



## 荒岛的惨淡科学

### 为什么经济学家喜爱《鲁滨逊漂流记》

沉船水手的经典故事揭示了关于稀缺性的许多问题【深度】

在孤岛上度过了28年零2个月又19天后，鲁滨逊·克鲁索并没有失去对冒险的嗅觉，也没有丢掉“四处游逛的天性”。他在“地狱般的狼群”的追逐下穿越了比利牛斯山脉，目睹了中国的“浮华与贫困”，在俄罗斯大草原上与鞑靼人作战。

然而，这个角色最奇特的冒险并不是这些，而无疑是他几个世纪以来在经济学文献中的漫游。鲁滨逊曾出现在卡尔·马克思的《资本论》、约翰·梅纳德·凯恩斯的《就业、利息和货币通论》和米尔顿·弗里德曼在芝加哥主讲的《价格理论》中。《新帕尔格雷夫经济学词典》中有他的条目。而且他还经常冲上经济学教科书的岸头。

鲁滨逊对于经济学的吸引力并不让人惊讶。这个水手花了几页的时间逃离海盗并射杀食人族。但真正的战斗是对抗稀缺——他通过仔细部署他所掌握的资源（包括他自己的劳动力）来战胜稀缺性。

在遭遇海难之后，鲁滨逊把他的小岛监狱改造得适合居住，甚至可说宜人。他从沉船中打捞出一些东西，加固了一个山洞（他的“城堡”），搭建了一个帐篷（“我的乡间别墅”），种植庄稼，驯养了山羊（和一只鸚鵡），在简易架子上摆满了鸽子、乌龟和其他食物。

在1719年创作了《鲁滨逊漂流记》的小说家丹尼尔·笛福也被稀缺所困。在他坎坷的职业生涯中，他做过砖块、葡萄酒、泡菜、烟草和麝猫腺体的贸易。他还搞过马匹交易。他曾债务违约。两次。“没有人比我更饱尝命运转折，”他写道，“我经历过十三次贫富起落。”

他撰写的寓言故事将枯燥的经济变量转化为丰富多彩的人物形象，如“关税伯爵”——一位身穿家纺布料的英国贵族，以及“信用夫人”（“一旦对她

失信，再多的恳求也无法使她回心转意”）。他出版的《英格兰商人全书》（The Compleat English Tradesman）被誉为第一本商业教科书。

但正如莫纳什大学的迈克尔·怀特（Michael White）所写，他的荒岛寓言最能引起共鸣。经济学家渴望找到适用于任何地方的行为规律。因此，鲁滨逊的与世隔绝提供了一个有用的思想实验。在他的岛上适用的原则必然是基本的，而不是因社会而偶然形成的。

例如，威廉·福斯特·劳埃德（William Forster Lloyd）热衷于证明，即使在没有市场和交换的情况下，经济学也能对价值做出解释。他在1834发表的一篇著作中指出，随着商品变得越来越稀缺，鲁滨逊越来越珍视它们（“我的墨水开始不好用了，”鲁滨逊说，“我满足于更加节约地使用它”）。他将此作为边际效用递减原理的证据：第二瓶墨水的价值低于第一瓶。

大多数经济学家引用这个故事并不是为了证实某个理论，而只是为了阐释。例如，教科书的作者们希望在一个尽可能简单的案例中介绍供求原理，而最简单的莫过于一个人的“鲁滨逊·克鲁索”经济了。

谷歌首席经济学家哈尔·瓦里安（Hal Varian）在一本教科书中描述了这样的经济。鲁滨逊必须决定如何将一天的时间在采摘椰子和“晒黑皮肤”上做分配。根据边际效用递减原理，每多收一个椰子或多晒一小时太阳，其价值都会低于上一个椰子或上一小时日光浴。每工作一小时产出的椰子也比上一小时少。根据这些假设，鲁滨逊应该在一个额外椰子的价值已经比不上他为采这只椰子而必须牺牲的额外闲暇时停止工作。

单人经济有几个好处。没有浪费。如果额外的椰子不被需要，它就不会被采摘——供应量就意味着经济本身的需求量。没有失业。如果鲁滨逊想要额外的椰子而不是闲暇，他就会亲自去采摘。凯恩斯指出，这样的经济不会遭受20世纪30年代那样的衰退——当时人们没能将足够的收入用于购买经济所能生产的商品。

教科书将鲁滨逊的单人经济视为一种基准，我们可以用它来评判更复杂的

经济。即使决策被分割和分散——即使消费者和生产者的想法不同，这种和谐能否被复制？

答案是肯定的，这要利用弹性价格和工资的魔力。获得诺贝尔奖的经济学家，也是瓦里安的论文导师的丹尼尔·麦克法登（Daniel McFadden）为这个寓言写了一个更详细的版本。他引入了第二个角色（“星期五”）。在这个版本中，鲁滨逊采集的是山芋而不是椰子。“星期五”充当经理，雇用鲁滨逊的劳动力，用山芋支付报酬，并将剩余的山芋作为“红利”分给他。

