printing the dollar, the world's reserve currency. Everyone wants dollars, it is said, so America can raise funds more cheaply than others. Two other factors help. First,

foreigners like to buy low-yielding American debt, but Americans investing overseas are keener on higher-yielding equities. Second, America seems to earn more on some of its investments of a given type.

A paper last year by Stephanie Curcuru and Charles Thomas of the Federal Reserve argues that the second effect is by far the most important. Between 1990 and 2010 the average yield America received on its foreign direct investments (FDI) was about 6.2 percentage points higher than what it paid out on comparable liabilities. The authors attribute this mainly to the greater risk of investing overseas and to America's high corporate taxes, rather than to any mysterious benefit attached to issuing the world's reserve currency.

But that does not help to explain the recent widening of the gap between the NIIP and net returns. The current-account deficit, which includes the trade deficit, is only partly to blame for the worsening balance-sheet. At 2.6% of GDP in 2015, it was less than half what it was in 2006. The NIIP is being pushed higher because of the strong dollar (which reduces the dollar value of American overseas investments) and the rapid rise in American share prices, says the IMF; it forecasts that the NIIP will reach -63% of GDP by 2021. So, because the economy has performed strongly, foreign investors in America have booked bigger paper gains than Americans invested overseas, despite generating less income. Sometimes privilege isn't all its cracked up to be. ■



美国外债

净负债，高回报

过度特权看起来空前放大

正如特朗普之见，美国的贸易赤字是经济疲软的信号，也证明差劲的贸易协议导致了美国制造业的外流。但山姆大叔并非只从世界各地进口货物而未作任何输出（尽管这么做会是利润丰厚的安排）。相反，堪比货物的净流入，美国股票、债券及其他金融资产有相当程度的净流出。

这使美国成为债务人。理论上，向外国人支付的利息及红利可能会损耗国家未来的财富。自1989年以来，外国人所持的美国资产一直高于美国人所持的海外资产。以金融术语来说，美国的净国际投资头寸（NIIP）一直为负值。但美国并不是一般的借款人。上述期间的几乎大部分时间内，美国的海外投资收入均高于其对外国人的利息支出。这一点很不平常：这相当于说某人虽然负债远超存款，储蓄收入却还足以偿还债务利息。

这种反差正越来越严重（见图表）。近年来，美国的NIIP已跌至GDP的-44%，是自1976年该数据有记录以来的最低值。但净初次收入（投资回报）一直稳定在GDP的1%左右。按美元计算，美国的NIIP赤字几乎是其他任何国家的七倍。从GDP占比来看，有11个富裕国家的NIIP赤字比美国更严重，仅希腊取得了净正收益（可能是得益于纾困措施）。

美国的资产负债表与其收益之间的差距有时被归因于其拥有印发美元（世界储备货币）这一“过度特权”。据说人人都想拥有美元，美国因此就能以比其他国家更低廉的成本融资。此外还有两个原因。首先，外国人喜欢购入低收益的美国债券，但美国人投资海外时则热衷高收益的股票。第二，美国似乎在某类型的投资中获利更多。

去年，美联储的斯蒂芬妮·柯卡鲁（Stephanie Curcuru）和查尔斯·托马斯（Charles Thomas）发表文章指出，上述第二个效应最为重要。在1990年至2010年间，美国从海外直接投资（FDI）获取的平均收益比其向可比

负债支付的利息高出约6.2个百分点。两位作者认为，原因主要是投资海外风险更高以及美国企业高昂的所得税，而非因发行世界储备货币而带来的什么神秘好处。

但这无助于解释最近美国NIIP与净收益之间差距日渐扩大的现象。包含贸易赤字在内的经常项目赤字只是导致资产负债表恶化的原因之一。2015年，美国经常项目赤字为GDP的2.6%，不到2006年时的一半。国际货币基金组织（IMF）表示，目前因美元强势（令美国海外投资的美元价值下降），加上美国股票价格迅速攀升，NIIP被推高；IMF预测，到2021年，NIIP将达到GDP的-63%。由于美国经济表现强劲，投资美国的外国人比投资海外的美国投资者获得了更高的账面收益，尽管产生的收入有所减少。有时候，特权之名其实难副。 ■



Investment banking

Rebooting

Both revered and reviled, Goldman Sachs struggles to stay relevant

JUST outside Stanford University's campus sits the headquarters of Symphony, one of the myriad tech companies that sprout like weeds in Silicon Valley. After a lunch break exercising in a nearby park, a dozen fit-looking employees, still in workout clothes, help themselves from buckets of fruit, energy bars and the food of the day (Indian), before plopping themselves in front of monitors in an airy room bathed in natural light. For the sought-after engineers making up most of the company's 200-strong workforce, this sort of environment is the norm. Work is supposed to be healthy and relaxed—a far cry from the terrors of a New York bank with its incessant pressure to sell and complex internal politics, not to mention often unappetising, pricey food.

Across the continent, in a newly opened tower within the World Trade Centre, Kensho, a three-year-old company, has a similar feel. Like Symphony but a bit smaller, it is stuffed with talented engineers. In a New York approximation of the West Coast, it boasts “vertical gardens”—rectangular patches of vegetation like framed paintings—and a pool table.

Symphony is a messaging platform, owned by a consortium of investment firms. It offers a critical function at present almost monopolised by Bloomberg: the seamless incorporation of data and communication that makes the terminal the most important conduit in finance since Wall Street went from thoroughfare to metaphor. Kensho screens vast amounts of information—speeches, earnings, earthquakes and on and on—to help investors find correlations among all these data that might move prices.

If the two companies succeed—a big if—their products could become pervasive. They are tiny entities with vast potential. And they are examples of technology firms backed and used by Goldman Sachs, a big investment bank, in its efforts to transform itself, and indeed its industry, at a time when its core business is being pummelled by technology and regulation.

In 2014 Goldman spun out a messaging technology developed internally as a new company, Symphony. Kensho was formed with backing from Goldman in 2013. Early on, the investment bank had a contractual right to be the sole user of its products among brokers. Goldman continues to be the only outside investor with voting rights on the company's board, but many other banks have taken stakes in it and are customers.

It is possible that these two companies will provide little benefit to Goldman. Cynics are entitled to wonder whether these and similar efforts are merely a way of putting a modern veneer on an old structure. Tech companies are fashionable and widely perceived as helpful; banks are unfashionable and seen as parasitic. The non-cynical take is that Goldman understands that answers to the challenges it faces will have to come, at least in part, from outside its mirrored-glass headquarters in downtown Manhattan. It may have many flaws; a failure to grasp corporate vulnerability is not among them.

Goldman, with its enormous influence, lavish compensation and alumni network in pivotal political roles looks anything but embattled. But the firm—derisively dubbed a “great vampire squid” by *Rolling Stone* magazine—is in the process of seeing its tentacles severed.

| *Lost prop*

Since 2009 revenues have dropped by a quarter; they remain below where they stood a decade ago (see chart). Even in a good quarter, such as the one just completed, its return on equity barely exceeds single digits. “Principal

transactions”, ie, proprietary trading and investments, produced \$25bn in revenues in 2009 and \$18bn in 2010 but only \$5bn in 2015. The decline is a result of new rules that limit these activities—and regulators threaten more.

Fixed income, commodities and currency (FICC), the once immensely lucrative niche that nurtured the careers of Goldman’s chief executive, Lloyd Blankfein, and its president, Gary Cohn, has also been hit hard. Revenues reached \$22bn in 2009. In the first three quarters of this year they totalled \$5.6bn.

Richard Bove, an analyst at Rafferty Capital Markets, concludes Goldman has just one superb business left among its distinct parts: its traditional niche of providing advice on important transactions, notably mergers. Goldman remains the global leader, despite having missed out on a role in the year’s biggest proposed deal—AT&T’s attempt to take over Time Warner. Even its M&A business is in some difficulty—as exemplified by its big cutbacks in Asia, where governments in China and elsewhere still favour local institutions. Goldman also has a good business in wealth-management, which thrives on sophisticated schmoozing and does not require much capital.

Its other businesses, which collectively still account for about 60% of revenues, face unrelenting pressure from regulatory and technological change. None of this is unique to Goldman. A recent survey of 35 global investment banks by the Boston Consulting Group implied a long-term, industry-wide contraction: over the past five years, revenues have declined by 20%, return on equity has slipped from an inadequate 9% to 6%, and almost every business area has shrunk, with the exception of the advisory work that represents only about one-tenth of the overall pie.

Regulators want investment banks to reduce risk, and to do so by cutting

out businesses that directly support their own returns as opposed to those of clients. That means they cannot hold large inventories of securities, must reduce proprietary trading and must take on ever more capital (diluting returns). They should, in short, be intermediaries.

But that intermediary role is also under attack. Big fixed-income investors say they can underwrite many debt offerings directly. Fewer companies want to issue public shares. New competition has emerged in the shape of more than 300 “fintech” companies, a broad term for entities using technology to do what existing banks do with more people and at higher cost.

| *Monetary stimulus*

So far-reaching are these changes that it is surprising bank revenues have not fallen further. The most common explanation is that repressed interest rates have stimulated many borrowers to refinance their debt more cheaply. If so the positive news will be transitory; the pressures will endure.

In deference to these trends, Goldman describes its strengths in terms of characteristics—superior contacts and execution—rather than specific franchises (which may be imperilled). That provides a framework for four intertwined strategies.

The first involves collaborative efforts or strategic investments that gave rise to Symphony, Kensho and a number of similar ventures. “Orbit”, for example, is a suite of smartphone apps Goldman developed that enable e-mailing, browsing and file-saving within an environment controlled by an employer (and thus accessible by a regulator). It was spun off last October to another publicly traded company, Synchronoss, in exchange for a minority stake. Such ventures are more valuable if used more broadly than just by Goldman. If it had retained control, potential customers might be unwilling to allow a competitor access to sensitive information.

The second prong is automation. Not all that long ago, 600 people worked on a vast floor trading shares. Traders yelled and phones were slammed (though perhaps with more decorum at blue-blooded Goldman than elsewhere). Obscured by the din were 66 distinct actions, many of them amenable to mechanisation. Now, Goldman has two people who trade equities and another 200 software engineers who work on systems that, in effect, do the job on their own. Traditional investment-banking is ripe for change as well. Goldman has mapped each of the 146 steps of an initial public offering in 51 charts that appear in proper sequence on a five-foot long roll-out. Costly, redundant steps are being cut or, once again, automated.

The next big change is in the bank's sources of funds and its lending. Goldman pays just under 5% interest on its long-term debt, the most stable component of its funding. Its competitors, JPMorgan Chase and Bank of America, pay a fraction of one per cent on trillions of dollars of government-insured deposits. It is not feasible for Goldman to open branches. Nor, these days, is it necessary. In April, it acquired GE's internet bank with \$16bn in savings accounts, on which it pays an average of 1% in annual interest.

On October 13th, as expected, it launched an online lending arm to match, named Marcus after the firm's founding Goldman. Clients will pay from 6% to 23% a year for loans of up to \$30,000, to be used to repay more expensive credit-card debt. The clients are those huddled masses previously not affluent enough to afford a human Goldman account-manager, but now, apparently, an attractive market for a Goldman machine.

And that leads to the fourth change—in how Goldman interacts with clients. Not long ago, it was almost entirely through phone-calls, e-mails, electronic orders and presentations delivered in person. Now, a client portal named "Marquee" gives access to tools such as Goldman's risk

analytics for trading shares or arranging hedges (named “Studio”) or for corporate clients to create strategies for executing large share buy-backs (“Athena”).

| *Behind the paywall*

Among the largest challenges for this effort at reinvention is how to charge. The old methods—large fees on deals, commissions on trades, extraction of spreads (often in opaque ways) between the price paid by buyers and that received by sellers, the use of information gained in transactions for proprietary trades—are somewhat compromised. Clients know too much and can do too much on their own. New methods are being considered, such as a fee based on the number of employees at a firm, or number of users, or some form of subscription-based remuneration.

The change in environment is accompanied by a change in the Goldman kind of person. One-quarter of its employees now have a background in some facet of technology, be it a degree in mathematics, engineering, computer science or the like. That is up from 5% not long ago (a number it believes is still common for other banks). And the number of internal engineers underestimates the change since it does not include outside investments, such as Symphony and Kensho.

Perhaps the oddest aspect of this transformation is how little evidence exists of a payoff. Athena, the firm says, has been used in many share buy-backs. Another tool named “Simon” is widely used by customers who want to create customised “structured notes”, or debt instruments. Kensho is profitable. Symphony has many adopters. But it is early days and in many ways these are just experiments.

Further transformation is still to come and if, as seems probable, it enhances efficiency, then the Goldman of the future may do as much as it does now with far fewer people and smaller costs. In the past, Goldman’s

rise to the pinnacle of the investment-banking stack was a consequence of besting its rivals. The challenge now is less from them than from a difficult external economic, technological and regulatory environment. As for every other bank, change is not a matter of choice. ■



投资银行业务

重新启动

既被人尊崇又饱受诟病的高盛努力与时俱进

Symphony公司的总部就设在斯坦福大学校园外，它是硅谷众多如雨后春笋般冒出来的科技公司之一。十几个体态健康的员工利用午休时间刚在附近的公园做了下锻炼，回到公司通风良好、自然光充足的办公室。运动衣都还没换，他们便先享受了各种水果、能量棒和当日美食（今天是印度风味），然后才坐在电脑前开始工作。公司有200多名员工，其中大部分都是十分抢手的工程师，他们对这样优越的办公环境习以为常。工作就应该是健康而无压力的，这与纽约任何一家银行里永不休止的销售压力和复杂的办公室政治所带来的紧张气氛大相径庭，更别提那些看了就让人没食欲还价格不菲的餐食。

在美国的另一端，在世贸中心新开放的一座塔楼里，成立三年的公司Kensho也给人同样的感觉。Kensho比Symphony规模稍小，但和Symphony一样，公司员工大多为才能出众的工程师。Kensho地处纽约，却有堪比西海岸的办公环境，以拥有“垂直花园”（像装裱画一样长方形的植被墙面）为傲，还有一张台球桌。

Symphony是一个即时通讯平台，由多家投资公司组成的财团所有。它提供了一个很关键的功能：数据和通讯的无缝融合，目前这项功能几乎被彭博垄断。在华尔街从一个街名变成一个行业的代名词之后，这样的资讯终端便成为金融业最终的信息渠道。Kensho每天对海量信息做筛选——包含各种讲话、各类收益、地震等等——以帮助投资者在数据中找出可能影响价格走向的关联信息。

如果这两家公司能够成功——这是一个大胆的假设——它们的产品可能会被广泛使用。它们规模虽小，但潜力巨大。如今大型投行高盛的核心业务正遭受到技术和监管的重创，它试图通过扶持和利用科技公司来变革自身乃至整个行业，Symphony和Kensho就是这样的两个例子。

2014年，高盛以内部研发的一项即时通讯技术为基础成立了新公司Symphony。Kensho则于2013年在高盛的支持下成立。公司成立之初，合同规定在各经纪商中高盛对Kensho产品有独家使用权。后来高盛也一直是Kensho董事会中唯一一家具有投票权的外部投资者，不过很多其他银行也在Kensho持有股份，同时也是其客户。

这两家公司可能并不会对高盛有太大帮助。怀疑者有理由质疑这些举措与其他类似之举一样，只不过是给旧有架构添上了一层时髦的虚饰而已。科技公司光鲜时尚，被广泛认为有益于发展；而银行则传统守旧，被视作寄生行业。反而言之，高盛深知它要克服所面临的挑战，就必须在曼哈顿市中心的玻璃幕墙总部大楼以外去寻找出路（至少是部分出路）。高盛也许有许多不足之处，但忽视企业自身弱点不在其列。

高盛影响力巨大，薪酬丰厚，很多曾在高盛高就的人如今在政界身居要职，怎么看也不像是深陷困境。但这家被《滚石》杂志讥讽为“巨型吸血乌贼”的公司正经历着触角被斩的困难。

| 失去支柱

2009年以来，公司收入已经下降四分之一，一直低于十年前的水平（见图表）。即使是业绩好的季度（比如刚刚结束的这个季度），其股本回报率也才勉强达到两位数。2009年“自营交易”（即以自有账户进行的交易和投资）收入为250亿美元，2010年180亿，2015年仅为50亿。收入萎缩的原因是限制这些交易活动的新规——而监管机构声称还会出台更多此类规定。

固定收益、大宗商品及货币（合并简称FICC）曾是利润丰厚的利基市场，高盛CEO罗伊德·布兰克芬（Lloyd Blankfein）和总裁盖瑞·柯恩（Gary Cohn）都出身于此。但这一市场同样遭到重创，2009年的收入高达220亿美元，而今年头三季度仅为56亿美元。

Rafferty Capital Markets分析师理查德·波弗（Richard Bove）得出结论，高盛各特色板块中，仅剩一项优势业务：为重要交易（尤其是并购）提供咨询的传统业务。高盛在这一领域仍全球领先，尽管它错过了机会，没能

参与今年最大的一项收购案，即美国电话电报公司（AT&T）对时代华纳的收购。但即使是高盛的并购咨询业务也面临着一些困难，其亚洲业务的大量缩减就是例证（中国及亚洲其他国家政府仍然更为支持本地金融机构）。高盛的财富管理业务也不错——这主要依赖口舌之能，并不需要太多资本金。

占总收入约60%的高盛其他各项业务都面临着监管和技术变革的巨大压力。有此困难的不止高盛一家。最近波士顿咨询公司对35家跨国投行的调查显示全行业都将面临着长期萎缩：过去五年里，行业收入下降20%，股本回报从本就不高的9%跌至6%；几乎每个业务领域都出现萎缩，只有咨询业务例外，但这项业务只占总收入的十分之一左右。

监管机构希望投行降低风险，而且是通过减少直接为自身而非客户带来回报的业务。这意味着投行不能自己持有大量证券，必须减少自营交易，以及充实资本金（摊薄了收益）。简而言之，就是投行应该仅扮演中介机构的角色。

但投行作为中介角色的地位也不稳固。大型固定收益投资机构表示它们可以直接承销很多债券发行。越来越少的公司愿意发行公开股，新的竞争以300多家“金融科技”公司的形式出现（“金融科技”公司泛指那些利用科技手段完成现有银行需依靠更多人力和更高成本去做的工作的企业）。

| 货币刺激

这些变化影响深远，令人惊讶的是银行收入并没有进一步下滑。最常见的解释是利率被压低，刺激众多贷款人以更低的成本对债务进行再融资。果真如此的话，银行收入的好景也不会长久；市场压力仍将持续。

鉴于这些趋势，高盛认为自己的强项在于其自身特质，即强大的人脉和执行力，而不是某几项优势业务（这些业务可能都岌岌可危）。这为高盛提供了一个战略框架，包含四个相互关联的战略。

第一个战略是合作或战略投资（这催生了Symphony、Kensho和其他几个类似的企业）。举例来说，Orbit是高盛研发的一系列智能手机应用，可在

雇主控制的环境下发邮件、浏览网页和保存文件（便于监管机构监督）。去年10月，高盛将Orbit剥离给另一家上市公司Synchronoss，换取了后者的少许股份。这样的公司如果不仅仅服务高盛一家公司，其价值会更高。如果高盛保留控股权，潜在客户可能便不愿意让竞争对手接触到敏感信息。

第二个战略是自动化。也就不久之前，高盛还有600人在一个宽广的大厅里交易股票。交易员大声喊叫，电话挂得砰砰响（不过也许高盛的员工身处名门，会比别处的交易员更注意礼仪）。掩盖在一片喧嚣之下的其实是66项具体操作，很多都可以自动化完成。如今，高盛只有两个人交易股票，另外还有200名软件工程师专门负责开发维护系统，这些系统实际上都在自动完成任务。传统投行业务也必须进行变革。高盛用51张表格列出了IPO要经过的所有146个步骤，这些表按顺序排好后有5英尺长。成本高且冗余的步骤需被剔除，或者再次自动化。

下一个将要经历重大变革的领域是高盛的资金来源和贷款。高盛的长期债务利息将近5%，是其资金来源组成中最稳定的一部分。它的竞争对手摩根大通和美国银行存着数万亿美元政府担保的存款，利息还不到1%。高盛开设分行并不可行，眼下也没有必要。4月，高盛收购了通用电气的网络银行部门，其160亿美元存款的年均利息为1%。

10月13日，高盛如期推出了在线借贷平台Marcus（以高盛创始人Marcus Goldman的名字命名）。客户最高可贷款三万美元，年利息6%至23%不等，用于偿还利息更高的信用卡债务。以前这些客户没那么多钱聘请高盛的客户经理，但如今，他们对高盛的自动化系统来说显然是个颇具吸引力的市场。

这也带来了第四个变革——高盛与客户的交流方式。不久之前，与客户的交流基本上都还是通过电话、发送电子邮件、电子订单和当面介绍来实现的。现在，一个叫做“Marquee”的客户端可以向客户提供各种工具，例如高盛用于交易股票的风险分析工具、协助客户安排对冲交易的“Studio”，或是帮助集团客户制定大规模股票回购战略的“Athena”。

| 付费专区背后

如何收费是革新努力所面临的巨大挑战。传统方法——大笔的交易项目收费、交易佣金、在买家支付的价格和卖家接受的价格之间赚取价差（经常缺乏透明度）、利用交易中获取的信息进行自营交易——都不太好用了。客户懂得太多，很多都能自己搞定。高盛正在考虑新的收费办法，比如根据公司员工人数、用户人数，或以订阅的形式来收费。

伴随着环境的变化，高盛人也在发生转变。现在高盛四分之一的员工都有某个方面的技术背景，可能拥有数学、工程、计算机科学等类学位，相较不久之前的5%大幅增加（高盛认为其他银行还普遍停留在这个水平）。而内部工程师的数量没有充分体现变化的程度，因为它不包括像Symphony和Kensho这样的外部投资。

也许这一变革最奇怪的方面是缺乏变革能带来好处的证据。高盛称Athena已经被用于很多股票回购交易。另一个叫“Simon”的工具在想要量身定制“结构性票据”或债务工具的客户中被广泛使用。Kensho已有盈利，Symphony也有很多人在用。但现在下结论还为时过早，在很多方面这些都还是尝试。

进一步变革仍将继续，如果（现在看来很可能）变革能够提升效率，未来对于同样的业务，高盛有可能用人更少，成本更低。过去，高盛之所以能够占据投行业的头把交椅是因为它比对手更胜一筹。如今，相对于竞争对手，给高盛带来更大挑战的是困难的外部经济、技术和监管环境。至于其他投行，变革也同样是必经之路。■



Siemens and General Electric

Machines learning

The world's two biggest industrial conglomerates differ on how best to go digital

IT DOESN'T take long to walk from Siemens's old headquarters in Munich to its new one, inaugurated in June: the German industrial conglomerate has built it right next door. The design is cutting-edge, as are the building's environmental features. It is packed with energy-saving sensors; channelled rainwater is used to flush the toilets.

General Electric, Siemens's big American rival, will soon have a new base, too. But it takes three hours to drive from the old site in Fairfield, a Connecticut suburb, to the new one in Boston. Its building will also boast plenty of green technology, such as a huge canopy made of solar panels, as well as spaces that the public can enter, including co-working areas and lounges. There will be laboratories both for internal startups and some from outside.

The two industrial giants aren't so much showing off as signalling transformation. Both firms are going through the most profound change in their corporate histories, attempting to switch from being makers of machines into fully digital businesses. GE's chief executive, Jeff Immelt, says the plan is to join the world's top ten software firms with sales of programs and services worth \$15bn as early as 2020.

It is tempting to bracket the firms together for other reasons, too. The basic numbers make them look alike. With annual revenues of around \$100bn each, they are the world's two largest diversified industrial conglomerates. About 70% of their markets overlap with each other, reckons J.P. Morgan, a bank.

But the similarities only go so far. GE mostly sells big, stand-alone products, such as jet engines and locomotives. It may look like a collection of distinct divisions, but it has a strong centre and can move swiftly. It is also greatly influenced by America's technology giants.

Siemens, in contrast, excels in product design and factory automation. It already has experience in digitising the entire life cycle of an industrial product, from design to fabrication, so it is in some ways already more of an IT firm than GE (though it still has a very long way to go). The German firm is more decentralised, featuring competing centres of power. Its top managers prefer to weigh options carefully, not always with great results: Siemens is about half as profitable as the American firm.

It is no surprise, then, that the two firms are also taking very different paths towards digitisation. GE is completely reinventing itself, whereas Siemens is staying close to its roots. What works best will be closely watched by other companies in all sorts of industries. They want to know what happens when operating technology, as represented by GE and Siemens, properly meets information technology. The first tends to be organised in vertical, industry-specific silos, such as machine tools and medical equipment. The second typically comes in horizontal, widely used layers, such as computer operating systems. Bringing it all together could go badly wrong.

Data have long been crucial for manufacturing and industrial goods. Siemens digitises its customers' factories; a typical GE jet engine contains hundreds of sensors. But now the data are no longer binned when the widget comes out of the factory or the plane has landed. Thanks to faster internet connections, cloud computing and clever algorithms, information can now be easily collected, stored in huge "data lakes" and sifted for insights.

That technology allows manufacturers to create what David Gelernter, a pioneering computer scientist at Yale University, over two decades ago imagined as “mirror worlds”. GE wants to build a similar, “virtual twin” of every category of physical asset it sells, from locomotives to wind farms. This would allow engineers to test products before they are built and also let them feed the virtual model with real-world data to improve performance. “A digital twin is not just a generic model but based on the exact conditions in the real world,” explains Ganesh Bell, chief digital officer at GE Power.

| *Not so byte-sized*

Although the efficiency gains for a single product may be relatively small, they can add up to billions of dollars in savings for customers over the lifetime of equipment. More broadly, linking the physical and the digital worlds via the “internet of things” (IoT) could create up to \$11trn in economic value annually by 2025, estimates the McKinsey Global Institute, a think-tank. A third of that could be in manufacturing.

It is not just the promise of such gains, however, that has prompted Siemens and GE to overhaul themselves. Digitisation is also a threat. If they do not satisfy customers’ demands to replace machines less often and to spend less money on maintenance, others will. Big IT firms such as Google and IBM might come to control the virtual part of manufacturing by developing software and services to optimise factories and supply chains. That would slice off a big chunk of manufacturers’ profits.

GE’s answer has been to invest billions since 2011 in a data platform called Predix. It wants the system to become for machines what Android is for smartphones: the dominant host of industrial “apps” to manage, for example, clusters of wind turbines and fleets of locomotives. GE has set up Predix to be “open”, meaning that it doesn’t only work with its own machines or its own apps. For example, Pitney Bowes, a maker of heavy-

duty mailing systems and products, uses the platform to analyse data from its machines in order to manage them better.

GE is also using Predix as a way to shake up its internal organisation. It set up a separate software unit in San Ramon, near Silicon Valley, to develop it. “We incubated the unit separately because it would otherwise have been killed by the main organisation,” explains Bill Ruh, who heads GE Digital. Only in September last year did it merge the startup with the company’s other digital activities, including its entire IT department, to form Mr Ruh’s unit. It interacts with all other GE businesses, making sure that an algorithm to control electric motors in a locomotive, say, can also be used for similar devices in a wind turbine or a power plant.

GE is changing its culture in other ways, too. As an industrial conglomerate, the firm was known for its near-obsession with the Six Sigma management method. This uses statistics and incremental improvements to drive everything a company does close to perfection. Now GE wants workers to take a leaf from the world of startups and start making mistakes—an approach it is calling “FastWorks”. The idea is to experiment more and to develop so-called minimum viable products that can be discarded quickly if they fail to take off.

| *Change your Weltanschauung*

Siemens’s digital transformation appears to be going more slowly (although that may be partly because its managers are less vocal about the firm’s achievements). Its primary focus is still on software tailored to industry verticals, such as health care and manufacturing, rather than on a horizontal platform to fit all sectors. Only recently did it begin marketing MindSphere, its equivalent to Predix, more intensively. “Our customers live in worlds that are very different from each other,” explains Horst Kayser, the firm’s head of strategy. Siemens is also keen not to displease an important group of customers: machine-tool makers that use components

from Siemens. They want to maintain direct relationships with their own industrial customers, not have them interacting through a platform like MindSphere.

Because MindSphere is less important inside Siemens than Predix within GE, the German firm's organisational changes have so far been less radical. But it is trying to open itself up to ideas from outside. Internal startups used to be at the mercy of its budgeting process, which often meant that they were the first to lose funding. In June the firm created a separate home for such projects, called next47 (Siemens was founded in 1847 in a Berlin courtyard), which is part-incubator, part-investment firm. It has hired an American to run it, but rather than basing it in the German capital, which boasts a thriving startup ecosystem, it will remain in Munich.

Siemens has also started sending senior employees on so-called "learning expeditions" to startups to see how things can be done differently. Its employees are now encouraged to communicate across organisational boundaries and directly with bosses. The company would have to do much of this regardless of its priorities in the digital sphere; a reputation for being risk-averse and overly hierarchical is not the best way to attract young talent as Germany's population ages.

In other IT markets, one firm has quickly come to dominate, whether in online search (Google), computer operating systems (Microsoft) or corporate databases (Oracle). That seems to argue in favour of a gung-ho approach. GE is already well on its way to creating an "ecosystem" for Predix, says Nicholas Heymann of William Blair, an investment bank. It has agreed partnerships with big telecoms operators, consultancies and IT-services companies, not least to gain access to outside data sources.

Yet the consumer world and that of business differ. Online search and social-networking services are easy to scale, because human beings' needs

are similar across the world. Particular industries and companies, on the other hand, often have specific requirements that call for customised products—not for a platform that is trying to be all things to all machines. That may help Siemens's more tailored, customer-centric approach.

Siemens's attitude to its industrial customers' data may also work better than GE's. Whereas individual consumers are by and large willing to give up personal information to one platform, such as Google or Facebook, most companies try to avoid such lock-in. Whether they are makers of machine tools or operators of a factory, they jealously guard their data because they know how much they are worth. Both GE and Siemens say their customers will keep control of their data in the new digitised world, but the real question is who will own the algorithms that are generated using these data. GE claims ownership, Siemens is much less categorical.

It is thus unlikely that a single platform will come to dominate the industrial internet. There will be plenty of room for Predix, MindSphere and other services, concludes Andreas Willi of J.P. Morgan. Nonetheless GE seems better prepared for a digital future. The firm now has a flexible organisation that can change course quickly. Siemens, by contrast, is still living in a more closed vertical world. Both new headquarters feature small museums displaying the firms' roots. No prize for guessing which one you can visit strictly by appointment only. ■



西门子与通用电气

机器们学习

数字化转型，世界两大工业巨头各施各法

从西门子在慕尼黑的旧总部步行不远便可抵达今年六月启用的新总部：这家德国工业集团的新总部就建在隔壁。大楼的外观设计前沿，环保设计也很尖端，满布节能传感器，并利用导入的雨水冲洗马桶。

西门子的一大美国对手通用电气很快也将建成新总部，但从康涅狄格郊区费尔菲尔德（Fairfield）的旧址前往波士顿的新址需要三小时的车程。新大楼也将运用大量绿色技术，例如由太阳能发电板铺设的巨型屋顶。另外大楼还对公众开放部分空间，包括协作工作区及休息区。其中还设有实验室，供内部创业部门及一些外部创业公司使用。

这两家工业巨头并非意图炫耀，而是在传递变革的信号。两者都在经历各自公司历史上最深刻的变化，试图从机器制造商转变为全面数字化企业。通用电气的首席执行官杰夫·伊梅尔特（Jeff Immelt）表示，公司计划最早在2020年跻身世界十大软件公司，销售价值150亿美元的程序及服务。

人们也很容易因为其他原因将这两家公司相提并论。一些基本数字使其看似相近。两者年收入均约为1000亿美元，是世界上规模最大的两家多元化工业集团。据摩根大通银行的估计，两大集团约有70%的市场相互重叠。

但相似之处仅此而已。通用电气主要销售大型独立产品，如喷气发动机和机车。虽貌似是不同部门的集合体，但该集团拥有强大核心，行动迅速。另外，通用电气受美国大型科技公司的影响巨大。

相比之下，西门子则在产品设计和工厂自动化方面表现卓越。西门子已经有对工业产品从设计到制造整个生命周期进行数字化的经验，所以在某种程度上，西门子比通用电气更像一家IT公司，尽管它还有很长的路要走。这家德国公司较为去中心化，呈分权角力之势。它的高层管理者倾向于审

慎权衡选择，却不一定总能带来佳绩：西门子的盈利约为通用电气的一半。

所以，无怪乎这两家公司会采取截然不同的数字化路径。通用电气选择彻底变革，而西门子则紧贴本源。哪个才是最佳途径？各行各业的其他公司对此都将密切关注。它们想知道，以通用电气和西门子为代表的运营技术如果与信息技术正确结合会产生什么结果。前者倾向于按行业分门别类地垂直组织，如机床和医疗设备。而信息技术一般是横向的，有广泛的应用面，比如计算机操作系统。将这一切结合起来可能导致一团糟。

长期以来，数据对制造业和工业产品至关重要。西门子为客户工厂实现数字化管理；通用电气的一台普通喷气发动机就包含了数百个传感器。但如今，这些数据不会在部件出厂或飞机着陆后就弃之不用。得益于更快的互联网速度、云计算及各种智能算法，信息如今更容易被收集起来，并可存储在巨大的“数据湖”中供筛选分析。

这种技术使得制造商创造出耶鲁大学的计算机科学先驱人物大卫·盖勒特（David Gelernter）在20多年前想像的“镜像世界”。通用电气希望为销售的每种实体资产建造一个类似的“虚拟孪生体”，从机车到风电场，无一例外。这使工程师们在构建产品之前便可进行测试，也可以把真实数据输入虚拟模型，改善产品性能。“一个数字化镜像并非仅为通用模型，而是基于现实世界的实际情况构建。”通用电气发电部门（GE Power）的首席数字官甘尼仕·贝尔（Ganesh Bell）解释道。

| 个个字节，规模不小

尽管单个产品的效率提升可能相对较小，但在设备的整个生命周期中总和起来，便可为客户节省多达数十亿美元的成本。据智库麦肯锡全球研究院（McKinsey Global Institute）的估计，推而广之，通过“物联网”（IoT）把实体与数字世界连接起来，到2025年，或许每年可创造高达11万亿美元的经济价值。其中三分之一可能来自制造业。

然而，驱使西门子及通用电气彻底变革的不仅仅是对这些收益的期许。数

字化也是一种威胁。假如它们无法满足客户减少机器更换和维护支出的需求，其他公司便有机可乘。谷歌及IBM这类大型IT公司可能通过开发优化工厂和供应链的软件及服务来掌控制造业的虚拟流程。这将切走制造商一大块利润。

为应对挑战，通用电气自2011年已投资数十亿美元于名为Predix的数据平台，寄望它成为各类机器的操作系统，就像智能手机上的安卓系统那样。作为主要操作系统，该平台将安装各类工业“应用”来管理风力涡轮机组和机车编组等设备。通用电气已把Predix设为“开放”平台，不只通用电气自身的机器或应用可以使用。例如制造重型邮递系统及产品的必能宝公司（Pitney Bowes）也使用该平台分析其机器收集到的数据来改善管理。

通用电气也在利用Predix改变内部组织架构。公司在硅谷附近的圣拉蒙（San Ramon）设立了独立的软件公司进行开发工作。通用电气数字部门（GE Digital）的主管比尔·鲁哈（Bill Ruh）解释道，“我们单独打造了这家公司。要是不这么做，通用电气的主架构早就把它扼杀了。”直到去年九月，这一新建公司才并入通用电气的其他数字化活动（包括其整个IT部门），整合成为鲁哈主管的数字部门。该部门与通用电气所有其他业务交互，比如确保用于控制机车内电动机的算法也可以用于风力涡轮机或发电厂中的类似设备。

通用电气也正通过其他方式改变企业文化。作为一家工业集团，它对于六西格玛管理法则的痴迷众所周知。这套方法运用统计学及增量改进，促使公司的方方面面不断臻于完美。现在，通用电气希望员工学习创业公司，采取它所建立的“快速决策法”（FastWorks），开始试错。其理念是进行更多的尝试，开发所谓的“最简可行产品”，即假如无法成功便可快速舍弃的产品。

| 改变世界观

西门子的数字化转型似乎进展相对缓慢（不过一定程度上也可能是由于其管理者不喜声张公司成就）。其首要重点仍是针对垂直行业定制软件，如医疗保健和制造业，而非打造适合所有行业的横向平台。直到最近西门子

才开始更积极营销自己类似Predix的数据平台MindSphere。“我们的顾客所在的行业相互差异很大。”西门子的首席战略官霍斯特·凯瑟（Horst Kayser）解释道。西门子也特别不想开罪一个重要客户群：使用西门子部件的机床制造商。它们希望和自己的工业客户保持直接联系，而非让客户通过像MindSphere那样的平台交互。

由于MindSphere之于西门子的重要性低于Predix之于通用电气，西门子的组织变革一直相对不那么激进，但这家德国公司正尝试接纳外部创意。过往，内部创业受制于公司预算流程，往往首当其冲被削减资金。今年六月，西门子为这些创业项目另起炉灶，建立了名为“下一个47”（next47）的公司（西门子于1847年在柏林的一个庭院里创立），既是创业孵化器，也是投资公司。虽然请来一位美国人当主管，但公司没设在创业企业氛围活跃的德国首都柏林，而是会继续留在慕尼黑。

西门子也开始派遣高级员工参与所谓的“学习征程”，到创业公司观摩了解不同的做事方式。现在，它鼓励员工跨越组织架构界限来相互沟通，以及直接与上司交流。西门子必须在这方面多加努力，不管其数字化领域的首要任务为何；在德国人口老化之际，厌恶风险且过度强调等级的名声并不利于西门子吸引年轻人才。

在其他IT市场，总有一家企业迅速独大：在线搜索有谷歌，计算机操作系统有微软，企业数据库有甲骨文。这似乎证明了分工合作之道。通用电气已差不多为Predix打造好“生态系统”，投资银行威廉博莱公司（William Blair）的尼古拉斯·海曼（Nicholas Heymann）说道。通用电气已与大型电信运营商、咨询公司和IT服务公司达成伙伴关系，更多着眼于获取外部数据源。

然而，消费者和商业客户的世界并不相同。在线搜索及社交网络服务容易扩展，因为人类需求在世界各地都是相似的。相比之下，特定的行业及公司则往往有特定的要求，因而需要定制产品，而不是为所有机器提供一整套的统一平台。这也许有助于西门子以客户为中心的定制化方法。

西门子对待工业客户数据的态度也较胜于通用电气。个人客户一般都愿意向谷歌或Facebook等平台透露个人信息，但大部分企业则会尽量避免这种锁定。无论是机床制造商还是工厂管理者，他们都深知自家数据的价值所在，因而严加保密。通用电气和西门子表示，他们的客户在全新的数字化世界中可以全权掌控自己的数据，但真正的问题在于，使用这些数据生成的算法的所有权归谁。对此，通用电气称自己拥有所有权，西门子的态度则暧昧得多。

因此，工业互联网不太可能由单一平台独霸天下。Predix、MindSphere及其他服务平台将有足够的空间百花齐放，摩根大通的安德鲁斯·威利（Andreas Willi）总结道。尽管如此，通用电气对于数字化未来似乎更有备而来。该公司现已建立了灵活的架构，可迅速改变航向。相比之下，西门子仍活在较封闭的垂直世界里。两家公司的新总部均设有小型博物馆，展示公司的源流。猜猜参观哪家公司的博物馆只能靠提前预约？猜中没奖。■



BASF

Chemical reaction

How the world's largest chemical company brews innovation

ALONG the west bank of the Rhine, south of Frankfurt, cormorants and herons frolic as barges moor at Ludwigshafen. Here the world's largest chemical park stretches out over ten square kilometres. Streets such as Chlor-, Ammoniak- and Methanolstrasse are shaded by 2,850 kilometres of pipes that connect everything like arteries; red is for steam, yellow for gas, green for water. The saying goes that most Westerners touch at least one product from a BASF site before leaving home.

It is the world's largest chemical company, and one of Europe's largest manufacturers. Because it sells chemicals and chemical products to other companies, such as BMW, Nestle and Procter & Gamble, BASF is little known to consumers. It isn't one for blowing its own trumpet. "We will try our best to remain spectacularly unspectacular for the media," said Kurt Bock, the CEO, at last year's 150th anniversary. But BASF repays attention for two reasons: the sheer impact of what it does, given its size, and its systematic approach to innovation.

| *Big and bold*

The two go together. Mr Bock thinks size helps it make big bets on long-term innovation, which he calls an "increasingly lonely activity". Last year the company spent nearly €2 billion (\$2.2 billion) on R&D—its revenues last year were €70.4 billion—and devoted 10,000 employees to coming up with new ideas. It generated 1,000 patents, a typical number in any given year.

BASF's most celebrated breakthrough was its discovery in 1913 of a way to mass-produce fertiliser, which helped eliminate mass hunger. The real

innovation of this “Haber-Bosch process”, named after the two scientists who won Nobel prizes for it, was not converting nitrogen and hydrogen into ammonia, but doing so on an industrial scale. Subsequent inventions have ranged from the tape in cassettes (1935) to an aroma called citronellal (1982) to drought-tolerant corn (2013). The new Adidas Boost, a running shoe that promises extra bounce using “energy capsules”, relies on a BASF invention.

The firm’s next big bet is on electric cars. Some 200 metres from where Mr Bosch (of fertiliser fame) made his breakthrough, Marina Safont Sempere, a young chemist from Spain, is working on what could be another. Her team is working on next-generation battery materials. Today, she explains, electric cars typically contain 50 big, heavy batteries, which weigh them down, take up space and run out after 150km-200km. BASF hopes to create a powder that packs more energy into less space, weighs less and comes at a lower cost. Such investments are partly a bet on the future, partly a hedge on current revenues tied to the combustion engine.

One tested strategy for BASF is trying to anticipate exactly how future markets will develop. As the middle classes grow, for example, sales of dishwashers and dishwasher tablets are booming. But phosphate, which removes scale, will be banned in the EU from January. Scientists at BASF started thinking about this over 20 years ago and worked on Trilon M, a chemical that performs as well as phosphate but is biodegradable.

Its approach is founded on an extensive network. It works with 600 universities, research institutes and companies, and has its own venture-capital outfit. It seeks out joint ventures and makes small strategic acquisitions, such as the recent purchase of Verenium (\$62m), an enzyme-research company. It also increasingly works in partnership with customers, as an inventor-for-hire, on whatever they need (non-sticky sunscreen, carbon-free packaging, lighter cars), marking an expansion to

downstream and service provision.

Some of BASF's customers increasingly request help to meet their environmental goals, although the company acknowledges that there are many clients for whom this is a much lower priority. It is a dilemma for the chemicals industry whether or not to shift more quickly to sustainable production than clients actually demand. The firm claims that by now, 27% of its products contribute in some way to "sustainability", a figure that it wants to increase. Its *Verbund* principle, a system whereby it recycles waste products—for example, by selling excess carbon to the beverage industry—is good for profits. It saves some €1 billion a year from such processes.

Another feature is BASF's habit of quickly shedding businesses when new iterations no longer pay off. This happened in the textile-chemicals business, and in parts of the paper-chemicals industry, when customers told it that there was no need for further product refinements. Similarly, it got out of fertilisers, caffeine and standard plastics because they all became too commoditised, making it hard to compete.

| *Steady as she goes*

Discipline has some drawbacks. Stockmarket analysts like BASF's vertically-integrated structure—it owns most of its supply chain—and its strong focus on innovation. Its share price has risen over the past decade. But the firm's methodical approach to acquisitions could also work against it.

On September 14th Monsanto, the world's biggest seed producer, accepted a takeover by Bayer, a German drugs and chemicals giant, worth \$66 billion (€59 billion). Amid a wave of consolidation in the agribusiness industry, says Lutz Grueten of Commerzbank, BASF could be left behind because it does not possess its own seeds business and has instead relied on partnerships, including with Monsanto. It is unclear whether this contract

will be renewed. BASF emphasises that it is serious about its crop-protection business, that it has €6 billion in sales and that it devotes 26% of its R&D to agribusiness. The firm will be on the lookout for anything coming onto the market as a consequence of the Bayer-Monsanto deal.

Another worry for Mr Bock is a zeal for regulation on the part of European governments. The continent's approach to scientific testing is becoming too cautious compared to that of America, he reckons. A current debate over research on, and use of, endocrine-disrupting chemicals (substances that can have harmful effects on the body's hormone system) is one example. But Mr Bock is optimistic about his industry's ability to help solve mankind's problems as a silent enabler of progress. He apologises for sounding pompous, but promises that "if you want to improve the state of the world, chemistry can really help." ■



巴斯夫

化学反应

全球最大化工企业如何酝酿创新

在莱茵河西岸、法兰克福以南，鸬鹚和苍鹭嬉闹于停泊着驳船的路德维希港。世界最大的化工园区在这里延绵十余平方公里。名为“氯街”、“氨街”、“甲醇街”的道路上方架设着总长达2850公里的管道，有如“动脉”连接各处；红色管道输送的是蒸汽，黄色的是燃气，绿色的是水。有这么一种说法：大多数西方人在出门前总会触碰到至少一件来自巴斯夫园区的产品。

巴斯夫是世界最大的化工企业，也是欧洲最大的制造商之一。因其生产的化学品和化工产品售往宝马、雀巢、宝洁等其他公司，消费者对巴斯夫公司本身较为陌生。该公司也不喜欢自吹自擂。“我们会尽力对媒体保持高度低调。”其CEO库尔特·博克（Kurt Bock）去年在公司的150周年庆典上说道。但巴斯夫值得关注，原因有二：鉴于其规模，其一举一动极具影响力；另外还有它系统性的创新手法。

| 大而勇

这两者紧密相连。博克认为，公司的规模助其大胆投资于长期创新这项他称之为“愈发要孤军作战的活动”。去年，该公司营收为704亿欧元，研发投入接近20亿欧元（22亿美元），专门从事创想研究的员工就有一万人。公司去年新增专利1000项，而且几乎每年都能达到这一数字。

巴斯夫最著名的突破是在1913年发明了批量生产化肥的方法，这帮助消除了大饥荒。“哈伯-博施法”（以因此获诺贝尔奖的两位科学家命名）的真正创新不在于把氮和氢结合转化为氨，而是在工业领域大规模实现了这一转化。巴斯夫随后的一些发明包括卡式录音带里的磁带（1935年）、名为香茅醛的香料（1982年）、抗旱玉米（2013年）。宣称通过“能量胶囊”提供加倍回弹力的新款阿迪达斯Boost跑鞋也有赖巴斯夫的一项发明。

巴斯夫把下一大赌注押在电动车上。距离博施取得规模化生产化肥突破之地约200米处，来自西班牙的年轻化学家玛丽安娜·萨芬特·森佩雷

（Marina Safont Sempere）正为巴斯夫的下一突破而努力。她的团队正在研究新一代电池材料。她解释说，现在的电动车一般含50组沉重的大型电池，不仅令车身变重还很占空间，行驶150至200公里便能量耗尽。巴斯夫希望能创制出一种粉末，能在更小空间里储存更多能量，而且更轻便、成本更低。这些投资既是对未来下赌注，也为目前公司内燃机相关收入做对冲。

巴斯夫一个屡试不爽的策略是准确预测未来市场将如何发展。例如，随着中产阶级的壮大，洗碗机及其专用清洁片销路大好。但欧盟将从一月起禁用有除水垢功效的磷酸盐。巴斯夫科学家们早在20多年前就开始考虑这个问题，并研发出Trilon M（甲基甘氨酸二乙酸）这一效果媲美磷酸盐且可生物降解的化学品。

其创新手段依存于广泛的网络。巴斯夫与600家高校、科研院所及公司合作，并拥有自己的风险投资部门。公司寻找合资企业，并进行小型战略性收购，例如最近以6200万美元收购生物酶研究公司Verenium。巴斯夫还越来越多地与客户合作，作为特聘发明家研发顾客所需的一切（不粘腻防晒霜、无碳包装材料、轻型汽车），标志着其向下游用户及服务方面的扩展。

巴斯夫的一些客户越发要求产品满足其环保目标，但该公司也承认，对许多客户来说，环保的优先级要低得多。在是否应超越客户实际需求、更快地转向可持续生产上，化工业处于两难的境地。巴斯夫称，目前为止，其27%的产品在一定程度上有助于“可持续发展”，而且希望继续提升该比例。巴斯夫的“一体化”原则（Verbund, 循环利用废料的体系，比如将富余的碳卖给饮料行业）有利于提升利润。通过这些操作，公司每年会节省约十亿欧元。

另一特点是巴斯夫有个习惯——当新尝试不再值得投入时公司会迅速舍弃这一业务。这曾发生在纺织化学品业务及造纸化学品的部分业务，当时客

户告知巴斯夫没有必要再进一步改良产品。同样，巴斯夫也从化肥、咖啡因及标准塑料业务中抽身，因为这些产品都过于同质化，难以参与竞争。

| 保持航向

循规蹈矩也有缺点。股市分析师喜欢巴斯夫的垂直一体化结构（公司的供应链大部分为自营）及其大力投入创新的做法。在过去十年间，巴斯夫的股份一直在上升。但该公司对于收购一板一眼的态度可能有损公司利益。

9月14日，全球最大的种子生产商孟山都接受德国药物和化学品巨头拜耳的收购，总值660亿美元（590亿欧元）。德国商业银行的卢茨·格鲁腾（Lutz Grueten）表示，在农业企业的整合潮中，巴斯夫可能会落后于人，因为它没有自己的种子业务，而是依赖包括孟山都在内的合作伙伴。该合约是否会续约仍是个未知数。巴斯夫强调十分重视自己销售额达60亿欧元的作物保护业务，而且26%的研发经费都用于农业业务。该公司将关注拜耳收购孟山都引发的市场结果。

博克的另一忧虑是欧洲各国政府热衷立法监管。他认为，相比美国，欧洲对科学测试的态度过于谨慎。目前就研究及使用内分泌干扰物（可能有损人体激素系统的物质）的争论就是一个例子。但博克还是乐观地认为，其所在行业能够默默推动进程，助力解决人类的问题。他很抱歉这听起来显得自大浮夸，但仍认为“要改善世界的境况，化学真的可以发挥作用。”■



Emirates and the A380

Flying low

Problems at Emirates strike another blow to the super-jumbo

AT THE world's major airports, plane-spotters often spend days waiting for the world's largest passenger plane, the Airbus A380, to make an appearance. The nerds at Dubai International Airport are spoilt for choice. It is home to Emirates, an airline that owns 86 of the monster aircraft, almost half of the global A380 fleet. These planes have propelled Emirates from insignificance a decade ago to its position as the world's biggest carrier (measured by international passenger mileage in 2015). Now the airline has hit a rough patch. That is bad news for Airbus, the European aerospace and defence giant which makes the A380, and for the plane itself.

Demand once seemed insatiable for flights through Emirates' hub in Dubai, which is known in the industry as a "super-connector" airport. Now its location helps explain the airline's difficulties as well as its spectacular past growth, says its president, Sir Tim Clark. When he helped set up the airline in 1985, he says, Dubai was "an enchanting Arab village" that generated little air traffic. Instead of filling up the planes with locals, his strategy was to use its position halfway between Asia and Europe to connect flights between cities that lacked obvious links, such as Cairo and Shanghai or Moscow and Cape Town.

Connecting these "strange city pairs", as he puts it, led to soaring passenger numbers. A string of purchases of A380s, starting in 2008, helped traffic to more than double to 51m in 2015. Good airport facilities and access to cheap labour (even expatriate pilots are inexpensive in Dubai because of low taxes) contributed to profits as well: the airline has the lowest costs of any long-haul carrier in the world.

But over the past year or so problems have mounted. Low oil prices have hit the economies of many of Dubai's neighbours, reducing regional passenger traffic. Terrorist attacks in cities and airports in Europe and the Middle East have dampened tourism activity generally.

Although Dubai itself is safe, conflict in Iraq, Syria and Yemen, as well as Turkey's attempted military coup in July, are prompting passengers to choose other connecting cities. Currency volatility has also meant abrupt drops in revenue on some routes. "We used to have one of these business-damaging events once a year but now we have them more than once a month," groans Sir Tim. In the year to March, Emirates made a record \$1.9bn in profits, but since April its earnings have tumbled by 75%. Weak demand has forced it to slash its fares to keep planes full.

Emirates can take some solace from the fact that its super-connector rivals in the Middle East—Etihad of Abu Dhabi, Qatar Airways and Turkish Airlines—are also hurting. Turkish Airlines has had to suspend flights on 22 routes and mothball 30 planes. Industry analysts reckon the airline will this year suffer its first annual loss for a decade. Qatar and Etihad may also end up in the red.

Tricky geopolitics is nothing new for Emirates, which was founded during the Iran-Iraq war, argues Sir Tim. Dubai is trying to boost its own tourism industry, which should help replace some of the connecting passengers the airline is losing. No one doubts that it will pull through.

Emirates' appetite for the A380 is a different story. That may dwindle more quickly than Airbus had anticipated. On December 2nd the first planes in a new batch of super-jumbos are due to arrive in Dubai. In total, Emirates has a further 56 A380s on order: 31 are to be delivered between now and 2019, with another 25 due to arrive in the 2020s to replace older ones nearing retirement. Emirates rescued the A380 programme with its last big order in

2013. The airline had wanted to buy another 200 A380s equipped with more fuel-efficient engines. But in current conditions Sir Tim says there is little chance of his airline making another large order anytime soon.

Airbus has orders for only another 18 super-jumbos from other airlines that are likely to be delivered and paid for, according to Richard Aboulafia of the Teal Group, a consultancy in Virginia. The manufacturer has already cut planned production, but may still run out of customers for even this diminished number.

So Airbus is on the hunt for new buyers in China and Japan, places where runways are most congested and the need for larger planes is most acute (the firm originally gave the A380 its name because eight is considered lucky in some Asian countries). Chinese airlines have only bought five so far but the hope is they might buy more now that the country's aviation regulator, a noted super-jumbo sceptic, retired earlier this year. If they are not willing to step up, as Emirates once did, plane-spotters will have even more reason to cherish their sightings of the A380. ■



阿联酋航空和A380

低空飞行

阿联酋航空的问题给了巨无霸客机又一重击

在全球多个主要机场，飞机爱好者经常会等上好几天，只为一睹世界最大客机空客A380的芳容。而在迪拜国际机场，飞机迷们却目不暇接。这里是阿联酋航空的老家，这家航空公司拥有86架巨无霸客机，几乎占了全球所有A380的一半。正是这些飞机推动阿联酋航空从十年前的籍籍无名成长为今天全球最大的航空公司（根据2015年国际乘客里程数计算）。现在这家航空公司却遇到了麻烦。这对A380的生产者、欧洲航空航天及防务巨头空客来说是坏消息，对这款机型本身来说也是如此。

曾经，对途经迪拜机场航班的需求似乎永无止境，这一阿联酋航空的中心基地被业界称为“超级中转”机场。公司总裁蒂姆·克拉克爵士（Sir Tim Clark）认为，它的地理位置造就了公司过去惊人的发展，如今却也是其困境的成因。他说，当他在1985年帮助成立这家航空公司时，迪拜还只是“一个迷人的阿拉伯村庄”，几乎没有空中交通。他的策略不是把飞机塞满当地人，而是利用迪拜位于欧亚之间的位置，打通之前没有明显联系的城市之间的航线，比如开罗和上海，或是莫斯科和开普敦。

他称之为“奇怪的城市组合”，连接它们后乘客数量飙升了。自2008年开始购置的数批A380使乘客运输量翻了一倍多，到2015年达到5100万人次。良好的机场设施和廉价劳动力（因为税收低，在迪拜即使是聘请外籍飞行员也不贵）也有助于盈利：阿联酋航空的成本是全球长途航空公司中最低的。

但是在过去一年左右的时间里，问题接踵而至。低油价已经打击了迪拜很多近邻的经济，进而缩减了该地区的乘客运输量。在欧洲和中东的城市和机场发生的恐怖袭击也普遍抑制了旅游活动。

尽管迪拜本身是安全的，但发生在伊拉克、叙利亚和也门的冲突，以及7

月土耳其未遂的军事政变，都促使乘客选择其他的中转城市。汇率波动也令某些航线的收入骤然减少。克拉克爵士抱怨道，“以往这类损害生意的事件一年才碰到一次，但现在一个月都不止一次。”截至3月的财年，阿联酋航空的利润已达创纪录的19亿美元，但是从4月起至今其盈利已经下跌了75%。需求疲软迫使它大幅降低票价以便填满座位。

阿联酋航空可以从这样的现实中获得些许安慰：它在中东的超级中转对手，阿布扎比的阿提哈德航空、卡塔尔航空和土耳其航空也在受损。土耳其航空已经不得不暂停22条航线，停运30架飞机。业界分析人士认为这家航空公司今年将遭受十年来首次年度亏损。卡塔尔航空和阿提哈德航空可能最终也会亏损。

克拉克爵士认为，复杂的地缘政治对在两伊战争期间创建的阿联酋航空来说并不新鲜。迪拜正设法推动自己的旅游业，这应当有助于填补航空公司正在流失的部分中转乘客。没人怀疑它会渡过难关。

阿联酋航空对A380的需求则是另一回事。这可能减少得比空客曾经预想的更快。12月2日，新一批次巨无霸的首批飞机将抵达迪拜。阿联酋航空总共还订购了56架A380：31架将在2019年前交付，剩下的25架将于2020年至2030年交付，以替换接近退役的老旧飞机。阿联酋航空上一个在2013年的大订单拯救了A380项目。这家航空公司曾经还想再添置200架更省油的A380。但在目前的形势下，克拉克爵士认为公司几乎没有可能在近期再下大订单。

位于弗吉尼亚州的咨询公司Teal Group的理查德·阿波拉弗亚（Richard Aboulafia）称，空客从其他航空公司收到的最后很可能要交付并付款的巨无霸订单只有18架。空客已经削减了计划产量，但即便是这个已减少的数量可能也还是供过于求。

因此空客正在中国和日本搜寻新买家，这些地方的飞机跑道最为拥挤，对更大型飞机的需求也最急迫（空客最初给A380取这个名字正是因为某些亚洲国家认为数字八很吉利）。中国的航空公司目前为止仅购买了五架，但

空客的希望是它们现在有可能会购买更多，因为曾因对巨无霸持怀疑态度而著称的中国民航局原局长今年初已退休。如果它们不愿意像阿联酋航空曾经所做的那样增加订单，那么飞机爱好者就更应珍惜看到A380的机会了。■



Consumer goods

Invasion of the bottle snatchers

Smaller rivals are assaulting the world's biggest brands

THEY make some of the world's best-loved products. Their logos are instantly recognisable, their advertising jingles seared in shoppers' brains. For investors, they promise steady returns in turbulent times. They seem to be getting ever bigger: on June 30th Mondelez International made a \$23 billion bid for Hershey to create the world's biggest confectioner; and on July 7th Danone, the world's largest yogurt maker, agreed to buy WhiteWave Foods, a natural-food group, for \$12.5 billion. Yet trouble lurks for the giants in consumer packaged goods (CPG), which also include firms such as General Mills, Nestlé, Procter & Gamble and Unilever. As one executive admits in a moment of candour, "We're kind of fucked."

For a hint of the problem they face, take the example of Daniel Lubetzky, who began peddling his fruit-and-nut bars in health-food stores: his KIND bars are now ubiquitous, stacked in airports and Walmarts. Or that of Michael Dubin and Mark Levine, entrepreneurs irked by expensive razors, who began shipping cheaper ones directly to consumers five years ago. Their Dollar Shave Club now controls 5% of America's razor market.

Such stories abound. From 2011 to 2015 large CPG companies lost nearly three percentage points of market share in America, according to a joint study by the Boston Consulting Group and IRI, a consultancy and data provider, respectively. In emerging markets local competitors are a growing headache for multinational giants. Nestlé, the world's biggest food company, has missed its target of 5-6% sales growth for three years running.

For a time, size gave CPG companies a staggering advantage. Centralising

decisions and consolidating manufacturing helped firms expand margins. Deep pockets meant companies could spend millions on a flashy television advertisement, then see sales rise. Firms distributed goods to a vast network of stores, paying for prominent placement on shelves.

Yet these advantages are not what they once were. Consolidating factories has made companies more vulnerable to the swing of a particular currency, points out Nik Modi of RBC Capital Markets, a bank. The impact of television adverts is fading, as consumers learn about products on social media and from online reviews. At the same time, barriers to entry are falling for small firms. They can outsource production and advertise online. Distribution is getting easier, too: a young brand may prove itself with online sales, then move into big stores. Financing mirrors the same trend: last year investors poured \$3.3 billion into private CPG firms, according to CB Insights, a data firm—up by 58% from 2014 and a whopping 638% since 2011.

Most troublesome, the lumbering giants are finding it hard to keep up with fast-changing consumer markets. Ali Dibadj of Sanford C. Bernstein, a research firm, points out that some consumers in middle-income countries began by assuming Western products were superior. As their economies grew, local players often proved more attuned to shoppers' needs. Since 2004 big emerging economies have seen a surge of local and regional companies, according to data compiled by RBC. In China, for example, Yunnan Baiyao Group accounts for 10% of the toothpaste market, with sales growing by 45% each year since 2004. In Brazil Botica Comercial Farmacêutica sells nearly 30% of perfume. And in India Ghari Industries now peddles more than 17% of detergent.

In America and Europe, the world's biggest consumer markets, many firms have been similarly leaden-footed. If a shopper wants a basic product, he can choose from cheap, store-brand goods from the likes of Aldi and

Walmart. But if a customer wants to pay more for a product, it may not be for a traditional big brand. This may be because shoppers trust little brands more than established ones. One-third of American consumers surveyed by Deloitte, a consultancy, said they would pay at least 10% more for the “craft” version of a good, a greater share than would pay extra for convenience or innovation. Interest in organic products has been a particular challenge for big manufacturers whose packages list such tasty-sounding ingredients as sodium benzoate and Yellow 6.

All this has provided a big opening for smaller firms. In recent years they contributed to a proliferation of new products (see chart). For instance, America now boasts more than 4,000 craft brewers, up by 200% in the past decade. For a sign of the times, look no further than Wilde, which sells snack bars made of baked meat. The bars, revolting to some, may appeal to the herd of weekend triathletes who want to eat like cave men.

Big companies have been trying to respond. One answer is to focus more. In 2014 Procter & Gamble said it would sell off or consolidate about 100 brands, to devote itself to top products such as Gillette razors and Tide detergent. Mondelez, the seller of Oreo biscuits and Cadbury’s chocolate, is spending more to understand who snacks on what, and why.

But the most notable strategy has been to buy other firms and cut costs. 3G, a Brazilian private-equity firm, looms over the industry. It has slashed budgets at Heinz, a 147-year-old company it bought in 2013; then Kraft, which it merged with Heinz in 2015; as well as Anheuser-Busch InBev, a beer behemoth poised to swallow SABMiller. Heinz’s profit margin widened from 18% to 28% in just two years, according to Sanford C. Bernstein.

Big firms are also acquiring or backing smaller rivals. In 2013 two American food companies and a French one—Campbell Soup, Hain Celestial and Danone—each snapped up a maker of organic baby food. Coca-Cola and

Unilever, an Anglo-Dutch titan, have long bought companies outright or invested in them. Both General Mills and Campbell have launched their own venture-capital arms.

Such strategies may eventually make CPG firms even more like big pharmaceutical companies. They may invent few products themselves and instead either acquire small firms or join up with them, then handle marketing, distribution and regulation. That has worked decently well for drugmakers. Yet consumers are more fickle when buying skin cream than a patent-protected cancer drug. A CPG firm may pay a bundle to buy a startup, only to see its products prove a fad. And cutting costs expands margins, but may depress sales.

Despite such conundrums, executives remain bullish. Tim Cofer, Mondelez's chief growth officer, maintains that wise cuts and reinvestment will position the firm well. "This is about the scale of a \$30 billion global snacking powerhouse," he declares, "and at the same time the speed, the agility, the dexterity" of a startup.

Others are gloomier. EY, a consultancy, recently surveyed CPG executives. Eight in ten doubted their company could adapt to customer demand. Kristina Rogers of EY posits that firms may need to rethink their business, not just trim costs and sign deals. "Is the billion-dollar brand," she wonders, "still a robust model?" ■



消费品

抢瓶者的入侵

体量较小的对手正在攻击世界最大的品牌

它们生产的是世界上最受欢迎的产品，它们的标志人们一眼便能认出，它们的广告歌也已印在了消费者的脑海中。对投资者而言，它们能在动荡的时代保证稳定的回报。它们的规模似乎也在日益壮大：6月30日，亿滋国际（Mondelez International）出价230亿美元竞购好时公司（Hershey），以打造世界最大的糖果公司；7月7日，世界最大的酸奶制造商达能同意斥资125亿美元收购天然食品生产商WhiteWave Foods。然而，对于通用磨坊（General Mills）、雀巢、宝洁和联合利华在内的包装消费品巨头来说，危机已悄然出现。正如一位高管一度坦言所说的那样：“我们算是被搞惨了。”

为了了解他们面临的问题，不妨以丹尼尔·鲁比兹基（Daniel Lubetzky）为例。他从在健康食品店推销由水果和坚果制成的营养棒起家，如今他的KIND营养棒已无处不在，机场和沃尔玛的货架上都摆得满满当当。或是看看迈克尔·杜宾（Michael Dubin）和马克·莱文（Mark Levine），他们受够了昂贵的剃须刀，5年前开始直接将便宜的剃须刀送货上门。他们的Dollar Shave Club如今控制着美国剃须刀市场5%的份额。

这类故事数不胜数。波士顿咨询公司和数据供应商IRI的一项联合研究报告显示，2011年至2015年间，大型包装消费品公司在美国失去了近3%的市场份额。在新兴市场上，本地竞争对手让跨国巨头们愈发头痛。世界最大的食品公司雀巢已经连续三年未能实现销售额增长5%到6%的目标了。

规模曾给予包装消费品企业惊人的优势。集中化决策及整合制造能力帮助企业提高了利润。鼓鼓的钱包意味着这些企业可以为制作一则花哨的电视广告斥资百万，然后坐等销售额上升。公司将产品分销至庞大的商店网络，通过付费使产品置于货架的显眼位置。

然而这些优势已成过眼云烟。投行RBC Capital Markets的尼克·莫迪（Nik Modi）指出，整合工厂让企业更容易受到某种货币汇率波动的影响。电视广告的影响正在减弱，因为消费者会通过社交媒体和网上的点评来了解产品。同时，小企业进入市场的门槛越来越低。它们可以将生产外包并在网络投放广告。分销也变得容易多了：一个年轻品牌可以先通过网上销售站稳脚跟，然后再进驻大商店。融资也呈现出相同的趋势：数据公司CB Insights的数据显示，去年投资者为私人包装消费品企业注入了33亿美元，较2014年上升了58%，自2011年以来更是剧增638%。

最令人担忧的是，行动迟缓的巨头们越来越难以跟上快速变化的消费品市场。盛博研究公司（Sanford C. Bernstein）的阿里·迪巴贾（Ali Dibadj）指出，中等收入国家里的一些消费者最初会认为西方的产品更上档次。随着这些国家经济的发展，本土企业经常能更好地迎合消费者的需求。RBC编制的数据显示，自2004年以来，大型新兴经济体中涌现出大量本土和地区性企业。以中国为例，云南白药集团占领了10%的牙膏市场，2004年至今年均销售额增幅达45%。巴西的Botica Comercial Farmacêutica销售了市场上近30%的香水，印度的Ghari Industries则占据了洗涤剂市场17%以上的份额。

在美国和欧洲这两个世界最大的消费品市场，很多企业同样步履维艰。如果消费者想买一个基本产品，他可以选择阿尔迪（Aldi，德国最大的连锁超市）和沃尔玛这类超市供应的廉价自有品牌。但如果他愿意付更多的钱，他未必就会选择传统大品牌。这可能是因为相较于已成名的品牌，消费者更信任小品牌。咨询公司德勤调查的美国消费者中有三分之一的人表示，相比便捷或创新，他们更愿意为某种产品的“手工”版多付至少10%的价钱。人们对有机产品的兴趣对大型制造企业来说尤其是一个挑战，它们在包装上罗列出的诸如苯甲酸钠和黄色6号等成分听起来还真诱人呢。

所有这些都为小企业开启了大门。近年来，它们对新产品数量的爆发式增长贡献良多（见图表）。比方说，美国如今拥有4000多个手工酿酒企业，在过去十年里增长了200%。想为时代把脉，只需看看销售肉干零食

的Wilde公司。这些肉干会让有些人觉得恶心，但却为周末参加铁人三项、要像原始人一样狼吞虎咽的人群所欢迎。

大企业一直试图应对市场的变化。一种做法是要更为专注。2014年宝洁宣布将出售或整合约100个品牌，以专心发展其高端产品，如吉列剃须刀和汰渍洗涤剂。销售奥利奥饼干和吉百利巧克力的亿滋国际也投入更多的资金来分析什么样的人出于何种原因在吃哪些零食。

然而一直以来收效最为显著的策略还是收购其他公司和降低成本。巴西私募公司3G在食品行业雄霸一方。它于2013年收购了有着147年历史的亨氏集团，现已大幅削减其预算。2015年它将卡夫（Kraft）与亨氏合并，接着也削减了卡夫的预算；被削减预算的还有啤酒巨头百威英博（Anheuser-Busch InBev），它意图吞并另一家啤酒企业萨博米勒（SABMiller）。盛博的数据显示，亨氏的利润仅在过去两年中就从18%提升至28%。

大企业也在收购或投资规模较小的竞争对手。2013年，美国食品企业金宝汤（Campbell Soup）和Hain Celestial及法国企业达能分别吞并了一家有机婴儿食品制造商。可口可乐和英荷巨头联合利华一直都是要么直接收购公司，要么对其投资。通用磨坊和金宝汤都设立了各自的风险投资部门。

这些战略最终也许会使包装消费品企业变得更像大型制药公司。它们可能只会亲自研发少量新品，转而收购或者投资小公司，然后负责其产品的营销、分销和监管。这种模式对制药企业来说一直运作良好。然而消费者在选择护肤品时比购买受专利保护的抗癌药时要易变得多。一家包装消费品企业可能花费大把银子收购了一家创业公司，结果其产品可能也就是昙花一现。降低成本可以扩大利润，但也可能打压销售。

尽管面临各种难题，高管们依然信心不减。亿滋国际的首席发展官蒂姆·科弗（Tim Cofer）坚持认为，明智的成本削减和再投资会让公司稳住阵脚。科弗宣称，“我们可是一个年收入超过300亿美元的世界零食巨头，同时还具备（创业公司的）速度、敏捷和灵活。”

其他人则要悲观许多。咨询公司安永最近对包装消费品高管做了一项调查。八成受访者怀疑其公司是否有能力去适应消费者的需求。安永的克里斯蒂娜·罗杰斯（Kristina Rogers）认为企业可能需要重新思考其业务，而不仅是去削减成本、忙于并购。她提出了一个问题：“十亿美元品牌的模式仍然站得住脚吗？” ■



India's diaspora

A model minority

How Indians triumphed in America

IN THE early 20th century just a few hundred people emigrated from India to America each year and there were only about 5,000 folk of Indian heritage living in the United States. That was more than enough for some xenophobes. A government commission in 1910 concluded that Indians were “the most undesirable of all Asiatics” and that the citizens of America’s west coast were “unanimous in their desire for exclusion”.

Today Indian-born Americans number 2m and they are probably the most successful minority group in the country. Compared with all other big foreign-born groups, they are younger, richer and more likely to be married and supremely well educated. On the west coast they are a mighty force in Silicon Valley; well-off Indians cluster around New York, too. “The Other One Percent” is the first major study of how this transformation happened. Filled with crunchy analysis, it exudes authority on a hugely neglected subject.

India’s diaspora is vast, with 20m-30m people spread across the world from the Caribbean to Kenya. In colonial times many moved as labourers after Britain abolished slavery in 1833, to build the east African railway, for example. In the 1970s a second wave of workers went to the Gulf during the oil boom. Perhaps the least well known flow of Indians abroad is the one to America. It picked up after 1965, when American immigration rules were relaxed, and surged after 1990. Three-quarters of the Indian-born population in America today arrived in the last 25 years.

Like all immigrant groups, Indians have found niches in America’s vast economy. Half of all motels are owned by Indians, mainly Gujaratis.

Punjabis dominate the franchises for 7-Eleven stores and Subway sandwiches in Los Angeles. The surge in Indians moving to America is also intimately linked to the rise of the technology industry. In the 1980s India loosened its rules on private colleges, leading to a large expansion in the pool of engineering and science graduates. Fear of the “Y2K” bug in the late 1990s served as a catalyst for them to engage with the global economy, with armies of Indian engineers working remotely from the subcontinent, or travelling to America on workers’ visas, to make sure computers did not fail at the stroke of midnight on December 31st 1999.

Today a quarter or more of the Indian-born workforce is employed in the tech industry. In Silicon Valley neighbourhoods such as Fremont and Cupertino, people of Indian origin make up a fifth of the population. Some 10-20% of all tech start-ups have Indian founders; Indians have ascended to the heights of the biggest firms, too. Satya Nadella, Microsoft’s boss, was born in Hyderabad. Sundar Pichai, who runs Google, the main division of the firm Alphabet, hails from Tamil Nadu.

The authors of “The Other One Percent” have been careful to avoid the trap of explaining Indians’ success in America through their particular culture. Instead they argue it is “at its core a selection story”. Indians cannot walk across a border to America. Because of the filters of caste, class and a fiercely competitive education system, only those with above average financial and human capital get the chance to move to America. Most have travelled either as students or holders of H1-B working visas, which require a university degree, and then acquire residency. This visa system acts as a further filter.

Despite the light that the authors’ data-driven approach casts on this little-known story, there are some disadvantages. One is that it leaves little scope for exploring the dark side of India’s diaspora. Readers keen to peek at the underbelly should buy “The Billionaire’s Apprentice”, by Anita Raghavan,

which was published in 2013. It is a brilliant account of the insider-trading ring that led to the downfall of Rajat Gupta, the former boss of McKinsey, a consulting firm. Fittingly he was pursued by a much-admired prosecutor of Indian descent.

But the authors do touch on the most fascinating question of all: how this gilded corner of the diaspora influences India itself. Diplomatic relations between the two giant democracies have long been testy. But in other realms the bond has grown closer. The stars at the pinnacle of American society are celebrated back in India alongside rather un-American figures such as spin-bowling masters and Bollywood maidens. The American-educated children of India's governing elite probably helped push India to open up its economy in 1991. The tens of billions of dollars of income earned in America by India's big technology firms is crucial for its balance of payments. And a new generation of entrepreneurs who have led a boom in e-commerce in India in the last five years are almost all American educated, or have worked for American technology firms.

If, under its new president, America clamps down on immigration, the mutually beneficial movement of Indians will surely slow—they were the largest group of new immigrants in 2014, exceeding even arrivals from China and Mexico. That will be a loss, both to America and to India. In this new era of populism, “The Other One Percent” is a rigorous, fact-based analysis of how cross-border flows of brainy and ambitious people make the world a better place. Politicians and policymakers in both America and in India should make sure they read it. ■



印度移民

模范少数族裔

印度人如何在美国获得成功

20世纪初，每年只有几百人从印度移民美国，生活在美国的印度裔仅有5000人左右。但这个数字对一些仇外人士来说已经不少了。一个政府委员会在1910年得出结论：印度人是“最不受欢迎的亚洲人”，且美国西海岸的公民“一致希望驱逐他们”。

今天，出生于印度的美国人有200万，他们可能是美国最成功的少数族裔。与其他所有生于外国的主要族裔相比，他们更年轻、更富有，已婚比例更高，并受过极好的教育。在西海岸，他们是硅谷的一股强大力量，而在纽约周边也聚集着富有的印度人。《另外百分之一》（The Other One Percent）是对这种转变的由来所做的第一项大型研究，充满了详实的分析，在这个被严重忽略的课题上尽显权威。

印度移民人数众多，从加勒比到肯尼亚，全世界有2000到3000万印度移民分布各地。在殖民时期，许多印度人在1833年英国废除奴隶制之后作为劳动力移居海外，例如参与建造东非铁路的那些印度人。20世纪70年代，第二波移民工人在石油繁荣时期涌向了波斯湾。印度人移民美国的情况也许最不为人知。移民美国的人数在1965年美国放松移民规则之后开始增加，并在1990年以后飙升。如今，出生于印度的美国居民中有四分之三是在过去25年里移民而来的。

与所有移民群体一样，印度人在美国庞大的经济中找到了自己的位置。美国的汽车旅馆有一半为印度人所有，他们主要来自古吉拉特邦。来自旁遮普地区的印度人则经营着洛杉矶大多数的7-Eleven加盟便利店和赛百味三明治店。印度人涌入美国的浪潮也与科技产业的兴起密切相关。20世纪80年代，印度放松了对私立大学的规定，使得理工科毕业生人数激增。20世纪90年代后期对“千年虫”的恐惧推动这些毕业生融入全球经济——大批的印度工程师要么在次大陆远程工作，要么持工作签证前往美国，以确

保在1999年12月31日午夜时钟敲响时计算机不会瘫痪。

今天，美国出生于印度的劳动力中有四分之一或更多的人在科技行业工作。在硅谷的弗里蒙特（Fremont）和库比蒂诺（Cupertino）等地区，印度裔人口占总人口的五分之一。大约10%到20%的科技创业公司有印度裔创始人，有些印度人还登上了最大型公司的高层之位。微软的老板萨蒂亚·纳德拉（Satya Nadella）出生在海德拉巴。Alphabet主要子公司谷歌的CEO桑达尔·皮查伊（Sundar Pichai）则来自泰米尔纳德邦（Tamil Nadu）。

《另外百分之一》的作者小心避免了常见的陷阱，即从印度独特的文化这一角度来解释印度人在美国的成功。相反，他们认为这种成功的“核心就是一个筛选过程”。印度与美国不接壤，人们并不能直接穿越边境到美国。由于种姓制度、阶级分化和竞争激烈的教育制度的筛选，只有具备高于平均水平的财力和工作能力的人才有机会迁移到美国。大多数人都是持学生签证或是拥有大学学位才能获得的H1-B工作签证入境，然后获得居留权。这一签证制度起到了进一步过滤的作用。

尽管作者通过数据分析的方法让人们了解了印度移民鲜为人知的成功故事，但本书还是存在一些不足。一是它几乎没有花什么笔墨来探索印度移民的黑暗面。渴望一窥故事另一面的读者应该购买2013年出版、由阿妮塔·拉加万（Anita Raghavan）所著的《亿万富翁的学徒》（The Billionaire's Apprentice）。这本书精彩地讲述了内幕交易圈的故事，咨询公司麦肯锡前老板拉贾特·古普塔（Rajat Gupta）正是因此下台入狱。对他提出起诉的是一位备受尊崇的检察官，也是印度裔。

但作者确实触及了一个最引人深思的问题：这些光鲜的印度移民是如何影响印度本国的。美印两大民主国家之间的外交关系长期以来一直颇为紧张。但在其他领域，两国间的联系已越来越紧密。那些在美国社会里地位崇高的印度名人在印度国内就和板球大师及宝莱坞美女等完全非美国的形象一样受到追捧。印度政界精英的孩子在美国接受教育，很可能是他们在1991年帮助推动了印度经济的开放。印度大型科技公司在美国所获的数百

亿美元收入对印度的国际收支也至关重要。过去五年里引领印度电子商务蓬勃发展的新一代企业家几乎都受过美国的教育，或在美国科技公司工作过。

如果新总统上任后美国收紧移民政策，令美印双方互利的印度移民潮肯定会放缓——印度人是2014年最大的新移民群体，人数甚至超过来自中国和墨西哥的移民。这对美国和印度都将是损失。在这个新的民粹主义时代，《另外百分之一》是一本论述严谨、以事实为依据的书，分析了富有头脑和雄心的跨国移民如何让世界变得更好。美国和印度的政客和政策制定者都应该好好读读。 ■



2016 in charts

The year of Brexit and Trump

Despite the Brexit vote, growth in Britain outpaced the euro area, again. America's steady recovery continued, while Japan's faltered. China's slowdown was stately.

After staying steady for months as fewer of the unemployed left the labour force, America's unemployment rate is falling again. In the euro area, it remains close to 10%.

In America, annual consumer-price inflation approached 2%. Elsewhere too, higher oil prices and a stronger dollar nudged prices up, though Japan still flirts with deflation.

Some analysts declared an end to the 30-year bull market in government bonds as yields picked up at last, most notably after Donald Trump's election victory. They may be premature.

The oil price spiked after OPEC in November agreed to cut output. Gold's advance was stemmed by the American election. China's economic resilience bolstered the copper price.

It was a good year for investors in emerging-market equities, and in America, especially after Donald Trump's victory. Foreign investors in British equities were hit by the weak pound.

The pound was pummelled by Brexit; the dollar boosted by expectations of

the Trump presidency. China spent some of its reserves to slow the yuan's depreciation against the dollar.

The Donald Trump effect thumped the Mexican peso. Other emerging-market currencies flailed, including Turkey's and Malaysia's. The oil-reliant rouble bucked the trend.

To catch holders of "black money", first India and then Venezuela courted chaos by cancelling high-denomination banknotes. The Venezuelan bolívar was already worthless.





图说2016

英国脱欧和特朗普之年

尽管英国发生脱欧公投，英国的增长率仍再次超过欧元区。美国仍保持稳定回升，而日本则蹒跚前行。中国经济放缓引人瞩目。

因为越来越少失业者彻底离开劳动力队伍，美国失业率保持了数月的稳定，现在失业率再次下降。欧元区失业率维持在近10%。

美国年消费者价格通货膨胀率接近2%。在其他地区，油价上涨和美元走强也同样推高了价格。而日本仍处在通货紧缩边缘。

一些分析人士称政府债券长达30年的牛市已结束，因收益率终于上升，且在特朗普当选后上升最为显著。他们的结论可能为时过早。

11月欧佩克同意减产后油价猛涨。黄金涨势被美国大选遏制。中国经济回升助力铜价上涨。

对于新兴市场股票的投资者来说，今年是个好年头，在美国也是如此，尤其是在特朗普获胜后。英国股票的外国投资者因英镑疲软而遭受打击。

受英国脱欧影响，英镑持续下跌；对特朗普执政的期望推高了美元。中国动用了部分外汇储备以减缓人民币对美元的贬值。

特朗普效应重创了墨西哥比索。其他新兴国家货币则震荡下行，包括土耳其里拉和马来西亚林吉特。而依赖石油的卢布则逆势上扬。

为了抓住持有“黑钱”的人，印度和委内瑞拉先后废止了高面值纸币，因而引发混乱。委内瑞拉波利瓦尔已一文不值。





Oil

Breaking the habit

The world's use of oil is approaching a tipping-point, writes Henry Tricks. But don't expect it to end imminently

AT THE TURN of the 20th century, the most malodorous environmental challenge facing the world's big cities was not slums, sewage or soot; it was horse dung. In London in 1900, an estimated 300,000 horses pulled cabs and omnibuses, as well as carts, drays and haywains, leaving a swamp of manure in their wake. The citizens of New York, which was home to 100,000 horses, suffered the same blight; they had to navigate rivers of muck when it rained, and fly-infested dungheaps when the sun shone. At the first international urban-planning conference, held in New York in 1898, manure was at the top of the agenda. No remedies could be found, and the disappointed delegates returned home a week early.

Yet a decade later the dung problem was all but swept away by the invisible hand of the market. Henry Ford produced his first Model T, which was cheap, fast and clean. By 1912 cars in New York outnumbered horses, and in 1917 the last horse-drawn streetcar was retired in Manhattan. It marked the moment when oil came of age.

That age has been one of speed and mostly accelerating progress. If coal drove the industrial revolution, oil fuelled the internal-combustion engine, aviation and the 20th-century notion that mankind's possibilities are limitless; it flew people to the Moon and beyond. Products that have changed lives—from lipstick to CD players, from motorcycle helmets to aspirin—contain petrochemicals. The tractors and fertilisers that brought the world cheaper food, and the plastics used for wrapping, are the progeny of petroleum products.

Oil has changed history. The past 100 years have been pockmarked with oil wars, oil shocks and oil spills. And even in the 21st century its dominance remains entrenched. It may have sped everything else up, but the rule of thumb in energy markets is that changing the fuel mix is a glacial process (see chart). Near its peak at the time of the Arab oil embargo in 1973, oil accounted for 46% of global energy supply. In 2014 it still had a share of 31%, compared with 29% for coal and 21% for natural gas. Fast-growing rivals to fossil fuels, such as wind, solar and geothermal energy, together amounted to little more than 1%.

| *Horses for courses*

Yet the transition from horse power to horsepower, a term coined by Eric Morris of Clemson University, South Carolina, is a useful parable for our time. A hundred years ago oil was seen as an environmental saviour. Now its products are increasingly cast in the same light as horse manure was then: a menace to public health and the environment.

For all its staying power, oil may be facing its Model T moment. The danger is not an imminent collapse in demand but the start of a shift in investment strategies away from finding new sources of oil to finding alternatives to it. The immediate catalyst is the global response to climate change. An agreement in Paris last year that offers a 50/50 chance of keeping global warming to less than 2° C above pre-industrial levels, and perhaps limiting it to 1.5° C, was seen by some as a declaration of war against fossil fuels.

That agreement has been thrown into doubt by the election of Donald Trump, who has dismissed climate change as a “hoax”, as America’s next president. But if big energy consumers such as the EU, China and India remain committed to curbing global warming, all fossil fuels will be affected. The International Energy Agency (IEA), a global forecaster, says that to come close to a 2° C target, oil demand would have to peak in 2020 at

93m barrels per day (b/d), just above current levels. Oil use in passenger transport and freight would plummet over the next 25 years, to be replaced by electricity, natural gas and biofuels. None of the signatories to the Paris accord has pledged such draconian action yet, but as the costs of renewable energy and batteries fall, such a transition appears ever more inevitable. “Whether or not you believe in climate change, an unstoppable shift away from coal and oil towards lower-carbon fuels is under way, which will ultimately bring about an end to the oil age,” says Bernstein, an investment-research firm.

Few doubt that the fossil fuel which will suffer most from this transition is coal. In 2014 it generated 46% of the world’s fuel-based carbon-dioxide emissions, compared with 34% for oil and 20% for natural gas. Natural gas is likely to be the last fossil fuel to remain standing, because of its relative cleanliness. Many see electricity powered by gas and renewables as the first step in an overhaul of the global energy system.

This special report will focus on oil because it is the biggest single component of the energy industry and the world’s most traded commodity, with about \$1.5trn-worth exported each year. Half of the *Global Fortune 500*’s top ten listed companies produce oil, and unlisted Saudi Aramco dwarfs them all. Oil bankrolls countries that bring stability to global geopolitics as well as those in the grip of tyrants and terrorists. And its products fuel 93% of the world’s transport, so its price affects almost everyone.

Since the price of crude started tumbling in 2014, the world has had a glimpse of the havoc a debilitated oil industry can cause. When oil fell below \$30 a barrel in January this year, stockmarkets predictably plummeted, oil producers such as Venezuela and Nigeria suffered budget blowouts and social unrest, and some American shale companies were tipped into bankruptcy. But there have been positive effects as well. Saudi

Arabia has begun to plan for an economy less dependent on oil, and announced it would partially privatise Aramco. Other Middle Eastern producers have enthusiastically embraced solar power. Some oil-consuming countries have taken advantage of low oil prices to slash fuel subsidies.

Western oil companies have struggled through the crisis with a new cross to bear as concerns about global warming become mainstream. In America the Securities and Exchange Commission and the New York attorney-general's office are investigating ExxonMobil, the world's largest private oil company, over whether it has fully disclosed the risks that measures to mitigate climate change could pose to its vast reserves. Shareholders in both America and Europe are putting tremendous pressure on oil companies to explain how they would manage their businesses if climate-change regulation forced the world to wean itself off oil. Mark Carney, the governor of the Bank of England, has given warning that the energy transition could put severe strains on financial stability, and that up to 80% of fossil-fuel reserves could be stranded. The oil industry's rallying cry, "Drill, baby, drill!" now meets a shrill response: "Keep it in the ground!"

| *Which peak?*

This marks a huge shift. Throughout most of the oil era, the biggest concern has been about security of energy supplies. Colonial powers fought wars over access to oil. The Organisation of Petroleum Exporting Countries (OPEC) cartel was set up by oil producers to safeguard their oil heritage and push up prices. In the 20th century the nagging fear was "peak oil", when supplies would start declining. But now, as Daniel Yergin, a Pulitzer-prizewinning oil historian, puts it: "There is a pivot away from asking 'when are we going to run out of oil?' to 'how long will we continue to use it?'" For "peak oil", now read "peak demand".

Oil to fuel heavy-goods vehicles, aeroplanes and ships, and to make

plastics, will be needed for many years yet. But from America to China, vehicle-emissions standards have become tougher, squeezing more mileage out of less fuel. Air pollution and congestion in big cities are pushing countries like China and India to look for alternatives to petrol and diesel as transport fuels. Car firms like Tesla, Chevrolet and Nissan have announced plans for long-range electric vehicles selling, with subsidies, for around \$30,000, making them more affordable. And across the world the role of energy in GDP growth is diminishing.

Analysts who think that the Paris accords will mark a turning point in global efforts to reduce carbon-dioxide emissions say global oil consumption could start to wane as early as the 2020s. That would mean companies would have to focus exclusively on easy-to-access oil such as that in the Middle East and America's shale-oil provinces, rather than expensive, complex projects with long payback periods, such as those in the Arctic, the Canadian oil sands or deep under the ocean.

Yet many in the industry continue to dismiss talk of peak demand. They do not believe that governments have the political will to implement their climate goals at anything like the speed the Paris agreement envisages. In America they ridicule the idea that a nation built around the automobile can swiftly abandon petrol. And Khalid Al-Falih, Saudi Arabia's energy minister, estimates that the world will still need to invest in oil to the tune of almost \$1trn a year for the next 25 years. Oil veterans point out that even if global oil consumption were to peak, the world would still need to replace existing wells, which deplete every year at the rate of up to 5m b/d—roughly the amount added by America's shale revolution in four years. Demand will not suddenly fall off a cliff.

A number of big oil companies accept that in future they will probably invest less in oil and more in natural gas, as well as in renewable energy and batteries. Rabah Arezki, head of commodities at the IMF, says the world

may be “at the onset of the biggest disruption in oil markets ever”.

This report will argue that the world needs to face the prospect of an end to the oil era, even if for the moment it still seems relatively remote, and will ask three central questions. Will the industry as a whole deal with climate change by researching and investing in alternatives to fossil fuels, or will it fight with gritted teeth for an oil-based future? Will the vast array of investors in the oil industry be prepared to take climate change on board? And will consumers in both rich and poor countries be willing to forsake the roar of a petrol engine for the hum of a battery? ■



石油

打破习惯

亨利·特里克斯写道，世界对石油的使用正在接近一个临界点。但是，别指望它会马上终结

在人类刚刚进入20世纪时，全球各大城市面临的带来最多恶臭的环境挑战不是贫民窟、污水或煤灰，而是马粪。在1900年的伦敦，大约有30万匹马拉着出租车和公共马车，还有运货车、平板车和干草车，身后留下滩滩马粪。纽约有10万匹马，市民也忍受着同样的问题——他们不得不在雨天蹚过遍地横流的污水，在晴天穿过蚊蝇飞舞的粪堆。在1898年于纽约举行的第一次国际城市规划会议上，粪便是头号议程。人们对此束手无策，失望的与会代表提前一周打道回府。

然而十年后，粪便问题几乎被市场的无形之手一扫而空。亨利·福特生产了第一款T型车，便宜、快捷而且干净。到了1912年，纽约的汽车数量已经超过了马匹，最后一辆马拉街车于1917年在曼哈顿退役。这是石油成熟的标识。

那是一个速度的年代，一个大部分时间都在加速发展的年代。如果说煤炭推动了工业革命，石油则带来了内燃机、航空，以及一种20世纪的新的信念——人类拥有无限的可能性。它让人类飞向了月球甚至更远的地方。从口红到CD播放器，从摩托车头盔到阿司匹林，改变了人类生活的许多产品都含有石化产品。拖拉机和化肥给世界带来了更廉价的食物，用于包装的塑料也是石油产品的恩赐。

石油已经改变了历史。过去的100年充满了石油战争、石油危机和石油泄漏的印迹。即使在21世纪，石油的主导地位依然根深蒂固。它可能曾让所有其他东西都加速发展，但能源市场有一条经验法则，即改变燃料结构就像是冰川融化般缓慢（见图表）。石油在全球能源供应中的占比在1973年阿拉伯石油禁运时达到46%的顶峰。2014年它仍然有31%的份额，相比之下，煤占29%，天然气占21%。化石燃料那些快速增长的竞争者，比如风

能、太阳能和地热能，加起来也比1%多不了多少。

| 各得其所

然而，“从马力到马力”的转变——这个由南卡罗来纳州克莱姆森大学的埃里克·莫里斯（Eric Morris）创造的说法，正是我们这个时代的缩影。一百年前，石油被视为环境救星。现在，石油产品愈发沦落为和当时马粪一样的角色——对公众健康和环境的一种威胁。

尽管经久不衰，石油也可能会面临和T型车同样的时刻。危险不在于需求会马上崩盘，而是投资策略正在从寻找新的石油来源转变为寻找石油的替代品。眼前的催化剂是全世界对于气候变化的反应。去年在巴黎达成的协议带来了一个五五开的机会，要将全球变暖限制在不超过工业化前 2°C ，甚至可能是 1.5°C 的水平。这被一些人视为对化石燃料宣战的标志。

随着将气候变化斥为“骗局”的唐纳德·特朗普当选为美国下一任总统，该协议已经遭到了质疑。但是，如果欧盟、中国和印度等能耗大户继续致力于遏制全球变暖，所有化石燃料都会受到影响。全球性预测机构国际能源署（IEA）称，为接近达成控制变暖在 2°C 的目标，石油需求应该在2020年达到每天9300万桶的峰值，而这仅略高于目前的水平。客运和货运的石油用量将在未来25年中直线下降，而被电力、天然气和生物燃料替代。尚未有任何一个巴黎协议签约国承诺做出如此严厉的行动，但随着可再生能源和电池成本下降，这样的转变似乎越来越不可避免。“无论你是否相信气候变化，一场从煤炭和石油转向低碳燃料的不可阻挡的转变正在发生，并将最终导致石油时代的结束。”投资研究公司伯恩斯坦（Bernstein）如是说。

很少有人怀疑，在这场转变中受影响最大的化石燃料会是煤。2014年，煤产生了全球因燃料带来的二氧化碳排放中的46%，而石油占34%，天然气占20%。天然气很可能是坚持到最后的化石燃料，因为它相对清洁。许多人认为，天然气和可再生能源发电将是全球能源体系全面改革的第一步。

本特刊将专注于石油，因为它是能源行业最大的组成部分，也是世界上交

易量最大的大宗商品，每年出口价值约1.5万亿美元。《财富》全球500强排名前十的上市公司中有一半生产石油，而未上市的沙特阿美公司（Saudi Aramco）让它们全都相形见绌。石油收入支撑了给全球地缘政治带来稳定的国家，也支撑了那些掌握在暴君和恐怖分子手中的国家。石油产品驱动着全球93%的交通运行，所以它的价格几乎影响着每一个人。

自原油价格从2014年开始下跌以来，世界已经隐隐见到了萎靡不振的石油行业可能带来的浩劫。当油价在今年一月跌破每桶30美元时，股市如预想般暴跌，委内瑞拉和尼日利亚等产油国遭遇预算井喷和社会动荡，一些美国页岩公司随之破产。但这也带来了一些积极的影响。沙特阿拉伯已经开始筹划减少经济对石油的依赖，并宣布将把阿美公司部分私有化。其他中东产油国已热情拥抱太阳能发电。一些石油消费国则趁油价低迷削减燃料补贴。

随着对全球变暖的担忧成为主流，西方石油公司挣扎着度过了危机，却又要背上新的负担。在美国，证券交易委员会和纽约州总检察长办公室正在调查世界上最大的私营石油公司埃克森美孚，看它是否充分披露了减缓气候变化的措施可能对其庞大储备带来的风险。美国和欧洲的股东都对石油公司大量施压，要求它们解释若气候变化的监管迫使世界戒断石油，它们将如何管理自己的业务。英格兰银行行长马克·卡尼（Mark Carney）警告说，能源转型可能会对金融稳定带来巨大压力，化石燃料储量中最多可能有80%被弃置不用。石油行业的振臂高呼“钻吧宝贝，钻！”现在遇到了一个尖锐的回应：“把它留在地下！”

| 哪种峰值？

这标志着一个巨大的转变。在石油时代的大多数时候，最大的担忧是能源供应的安全。殖民国家为了获取石油而发动战争。产油国成立了卡特尔——石油出口国组织（OPEC），以保障其石油家当并推高价格。20世纪挥之不去的恐惧是“石油产量达到峰值”后供应将开始下降。而现在，正如普利策奖得主、石油历史学家丹尼尔·耶金（Daniel Yergin）所说：“关注的重点从问‘油什么时候用光？’转为问‘我们还会用多久？’”“石油产量峰值”现在的意思变成了“需求峰值”。

在未来很多年，人们还会用石油来驱动重型货车、飞机和船舶以及制造塑料。但从美国到中国，汽车排放标准已经变得更为严苛，要从更少的燃料中抠出更多的里程。大城市中的空气污染和拥堵正在推动中国和印度等国寻找汽油和柴油的替代品作为交通燃料。特斯拉、雪佛兰和日产等汽车公司已经公布了以补贴后大约30,000美元的价格销售长程型电动车的计划，让它们变得更实惠。在世界各地，能源在GDP增长中的作用正在减弱。

一些分析师认为巴黎协定将标志着全球减少二氧化碳排放的工作步入转折点。他们表示，全球石油消费量可能最早在21世纪20年代开始下降。这将意味着公司将不得不专攻易于开采的石油，比如中东和美洲页岩油省份的石油，而不去开采那些昂贵而复杂、回报周期很长的项目，如北极、加拿大油砂或深海石油。

然而，不少业内人士继续对需求顶峰的说法嗤之以鼻。他们不相信各国政府有以巴黎协定设想的速度履行气候目标的政治意愿。在美国，他们嘲笑这个车轮上的国家能够迅速放弃汽油的想法。沙特阿拉伯能源部长卡立德·法利赫（Khalid Al-Falih）估计，在未来25年，全球仍然需要每年在石油上投资将近1万亿美元。资深石油人士指出，即使全球石油消费量快要达到顶峰，世界上仍有替换现有油井的需求，因为这些油井每年在以高达每天500万桶的速度消耗着——大约是美国页岩革命四年来增加的总量。需求并不会断崖式下跌。

许多大石油公司都承认，今后它们可能会较少投资于石油，而更多投资于天然气以及可再生能源和电池。IMF大宗商品主管拉巴·阿尔扎基（Rabah Arezki）表示，世界可能“快要出现石油市场有史以来最大的动荡”。

本期特刊将论证，即使石油时代的终结在现在看来似乎还比较遥远，世界也仍需要面对这种预期。我们还将提出三个核心问题：整体而言，石油行业是会通过研究和投资于化石燃料的替代品来应对气候变化，还是会咬紧牙关奋力争取一个仍然基于石油的未来？石油行业的庞大投资者群体会不会做好将气候变化提上日程的准备？无论在富裕还是贫穷国家，消费者愿

不愿意抛弃汽油发动机的轰鸣，换来电池的嗡嗡声？ ■



Producers

On the oil wagon

The industry is already suffering upheaval, but part of it is in denial

SOME CALL IT “Texarabia”. In Midland, West Texas, every bare 40-acre plot of land appears to have a pumping unit on it, drawing oil from the shale beds of the Permian Basin up to 12,000 feet (3,700 metres) below. One is toiling away in the car park of the West Texas Drillers, the local football team. The Permian Basin Petroleum Museum, on the edge of town, has an exhibition of antique “nodding donkeys” dating back to the 1930s. In a lot behind them a working one is gently rising and falling.

Drive 20 miles north, though, and the pumpjacks are overshadowed by hundreds of wind turbines whirring above them (see picture). In fields of cotton, shimmering white in the early-autumn sun, it is a glimpse of the shifting contours of the energy landscape.

You might think hardened oilmen would resent the turbines pointing the way to a future when the world no longer needs fossil fuels. But Joshua Johnson, who manages a string of oil leases in the area and proudly shows your correspondent the lustrous crude he stores in 500-barrel oil batteries, sees things differently, saying: “I think these new technologies are a wonderful thing.” In his view, renewable energy will be a vital complement to oil as the world’s demand for energy increases. But he dismisses global warming: “It’s always been hotter ’n hell here.”

The Permian Basin is oil’s latest frontier, and it is in the throes of a mini-investment boom, despite the deepest downturn in the oil market since the 1990s. The number of rigs has increased by 60% since May, whereas in other shale basins in America it has crept up only slightly. The hydraulic fracturing, or fracking, from wells that are drilled is picking up; around

Midland the sight of big red lorries gathered around a wellbore like circus wagons, pumping in fluid and sand at high pressure, has become more familiar again (though the amount of drilling is still less than half its level at the peak in 2014).

So far this year Wall Street has provided funding of more than \$20bn to American oil companies, mostly to acquire assets and frack them in the Permian. Some think that the prospects have been overhyped, but not Scott Sheffield, boss of Pioneer Natural Resources, one of the area's largest producers. He reckons that the Permian, made up of many layers of oil-bearing rock 250m years old, may have as much recoverable oil as Saudi Arabia's Ghawar field, source of more than half the kingdom's oil riches. That is probably wishful thinking, but it suggests that morale in America's oil industry is recovering after the price crash.

The Permian's story is an example of how a mixture of luck, geology, technology, law and true grit can keep on delivering oil in copious quantities. Such discoveries appear to settle the industry's perennial question about how soon the stuff will run out. In his recent book, "Market Madness: A Century of Oil Panics, Crises and Crashes," Blake Clayton catalogues four eras when the world panicked about "peak oil". The first was the emergence of the motor car, when oil prices started to soar. The second coincided with the second world war. The third was in the 1970s, when OPEC drove up the price of oil. The fourth began in the mid-2000s as oil began its rise to \$140 a barrel. Yet the Jeremiahs have always been proved wrong. M. King Hubbert, the doyen of peak-oilers, predicted back in 1956 that global oil supply would never exceed 33m b/d. It is currently 97m b/d. According to BP, a British oil company, proven global oil reserves have risen by 50% in the past 20 years, and at current rates of production would last about 50 years (see chart).

| *Too much of a good thing*

As concerns about climate have risen, policymakers, regulators and investors have switched from worrying about a potential oil shortage to fretting about a possible glut. In the most extreme scenarios, experts say that if there is to be a 50/50 chance of keeping global warming below 2° C, only 35% of proven fossil-fuel reserves (mostly coal and oil) can be burned. If the target limit is to be 1.5° C, only 10% of the proven reserves can be used. As Mr Clayton writes: “Oil will be outmoded long before the world’s oil wells run dry.”

Pioneer’s Mr Sheffield agrees, which makes him a heretic among his American peers. He reckons that global demand for oil may peak within the next 10-15 years because of slow global growth and the large-scale introduction of electric vehicles powered by renewable energy. To prepare for that day, he says, Pioneer is considering selling assets elsewhere in America to focus on the Permian, which he argues is cheap enough to compete in a world of dwindling oil demand.

Like Pioneer, some larger, integrated oil companies, especially European ones, are changing their bets on oil’s future, mostly because of the recent collapse in the oil price. For instance, Royal Dutch Shell, the Anglo-Dutch supermajor, pulled out of the Arctic because drilling there would be too expensive. Its French counterpart, Total, is unwilling to invest more in Canada’s oil sands, for similar reasons. But they are also aware that if demand goes into long-term decline, those with the cheapest oil will survive longest. Simon Henry, Shell’s chief financial officer, says the company expects a peak in oil demand within the next 5-15 years. It intends to concentrate on what it sees as the cheapest deepwater reserves in places like Brazil where investments can be recouped within that time frame. It may also cut oil exploration. Total, too, is hoping to find low-cost oil. It has bought a small stake in a 40-year oil concession near Abu Dhabi, in the expectation that Gulf oil will always be cheap.

Largely because the most prolific reserves are in the hands of OPEC countries, and hence difficult for Western firms to get hold of, some oil majors are turning to gas as a complement to oil (see chart). This year Shell completed a \$54bn acquisition of BG, a British producer of natural gas and oil, bringing gas close to half its energy mix. Oilmen say the gas business is more complex than oil; it needs more upfront capital to develop, pipelines for transport and new systems of delivery, so returns can be lower. Yet even the most pessimistic scenarios for the future of fossil fuels suggest better growth prospects for gas than for oil.

| *Belt and braces*

Some companies are also taking out options on renewable technologies, in case they grow very quickly. Total has bought battery and solar-power businesses, though its boss, Patrick Pouyanné, insists that without profits from oil and gas it would not have been able to do so. Shell's Mr Henry says his company's business model may increasingly resemble that of sovereign-wealth funds such as Norway's, which redirect the substantial cashflows from oil into lower-carbon technologies. Britain's BP, which pioneered the concept of "Beyond Petroleum", only to rue it later because its solar-power investments failed to make money, is gingerly considering investing more in wind for the first time in five years. When the nature of the energy transition becomes clearer, these companies say they may have to invest tens of billions of dollars to develop new energy businesses.

Philip Whittaker of the Boston Consulting Group (BCG) notes that in the past oil projects have been cash machines, because the value of an extra barrel of oil can vastly exceed the cost of production. The difference gets smaller as reserves become harder to find, but investors still like the industry's relatively high risk-return profile. Once an oil firm has covered the costs of developing a field, it can sometimes generate cash for decades.

He says it is not clear that investing in renewables could replicate oil's risk-

return profile. The oil companies have huge balance-sheets and make commensurately large capital investments, but in the short term it is hard to see renewables reaching sufficient scale to become important parts of their business. Perhaps installing large quantities of offshore wind turbines in deep and rough seas would be similar to deep-sea oil drilling. But the more that the oil companies come to resemble electricity companies, the more their risk profile looks like that of a dull utility. They would also have to get involved with their consumers, which is not something this engineering-minded industry could get excited about.

On a much bigger scale, the Saudi government hopes to pursue a similar diversification strategy via an initial public offering of part of Saudi Aramco. Some of the proceeds, estimated at up to \$150bn, will be put into a massive sovereign-wealth fund that will invest in technologies beyond oil. Some reckon that the kingdom has recently been producing oil at record levels because it is expecting an early end to the oil age. Others think it simply wants to recoup market share from other producers.

In America, meanwhile, many oil companies seem to want to keep their heads down. Some argue that market forces are better at reducing emissions than co-ordinated action by governments. The displacement of coal by shale gas, they point out, has cut emissions to ten-year lows. Many hope that the recent investment drought in the industry will lead to shortages that will send the oil price rocketing before the end of this decade. But that, says BCG's Mr Whittaker, could be the oil market's "last hurrah", giving a final push to electrification. ■



产油国

在石油的马车上

石油行业已饱受动荡，但有些人拒绝承认

有人称之为“得克萨斯伯”。在得克萨斯州西部的米德兰（Midland），每一片裸露的40英亩土地上似乎都有一台抽油机，从深达3700米处的二叠纪盆地页岩层将石油抽上来。有一台机器正在当地的西得克萨斯钻井工橄榄球队的停车场上辛勤工作。在位于城市边缘的二叠纪盆地石油博物馆中，陈列着一些可以追溯到20世纪30年代的“点头驴”。在其身后的一片场地上，一台仍能工作的“点头驴”正在缓缓升降。

然而如果向北开车20英里，抽油机头顶上出现的数百个呼啸的风力发电机让它们黯然失色（见图片）。初秋的阳光下，这些风车在棉花田中闪烁着白光，这正是能源格局转变的缩影。

你可能会觉得，风力发电机正引领世界通往一个不需要化石燃料的未来，经验丰富的石油商应该会对它心怀怨恨。然而约书亚·约翰逊（Joshua Johnson）却不这么看。他管理着该地区一系列石油租约，并自豪地向记者展示他储存在500桶容量石油储罐中锃亮的原油。他说：“我觉得这些新技术非常棒。”在他看来，随着世界对能源的需求越来越大，可再生能源将成为石油一个重要的补充。但他对全球变暖不以为然：“这儿一直都热得要死。”

二叠纪盆地是石油的最新前沿，而且尽管石油市场正处于上世纪90年代以来最严重的衰退，这里却正经历一个小型投资热潮的阵痛。钻机数自5月以来已上升了60%，而在美国其他页岩盆地则仅略有增加。已钻井的水力压裂正逐步回升。在米德兰附近，红色大货车像马戏团大篷车一样聚集在井筒周围，高压泵入液体和压裂砂的景象又越来越常见了（虽然钻井量仍不到2014年顶峰水平的一半）。

今年到目前为止，华尔街已经为美国石油公司提供了超过200亿美元的资

金，主要是为了在二叠纪盆地收购资产并进行压裂开采。有些人认为相关预期已经被炒得太热，但该地区最大的石油生产商之一——先锋自然资源公司（Pioneer Natural Resources）的老板斯科特·谢菲尔德（Scott Sheffield）并不这样想。他估计，在由许多个存在了2.5亿年之久的含油岩层构成的二叠纪盆地中，可开采的石油储量可能与为沙特阿拉伯王国带来其一半多石油财富的加瓦尔油田相当。这也许是一厢情愿，但这表明在石油价格崩盘后，美国石油行业的士气正在恢复。

二叠纪盆地的故事，是一个运气、地质、技术、法律和真正的勇气结合在一起带来大量石油的例子。这些发现似乎解决了业界永恒的问题——这玩意什么时候会用完。在新书《市场疯狂：石油恐慌、危机和崩溃的世纪》（Market Madness: A Century of Oil Panics, Crises and Crashes）中，布雷克·克莱顿（Blake Clayton）把世界对于“石油产量顶峰”的恐慌划分为四个时期。第一个时期是汽车的出现，油价开始飙升。第二个时期恰逢第二次世界大战。第三个时期是20世纪70年代欧佩克推高油价。第四个时期则始于2000年代中期，当时油价开始上涨，最终达到每桶140美元。然而先知们一直都是错的。石油顶峰论的老前辈M·金·哈伯特（M. King Hubbert）早在1956年就预测全球石油供应不会超过3300万桶/天，而目前供应量是9700万桶/天。英国石油公司（BP）称，过去20年间全球探明石油储量上升了50%，按照目前的生产速度还能坚持50年左右（见图表）。

| 过犹不及

随着对气候的担忧越来越大，政策制定者、监管者和投资者已经不再担心石油或许会短缺，而改为发愁石油可能过剩了。专家说，在最极端的情况下，如果要有五五开的机会保持全球变暖低于2℃，人类就只能消耗探明化石燃料储备（主要是煤和石油）的35%。而如果目标上限是1.5℃，那就只能使用探明储量的10%了。正如克莱顿写道：“在全世界油井枯竭之前，石油已经老早就被淘汰了。”

先锋的谢菲尔德也同意这一点，这让他成了美国同行中的异类。据他估计，因全球经济增长缓慢，以及大规模引入采用可再生能源的电动汽车，全球对石油的需求可能在未来10到15年达到顶峰。他说，为了对这一天的

到来做好准备，先锋正在考虑出售美国其他地区的资产而专注于二叠纪盆地。他认为这里足够便宜，可以在需求日益减少的世界中参与竞争。

和先锋一样，一些规模较大的综合石油企业，尤其是欧洲企业，也正在改变对石油未来的看法，这主要是由于近期石油价格的崩溃。例如，英荷巨头荷兰皇家壳牌公司撤销了北极钻探项目，因为在那里钻井实在是太贵了。出于同样的原因，与它相当的法国公司道达尔不愿再加大对加拿大油砂的投资。但它也知道，如果需求进入长期衰退，谁的石油最便宜，谁就能活到最后。壳牌公司首席财务官西蒙·亨利（Simon Henrey）表示，该公司预计石油需求将在未来5到15年达到顶峰。公司认为巴西等地的深水储量最为廉价并计划专注于此，因为投资可在这一期限内收回。公司也可能削减石油勘探。道达尔也希望能找到低成本的油，它已经收购了阿布扎比附近40年石油开采权的少量股份，期望海湾石油永远便宜。

由于最丰富的储量掌握在欧佩克国家手中，西方企业很难染指，主要出于这一考虑，一些石油巨头开始转向天然气作为石油的补充（见图表）。今年壳牌出资540亿美元完成了对英国天然气和石油生产商BG的收购，让天然气达到了其能源组合的近一半。石油商说天然气业务比石油更为复杂，它需要更多的前期资金用于开发、输送管道和新的交付系统，所以回报率可能会低一些。然而，即使是在未来化石燃料最为悲观的情况下，天然气的增长前景也要比石油好一些。

| 双保险

一些公司也在收购可再生能源技术，以备其迅速增长。道达尔收购了电池和太阳能发电企业，尽管其老板帕特里克·普亚纳（Patrick Pouyanné）坚持认为，如果没有来自石油和天然气的利润就无法完成收购。壳牌的亨利说，其公司的商业模式可能会越来越像主权财富基金（如挪威的基金），将来自石油的庞大现金流投到低碳技术。英国的BP曾开创了“超越石油”的概念，到头来却后悔了，因为太阳能发电投资没能赚到钱——如今也在五年内首次小心翼翼地考虑加大风电投资。当能源转型的性质逐渐明朗，这些公司说它们可能不得不投入上百亿美元来开发新能源业务。

波士顿咨询集团（BCG）的菲利普·惠特克（Philip Whittaker）指出，过去的石油项目都是提款机，因为多生产一桶石油的价值可以远高于生产成本。随着石油储备越来越难找，这一价差变小，但投资者还是喜欢这个行业相对较高的风险收益。一旦石油企业付清了开发油田的成本，它有时能连续数十年产生现金。

他说，目前尚不清楚可再生能源领域的投资是否能复制石油的风险收益。石油公司拥有庞大的资产负债表，并做出同量级的大型资本投资，但短期内是很难看到可再生能源的规模能够大到在其业务中占有重要一席。或许在波涛汹涌的大海中安装大量的海上风力发电机和深海石油钻探差不多。但石油企业越像电力公司，其风险收益就越接近乏味的公用事业行业。它们还必须和消费者打交道，这可不是这个充满了工程思维的行业乐于见到的。

沙特政府希望通过将阿美公司的部分股权上市来实施类似的多元化战略，这一行动的规模要大得多了。其收益（估计高达1500亿美元）的一部分将被放入一个庞大的主权财富基金，投资于石油以外的技术。一些人认为，该国近期石油产量达到创纪录水平，是因为它认为石油时代会很快结束；也有人认为它只是想从其他产油国那里夺回市场份额而已。

与此同时，美国许多石油公司似乎想保持低调。一些人认为，市场力量比政府的协调行动更能减少排放。他们指出，由页岩天然气取代煤已经将排放削减到十年低点。许多人希望近期石油行业的投资枯竭会导致短缺，在这个十年结束之前让石油价格飙升。但是BCG的惠特克说，这可能是石油市场的“回光返照”，为电气化加上最后一把力。■



Transport

From oiloholics to e-totallers

What changes in driving habits and improved batteries might do to oil demand

IT HAS BEEN a bad couple of years for those hoping for the death of driving. In America, where cars are an important part of the national psyche, a decade ago people had suddenly started to drive less, which had not happened since the oil shocks of the 1970s. Academics started to talk excitedly about “peak driving”, offering explanations such as urbanisation, ageing baby-boomers, car-shy millennials, ride-sharing apps such as Uber and even the distraction of Facebook.

Yet the causes may have been more prosaic: a combination of higher petrol prices and lower incomes in the wake of the 2008-09 financial crisis. Since the drop in oil prices in 2014, and a recovery in employment, the number of vehicle-miles travelled has rebounded, and sales of trucks and SUVs, which are less fuel-efficient than cars, have hit record highs.

This sensitivity to prices and incomes is important for global oil demand. More than half the world’s oil is used for transport, and of that, 46% goes into passenger cars. But the response to lower prices has been partially offset by dramatic improvements in fuel efficiency in America and elsewhere, thanks to standards like America’s Corporate Average Fuel Economy (CAFE), the EU’s rules on CO₂ emissions and those in place in China since 2012.

The IEA says that such measures cut oil consumption in 2015 by a whopping 2.3m b/d. This is particularly impressive because interest in fuel efficiency usually wanes when prices are low. If best practice were applied to all the world’s vehicles, the savings would be 4.3m b/d, roughly equivalent to the crude output of Canada. This helps explain why some

forecasters think demand for petrol may peak within the next 10-15 years even if the world's vehicle fleet keeps growing.

Occo Roelofsen of McKinsey, a consultancy, goes further. He reckons that thanks to the decline in the use of oil in light vehicles, total consumption of liquid fuels will begin to fall within a decade, and that in the next few decades driving will be shaken up by electric vehicles (EVs), self-driving cars and car-sharing. America's Department of Energy (DoE) officials underline the importance of such a shift, given the need for "deep decarbonisation" enshrined in the Paris climate agreement. "We can't decarbonise by mid-century if we don't electrify the transportation sector," says a senior official in Washington, DC. It is still unclear what effect Donald Trump's election will have on this transition.

In a recent paper entitled "Will We Ever Stop Using Fossil Fuels?", Thomas Covert and Michael Greenstone of the University of Chicago, and Christopher Knittel of the Massachusetts Institute of Technology, argue that several technological advances are needed to displace oil in the car industry. Even with oil at \$100 a barrel, the price of batteries to power EVs would need to fall by a factor of three, and they would need to charge much faster. Moreover, the electricity used to power the cars would need to become far less carbon-intensive; for now, emissions from EVs powered by America's electricity grid are higher than those from highly efficient petrol engines, say the authors.

| *My kingdom for a cheap battery*

They calculate that at a battery's current price of around \$325 per kilowatt hour (kWh), oil prices would need to be above \$350 a barrel for EVs to be cost-competitive in 2020. Even if they were to fall to the DoE's target of \$125 per kWh, they would still need an oil price of \$115 a barrel to break even. But if battery prices fell that much, oil would probably become much cheaper, too, making petrol engines more attractive. Even with a carbon tax, the

break-even oil price falls only to \$90 a barrel.

Those estimates may be too conservative, but the high cost of batteries and their short range help explain why EVs still make up only 0.1% of the global car fleet (though getting to 1m of them last year was a milestone). They are still mostly too expensive for all but wealthy clean-energy pioneers. Many experts dismiss the idea that EVs will soon be able seriously to disrupt oil demand. Yet they may be missing something. Battery costs have fallen by 80% since 2008, and though the rate of improvement may be slowing, EV sales last year rose by 70%, to 550,000. They actually fell in America, probably because of low petrol prices, but tripled in China, which became the world's biggest EV market.

Next year Tesla aims to bring out its more affordable Model 3. It hopes that the cost of the batteries mass-produced at its new Gigafactory in Nevada will come down to below \$100 per kWh by 2020 (see chart), and that they will offer a range of 215 miles (350km) on a single charge.

Countries that have offered strong incentives to switch to EVs have seen rapid growth in their use. Norway, for instance, offers lower taxes, free use of toll roads and access to bus lanes. Almost a quarter of the new cars sold there are now electric (ample hydroelectricity makes the grid unusually clean, too).

This bodes well for future growth, especially if governments strengthen their commitment to electrification in the wake of the Paris accord. The Electric Vehicles Initiative (EVI), an umbrella group of 16 EV-using nations, has pledged to get to 20m by 2020. The IEA says that to stand a 50/50 chance of hitting the 2° C global-warming target, there would need to be 700m EVs on the road by 2040. That seems hugely ambitious. It would put annual growth in EV sales on a par with Ford's Model T—at a time when the car industry is also in a potentially epoch-making transition to self-driving

vehicles.

But imagine that the EVI's forecast were achievable. By 2020 new EV sales would be running at around 7m a year, displacing the growth in sales of new petrol engines, says Kingsmill Bond of Trusted Sources, a research firm. Investors, focusing not just on total demand for oil but on the change in demand, might see that as something of a tipping point. As Mr Bond puts it: "Investors should not rely on the phlegmatic approach of historians who tell them not to worry about change." ■



运输

从嗜油到全电

驾车习惯的变化和电池的改进可能如何影响石油需求

对于那些期盼人类扔掉方向盘的人来说，过去两三年可不太合心意。在美国这个汽车是国民精神重要组成部分的国度，人们在十年前突然开始减少开车，这是自1970年代石油危机以来所未见的。学者们开始激动地谈论“开车见顶”，并给出了各种解释，比如城镇化、婴儿潮一代老去、千禧一代不爱用车、优步等拼车软件的流行，甚至还有Facebook分散了人们的注意力。

然而，真正的原因可能平淡无奇：2008-2009年金融危机后，油价上升和收入下跌联合发生了作用。而从2014年起油价开始下跌，同时就业复苏，人们的驾车里程数又开始反弹。燃油效率比轿车更低的卡车和SUV的销量创下历史新高。

这种对价格和收入的敏感度对全球石油需求具有重要影响。全球石油有超过一半用于交通，其中46%用于乘用车。不过，由于美国的公司平均油耗标准（Corporate Average Fuel Economy，简称CAFE）、欧盟碳排放规定以及中国自2012年以来各种标准的实施，价格下跌引发的反应在一定程度上被美国等地燃油效率的极大提升所抵消。

国际能源署（IEA）称，此类举措使得2015年的油耗每日骤减230万桶。这尤其引人注目，因为通常情况下，油价下跌时人们就不那么在意油耗了。如果全球所有交通工具都能最大程度地节省燃油，那么节省的石油总量将达到每日430万桶，约等同于加拿大的原油产量。这就是为何一些预言家认为，即便地球上的交通工具不断增加，石油需求也可能在未来10到15年内见顶的原因。

麦肯锡咨询公司的奥科·勒洛夫森（Occo Roelofsen）更进一步预测，由于轻型交通工具的石油用量减少，液体燃料的总消耗量将在十年内开始下

跌，而在未来几十年里，驾驶这一行为会因为电动车、自动驾驶汽车和拼车而发生翻天覆地的变化。美国能源部官员强调这种变化对于实现已被庄严载入巴黎气候协定的“深度脱碳”需求非常重要。“如果我们不能将交通产业电动化，我们就不可能在本世纪中期实现脱碳。”华盛顿一名高级官员说。目前尚不清楚特朗普当选总统会对这一转变带来何种影响。

芝加哥大学的托马斯·科弗特（Thomas Covert）和迈克尔·格林斯通（Michael Greenstone）以及麻省理工学院的克里斯托弗·尼特尔（Christopher Knittel）在近日发表的论文《我们会停止使用化石燃料吗？》（Will We Ever Stop Using Fossil Fuels?）中写道，若要在汽车产业中替代石油，需要几方面的技术进步。即使油价为每桶100美元，为电动车提供动力的电池价格也需要下跌至现价的三分之一，且充电速度要快得多才行。此外，用来驱动汽车的电力也需要大幅减少碳排放。论文作者们指出，目前由美国电网供电的电动车的碳排放量超过了高效汽油发动机的碳排放量。

| 我的廉价电池王国

他们估算，以电池目前每千瓦时约325美元的价格计，2020年的油价要高于每桶350美元，电动车的成本才具有竞争力。即使电池价格降到能源部的目标价，即每千瓦时125美元，油价仍需达到每桶115美元才能成本持平。但如果电池价格下跌那么多，油价也可能会便宜了许多，从而使得汽油发动机仍然具有更大的吸引力。即使算上碳排放税，油价也需不低于每桶90美元，电动车才有可能打个平手。

这些估计可能太过保守，但电池成本高昂而里程数短的特点解释了为何电动车仍然只占了全球汽车数量的0.1%（虽然去年电动车达到了100万辆的里程碑）。除了那些富裕的清洁能源倡导者，电动车对于其他人来说仍然过于昂贵。许多专家都不认为电动车能在近期真正颠覆石油需求。不过他们可能忽视了某些东西。2008年以来，电池成本已经下跌了80%，而尽管改良的速度可能在放缓，去年电动车销量仍增长了70%，达到55万辆。在美国，电动车的销量实际下跌了，或许是受低油价的影响；而在中国却增长了两倍，该国已成为全球最大的电动车市场。

明年特斯拉计划推出价格更便宜的Model 3车型。该公司希望，它位于内华达州的新建超级电池工厂大规模生产的电池成本到2020年将降至每千瓦时100美元以下（下图），车辆每充一次电能跑350公里。

在那些已经采取强力刺激手段推动向电动车过渡的国家，电动车的数量已经迅速增长。比如，挪威的电动车主可享受减税、免费使用收费道路、使用公交车道等。该国如今销售的新车中近四分之一是电动车（丰沛的水电也使得该国的电网异常清洁）。

这对未来的增长是个好兆头，尤其是如果各国政府在巴黎协定后更多地致力于电气化。由16个使用电动车的国家组成的“电动汽车倡议”组织（Electric Vehicles Initiative，简称EVI）承诺，到2020年电动车总数将达到2000万辆。国际能源署称，如果要让控制全球变暖幅度在2摄氏度这个目标有五成的实现机会，那么到2040年必须有七亿辆电动车上路。这目标看起来非常宏伟。为此电动车的销量年增率得和福特的T型车不相上下，而此时汽车产业本身也可能在经历向自动驾驶汽车过渡的划时代转变。

但假设“电动汽车倡议”的预测能够实现。到2020年新电动车年销量将达到约700万辆，而新汽油发动机的销量将停止增长，调研公司Trusted Sources的金斯米尔·邦德（Kingsmill Bond）说。投资者关注的焦点不仅仅是石油的总需求量，还有需求的变化，他们可能会将此视为一个临界点。正如邦德所言：“投资者不应听信历史学家疏离冷静的调调，说什么不用担心变化云云。”■



Batteries

Beyond lithium-ion

The next generation of batteries needs to be miles cheaper

DON HILLEBRAND, AN American motor-industry veteran, has an intriguing job. In a warehouse at the secure Argonne National Laboratory, which arose from the University of Chicago's work on the Manhattan Project, he scrutinises foreign-made cars, trucks and lithium-ion batteries to discover their technological secrets and share them with his employer, the Department of Energy, and its friends in the Big Three car companies.

His engineers have dismantled the engine of a new Honda model to lay bare its energy-saving technologies and then "reverse-engineered" it to make sure they have fully understood them. They do something similar with lithium-ion batteries, though they rarely dismantle them completely. When they do, it is in an explosion-proof room, Mr Hillebrand chuckles.

Much of the science behind those batteries originally came from America (ironically, the labs of ExxonMobil, America's biggest oil company), but it was Japan's Sony that first commercialised them in 1991. America is now in a race to catch up with Japan and South Korea, the two front-runners, though China is also a strong competitor. "The Asians are ten years ahead of us," says Mr Hillebrand.

Steve LeVine, in his book "The Powerhouse", describes the contest as "the great battery war". Winning it could not only revolutionise transport, it could cause the biggest oil crisis of all time. America has emerged victorious from some skirmishes; for instance, Argonne scientists developed the nickel-cobalt-manganese cathode used in the plug-in hybrid Chevy Volt. But the DoE's loyalties are split because, as well as wanting to develop batteries that could put the oil industry out of business, it also has

other energy industries to nurture, notably oil and natural gas.

Mr Hillebrand believes it may still be decades before batteries dislodge oil from the energy mix, especially if oil prices stay low. (One of his senior scientists, Amgad Elgowainy, drives a Volt, but says that with petrol at \$2 a gallon, he prefers filling it up with fuel rather than charging it.)

Yet in a different department at Argonne, known as JCESR (Joint Centre for Energy Storage Research), scientists are trying to go beyond lithium-ion to make batteries five times more energy-dense (meaning smaller and lighter) at one-fifth the cost. Scientists test different materials for anodes, cathodes and electrolytes and run their findings through numerous discharging and recharging cycles in an effort to produce safer and more efficient batteries.

George Crabtree, JCESR's director, says one of the current favourites is a lithium-sulphur battery, though more work is needed on the number of charging cycles it can endure. The aim is to come up with an EV battery, whether lithium-based or not, at a cost below \$100 a kilowatt hour, which would power a car that sells for \$20,000. Despite Tesla's efforts, he doubts that lithium-ion can deliver the goods. "With the present low oil price you have to get to an even lower battery price to become transformative," he says. Some also worry that production of lithium (pictured) in South America and elsewhere may be insufficient to support a transport revolution. But fears of peak lithium may be as premature as those of peak oil. ■



电池

锂离子之后

下一代电池必须要便宜得多

美国汽车业资深人士唐·希尔布兰德（Don Hillebrand）的工作很有意思。保密的阿贡国家实验室是由芝加哥大学在曼哈顿计划中的工作衍生而来。在该实验室的一个仓库里，他仔细琢磨外国制造的汽车、卡车和锂离子电池，探寻其技术秘密，并将它们分享给他的雇主——美国能源部，以及能源部在三大汽车公司的朋友。

他的工程师拆解了一辆新型本田车的发动机，揭示其节能技术，然后进行“逆向工程”以确保自己完全理解了它。对于锂离子电池，他们也做类似的事情，只不过完全拆解的情况并不多。真这么做的时候就是在防爆室里进行了，希尔布兰德笑着说。

这些电池背后的科学最初大部分来自于美国（讽刺的是，它是来自美国最大的石油公司埃克森美孚的实验室），但日本的索尼公司首先在1991年将其商业化。美国如今在努力追赶日本和韩国这两个领跑者，尽管中国也是一个强有力的竞争者。“亚洲人比我们领先了十年。”希尔布兰德说。

史蒂夫·莱文（Steve LeVine）在其著作《发电厂》（The Powerhouse）中将这场竞赛描述为“电池大战”。赢得竞赛不仅可以带来交通革命，还可能引发有史以来最大的石油危机。美国已经在一些局部战役中初尝胜果，如阿贡的科学家开发了雪佛兰沃蓝达（Volt）插电式混合动力车中使用的镍-钴-锰阴极。但美国能源部对此的感情是矛盾的：一方面想要开发出能让石油工业歇业的电池，另一方面还有其他能源产业要呵护，特别是石油和天然气。

希尔布兰德认为，电池将石油赶出能源组合可能还要几十年，如果油价保持在低水平的话尤为如此。他手下一位资深科学家安姆嘉德·艾尔格维尼（Amgad Elgowainy）开着一辆沃蓝达车，但表示既然一加仑汽油只要2美

元，他更乐意加油而不是充电。

然而，在阿贡国家实验室另一个被称为JCESR（能源存储研究联合中心）的部门，科学家们正在试图在锂离子之上更进一步，让电池的能量密度提升五倍（即更小、更轻），同时将成本降到五分之一。科学家测试不同材料制成的阳极、阴极和电解质，并通过大量反复的充放电来测试自己的发现，以便制造出更安全、更高效的电池。

JCESR的主任乔治·克拉布特里（George Crabtree）说，目前的热门之一是锂硫电池，不过在其能承受的充电循环次数方面还有些工作要做。业界的目标是要造出一种电动汽车电池，无论是否为锂基电池，成本都要低于每千瓦时100美元，用于驱动售价20,000美元的汽车。尽管特斯拉很努力，但他仍觉得锂离子电池可能达不到这一目标。他说：“目前油价这么低，电池价格必须要更低才能推动变革。”也有人担心南美洲等地的锂产量（如图）也许不足以支撑交通革命。但担忧锂产量顶峰可能和担忧石油产量顶峰一样，都为时过早。■



The future

Into the twilight zone

A glimpse of a post-oil era

STEWART SPENCE WAS a young hotelier in Aberdeen in 1971 when he first realised what an oil rush meant. His hotel, the Commodore, was the only one in the Scottish city with en-suite bathrooms. One day an American oil executive strode in, wearing denims, cowboy boots and a stetson. Once assured that the bedrooms had private facilities, he booked 20 rooms for six months and paid upfront by banker's draft. The American, boss of an oil-services company called Global Marine, was ferrying three oil rigs from the Gulf of Mexico to Aberdeen. Thus began Scotland's North Sea oil boom. Steak houses, cigars and words like roughneck and roustabout took hold. Texans famously drank Dom Pérignon champagne out of pint mugs. They lived the high life until oil prices crashed in 1986. Then they disappeared almost as swiftly as they had come, says Mr Spence.

Since those days oil has brought both boom and bust to Aberdeen, but never before the sense of despondency that grips the city today. In 2012 it had more multi-millionaires per 100,000 people than London and the world's busiest heliport, taking workers to and from the rigs. But the oil-price crash in 2014 drove home the fact that after almost half a century of exploitation, many of Aberdeen's offshore fields have become too expensive to be sustainable. The number of jobs has plummeted, and some oil producers are on the brink of bankruptcy.

As the world enters what could be the twilight of the oil age, some wonder whether Aberdeen's travails could be a harbinger of things to come in oil-producing regions across the world. Mr Spence thinks so. He still runs the smartest hotel in Aberdeen and is about to install a charging station for electric vehicles.

Not so fast, say many oil-industry veterans. They accept that high-cost oil regions like Scotland's North Sea, Canada's oil sands and the Russian Arctic may be in trouble, but expect at least one more oil boom, born from the ashes of today's bust, because there has been so little investment in the past two years to open up new sources of supply. Within the next couple of years, they think the market will once again swing from glut to shortage. The biggest beneficiaries will be producers in places with low-cost, abundant oil such as the Middle East, America's Permian basin, Brazil's pre-salt fields and parts of west Africa. But although those regions may see a boom in investment, it would be short-lived, because long-term demand is falling and the market could quickly become oversupplied.

| *After dark*

When it comes, what might a terminal decline in the use of oil mean for the industry, governments and the world at large? The biggest turmoil would be felt in oil-dependent developing countries. As Jason Bordoff, of Columbia University's Centre on Global Energy Policy, notes, the social stresses now evident in budget-strapped petrostates such as Venezuela and Nigeria are a hint of things to come. Gulf countries would accelerate their efforts to diversify their economies away from oil, as Saudi Arabia is already doing. America might rethink its "oil-for-security" geopolitical bargain with that country. Lower oil revenues could increase instability in places like Iraq.

Oil companies, for their part, will have to explore new lines of business. The North Sea provides a glimpse of some of the opportunities that lie ahead. Near Aberdeen, firms such as Royal Dutch Shell are decommissioning parts of the spectacular network of rigs and pipelines installed in the 1970s. Andrew McCallum, an adviser to Britain's regulator, the Oil and Gas Authority, says oil companies could deploy their decommissioning skills on projects around the world.

| *Look to Norway*

Statoil, the Norwegian state oil company, has set an example of what oil companies might do in future. Earlier this year it acquired a lease to build the world's largest floating wind farm 15 miles off the coast of Peterhead, north of Aberdeen. Each of its five 6MW turbines will be tethered to the seabed on a floating steel base, enabling it to operate in deeper water than a conventional turbine embedded into the sea floor. That will give it access to stronger winds farther offshore, making it cheaper to produce electricity.

Back in Norway, Statoil also operates two projects to store carbon dioxide under water, in some of the most advanced examples of a technology seen as key to removing greenhouse gases from the atmosphere: carbon capture and storage (CCS). This is costly and still in its infancy, and governments have supported it only erratically. In 2015 a mere 28m tonnes of CO₂ was stored that way. To help meet the 2° C limit, the IEA says the world needs to store a whopping 4bn tonnes a year by 2040.

Biofuels are another way to diversify. At the North Sea port of Rotterdam, Neste, a Finnish refiner, ships in waste fats from the world's slaughterhouses and converts them into biodiesel for the haulage and aviation industry. It costs more than regular diesel, but under EU rules member countries' fuel mix must include 10% biofuels by 2020. Neste's boss, Matti Lievonon, recalls that in 2012 nine-tenths of his company's operating profit came from refining fossil fuels, whereas now renewables account for 40%.

Not all oil companies want to be innovators. Many plan to develop more gas, but also insist that the world's demand for oil as feedstock for petrochemicals will keep them in business even if demand from cars wanes. The IEA predicts that petrochemicals will raise demand for oil by almost 6m b/d in the next 25 years. Oil companies are putting pressure on governments to impose carbon taxes, believing them to be the best way to

kill off coal and boost natural gas, at least until renewable energy and batteries have come of age. So far governments have shown remarkably little appetite for such taxes. The IEA calculated that carbon markets covered only 11% of global energy-related emissions in 2014. In contrast, 13% of emissions were linked to fossil-fuel use supported by consumption subsidies.

Transport fuels are more widely taxed, but at vastly different rates, ranging from high in Europe to low in America and China. Experts say that in America it is easier to regulate fuel consumption via vehicle-efficiency standards, which consumers notice much less than fuel taxes.

The crucial, and underappreciated, players in the future of oil are consumers. Their choices, at least as much as those of producers and governments, will determine its ultimate fate, because oil fuels the industries that make goods for them, the trucks that deliver those goods, the cars they drive and the plastic objects that clutter their homes.

This special report started by recalling how the horse was displaced by the car. Urban planners failed to find ways to reduce the horse-manure problem. Governments paved roads, put up traffic signs and introduced legislation that allowed the motor car to establish itself. Yet it was the allure of the Model T for millions of consumers that finally drove the horse off the road.

Similarly, oil companies may turn their attention to alternative fuels, governments may tinker with fuel taxes and congestion charges, battery costs may come down with a bump and the electricity grid may be converted to run on sun and wind. But none of these developments alone will end the oil era. Only when entrepreneurs can capture the public's imagination with new vehicles that transform the whole travel experience, rather than just change the fuel, will the petrol engine run out of road.

This could happen with electric self-driving cars, which may eventually become not just four-wheeled travel pods but mobile offices, hotels and entertainment centres, running noiselessly through city streets day and night. Or it could be some other futuristic innovation. A new play in London, "Oil", predicts that the hydrocarbon age will end with the Chinese mining helium-3 on the Moon to fuel nuclear-powered cars and homes on Earth. Whatever your particular fantasy, there are bound to be more oil wars and oil shocks. But it will be when the internal-combustion engine eventually loses its remarkable grip on the world's roads that the age of oil will come to a screeching halt. ■



未来

进入暮光之域

一窥后石油时代

1971年在阿伯丁，年轻的旅店老板斯图尔特·斯彭斯（Stewart Spence）第一次见识了什么是“石油热”。当时他的“海军准将”（Commodore）是这座苏格兰城市里唯一带有独立卫生间的旅店。一天，一名美国石油公司主管大步走了进来，他穿着牛仔裤，踩着牛仔靴，戴着牛仔帽。问清楚房间确实带有独立洗浴间后，他把20个房间包下半年，然后用银行汇票预先结了账。这名美国人是石油服务公司“环球海洋钻探”（Global Marine）的老板，正从墨西哥湾将三个石油钻井平台运送到阿伯丁。苏格兰北海的石油繁荣期就这样拉开了帷幕。牛排馆、雪茄以及“钻工”和“油井杂工”这样的称谓落地生根。得克萨斯人用啤酒杯喝唐培里依香槟的习惯众所周知。斯彭斯说，他们过着奢华的生活，直到1986年油价暴跌。然后就像来时一样迅速地消失得无影无踪。

从那时起，石油给阿伯丁带去过繁荣，也带去过萧条，但从没像今天这样使得这座城市被沮丧吞没。2012年时，这里每十万人中的千万富翁人数超过了伦敦；全世界最繁忙的直升机机场也坐落于此，运送工人往返油井。然而，2014年的油价大跌让人们认清了一个事实：在经过近半个世纪的开采后，阿伯丁的许多海上油田已经变得太过昂贵而不可持续。这里的工作职位数量已经大减，一些石油生产商濒临破产。

随着世界可能进入石油年代的衰退期，一些人怀疑阿伯丁的困境是否预示了全球各地产油区的未来。斯彭斯认为是的。他仍然经营着阿伯丁最光鲜的酒店，并很快将增设一个电动车充电站。

许多石油业资深人士说速度不会这么快。他们认同高成本产油区，比如苏格兰的北海、加拿大的油砂和俄罗斯北极地区可能确实陷入了麻烦，但他们预计会再出现至少一次石油热——从今日的灰烬中重生，这是因为过去两年极少再有投资开发出新的供应源。他们认为，几年之内市场就会再一

次从过剩变为短缺。最大的受益人将是那些成本低而储备丰富地区的油商。这些地区包括中东、美国的二叠纪盆地、巴西的盐下油田以及西非部分地区。但是，虽然这些地区可能会看到投资增长，这种增长也不会持续太久，因为长期需求正在下跌，而市场可能很快变得供给过剩。

| 天黑以后

当石油消费的终极衰退期来临时，对产业、政府以及全世界总体意味着什么？那些经济依赖石油的发展中国家将感受到最大的震荡。哥伦比亚大学全球能源政策中心的贾森·博尔多夫（Jason Bordoff）指出，目前委内瑞拉和尼日利亚这类预算吃紧的石油国家明显的社会压力预示了将要发生的事。海湾国家将加快从依赖石油到多样化经济的转变，正如沙特阿拉伯已经在做的那样。美国人可能要重新思考和这个国家“石油换安全”的地缘政治交易。石油收入的减少可能会使得伊拉克等地区变得更不稳定。

石油企业自身将需要探索新的业务领域。从北海的变化可以一窥未来的某些机遇。在阿伯丁附近，荷兰皇家壳牌（Royal Dutch Shell）等公司正在让1970年代建造的大型油井和管网中的一部分设施退役。英国的监管机构石油和天然气管理局（Oil and Gas Authority）的顾问安德鲁·麦卡勒姆（Andrew McCallum）说，石油公司可以在世界各地的采油项目中发挥它们在设备退役方面的技能。

| 借鉴挪威

挪威国家石油公司（Statoil）已经为石油企业未来可能的出路树立了范本。今年稍早时，该公司取得了一个租赁合约，在距阿伯丁北部彼得赫德（Peterhead）海岸15英里处的海上建造世界最大的浮体式风力发电厂。五个6兆瓦的风机将安装在漂浮的钢桩上，再通过锚链固定在海底。与需要埋入海底固定的传统风机相比，这种新方法可在更深的海域工作，使之能在远离海岸处获得更强劲的风力，从而降低发电成本。

在挪威本国，国家石油公司还在实施两个水下存储二氧化碳项目，它们是碳收集存储（Carbon capture and storage，简称CCS）这项技术最先进的案例之一。CCS被视为从大气中移除温室气体的关键手段，其成本高昂且

刚刚起步，各国政府的支持也时断时续。2015年仅有2800万吨二氧化碳用这种方式存储起来。国际能源署称，为实现将气温上升控制在2摄氏度的目标，全世界需要在2040年前存储多达40亿吨的二氧化碳。

发展生物燃料是另一个实现经济多样化的途径。在北海的鹿特丹港，芬兰精炼商纳斯特（Neste）从世界各地的屠宰场运来废弃脂肪，将它们转化为供运输和航空业使用的生物燃料。这种燃料比普通柴油贵，但欧盟规定到2020年其成员国使用的燃料组合必须包含10%的生物燃料。纳斯特的老板马蒂·列沃宁（Matti Lievonen）回忆道，2012年公司有九成的营业利润来自精炼化石燃料，而如今可再生能源贡献了利润的40%。

并非所有石油企业都想成为革新者。许多企业计划发展更多天然气业务，但同时坚持认为，即便汽车的石油需求减少，全世界对用作石化产品原料的石油的需求仍会让它们有生意可做。国际能源署预计，未来25年，石化产品将令石油需求增加将近每日600万桶。石油企业正在向政府施压，要求实施碳排放税，他们相信这是抛弃煤炭而提升天然气地位的最佳方式，至少在可再生能源和电池真正成熟之前是如此。到目前为止，政府在这类税赋上显现的兴趣极少。据国际能源署计算，2014年碳交易市场上的碳排放量仅占全球能源相关碳排放量的11%，相比之下，13%的排放与受消费补贴支持的化石燃料使用相关。

对交通用燃料的课税更为普遍，但税率差别极大，欧洲较高而美国和中国较低。专家们说，在美国，通过车辆燃油效率标准来调节汽油消费更为容易，因为消费者对燃油税要敏感得多。

消费者在石油的未来中扮演了至关重要却被低估的角色。他们的选择将决定石油最终的命运（其影响至少不亚于石油生产商和政府的选择），这是因为那些为他们制造商品的产业、运送这些商品的卡车、他们自己驾驶的汽车以及家中堆满的塑料物品都在使用石油。

本期特刊从回忆马匹如何被汽车取代开篇。城市规划人员未能找到缓解马粪问题的方法。政府铺设道路、竖立交通标识并进行立法来推动汽车的普

及。然而，是T型车对百万消费者产生的吸引力最终将马匹赶下了道路。

同样地，石油公司可能会将注意力转移到替代性燃料上，政府可能会在燃油税和拥堵费上做文章，电池成本可能突然大跌，电网可能会被改造成倚赖太阳能和风能发电，但它们无一能单枪匹马地终结石油时代。唯有企业家用彻底改变旅行体验的新交通工具抓住人们的想象力之时——而不仅仅只是改变燃料——汽油发动机才会从道路上消失。

这可能会在电动自动驾驶汽车上实现，这时汽车终于不再只是一个带四个轮子的移动盒子，它还是移动办公室、旅馆和娱乐中心，夜以继日、无声无息地行驶在城市道路上。也可能是其他的未来派创新。伦敦新上演的戏剧《石油》（Oil）预测，某天中国人会在月球上开采氦3来驱动地球上的核动力汽车及住宅，从而终结油气时代。不论你想象的终结者是哪一型，一定还会有更多的石油战争和石油危机。但是，只有当内燃机最终失去对世界各地道路的控制时，石油时代才会戛然而止。■