麦克法登证明了，存在这样一个时薪水平，它可以协调劳动力的供求关系，还能奇迹般地协调山芋的供求关系。但是，如果工资偏离这个水平或期望值过低就会出问题。举例来说，如果工资停留在过高的水平，鲁滨逊可能会发现自己并不能想工作多久就工作多久。他多工作一小时所能收获的山芋可能对他来说比失去的闲暇更有价值。但是，如果他必须得到的工资比这个价值还要高，“星期五”就会拒绝让他额外工作。这样一来，岛上的需求（山芋）得不到满足，资源（鲁滨逊的剩余劳动力）得不到利用，经济就会出现衰退。

如果“星期五”担心自己生产的山芋卖不出去，他可能会限制对劳动力的需求。这将抑制他的客户的购买力，从而似乎证实了他悲观的销售预测。鲁滨逊缺乏工作，因为“星期五”销售不足。“星期五”销售不足，因为鲁滨逊缺乏工作。

对这些寓言的一个明显反对意见是它们太卡通了。芝加哥经济学家弗兰克·奈特（Frank Knight）在1960年指出，“克鲁索经济”的概念已成为“又一个咒骂那些渴望现实主义且蔑视理论的人的字眼”。但简化往往有助于理解。例如，麦克法登的寓言说明，经济衰退并非必要或有益，而是荒谬和低效的。

然而，对于鲁滨逊爱好者来说，这些思想实验最惹眼的地方不是它们与现实的距离，而是它们与笛福原著故事的差异。书中既没有椰子，也没有山芋。鲁滨逊不仅不求晒黑皮肤，反而“费尽千辛万苦”躲避太阳，制作了一

把“笨拙、丑陋的山羊皮伞”来遮挡阳光。他的岛并不像麦克法登所说的那样在南海，而是在特立尼达附近。“星期五”和鲁滨逊并没有就劳动力或任何其他问题讨价还价。食人族用独木舟把“星期五”带到了岛上，鲁滨逊把他解救出来，之后“星期五”实际上成了鲁滨逊的奴仆。他学到的头几个英语单词里就有“主人”。

对笛福原著的忽视并不意味着教科书上的寓言就失效了。鲁滨逊是在南海还是其他地方采集椰子、山芋或葡萄并不重要。但这种忽视仍然是错失了机会。原著中有很多经济事件和见解。重新发现它可能会让经济学家欣喜。

他们可以不从采集椰子开始，而是从制作面包开始。“很少有人考虑过.....在提供、生产、腌制、调味、制作和完成这一个面包时所必需的奇怪的一大堆小事。”鲁滨逊在费劲给自己制作一些面包时说道。在尝试几乎是从头开始的过程中，鲁滨逊发现，即使是最简单的产品也是经济编排的一个小小奇迹。他的想法类似于伦纳德·里德（Leonard Read）在1958年写的经典文章《我，铅笔》（“I, Pencil”），其中详细介绍了不起眼的铅笔的“谱系”：其木材来自俄勒冈州，石墨来自斯里兰卡，橡胶来自印度尼西亚，所有这些都由拥有还更复杂谱系的机器进行采集、运输和精制。

在看完了面包制作之后，经济学家可以看看鲁滨逊的陶器。他花了大约两个月的时间制作了一对罐子——“两个又大又丑的土制东西”——来储存谷物。保护资源绝非易事：害虫威胁着他的庄稼，他的衣服开始腐烂毁坏。西尔维奥·格塞尔（Silvio Gesell）在1916年出版的《自然经济秩序》一书中想象到，如果鲁滨逊能将自己的备用物资借给另一个岛民（比如“星期五”）以换取几年后类似的物资，他会多么感恩。即使“星期五”不支付利息，他也会接受这笔交易，因为仅仅保持财富完好无损就代表着对无情的自然摧毁力量的胜利。对于那些憎恨当今金融体系的人来说，这是一个有用的思想实验：尽管金融体系存在种种缺陷，但它让人们得以将财富保存在方便的储蓄账户而不是畸形的罐子里。

教科书中的鲁滨逊是一个理性人，总是在平衡边际这个和边际那个。他是

经济学101的典型人物。笛福故事中的鲁滨逊更加善变和矛盾，让他更适用于阐释更新近的、受心理学启示的决策理论。他可能成为“行为经济学”的偶像。

有一次，鲁滨逊用他稀缺的笔墨来评估自己的困境，绘制了一份舒适与痛苦的资产负债表，有贷项有借项。他是一个孤独的漂流者（借项），但他还活着（贷项）。该岛无人居住，但并不荒芜。他没有防御措施，但岛上没有明显的掠食者。没有同伴在沉船中幸存，但可以从船上打捞出给养。

获得诺贝尔经济学奖的心理学家丹尼尔·卡尼曼（Daniel Kahneman）和阿莫斯·特沃斯基（Amos Tversky）指出，在评估自己的生活时，人们通常不是评估自己的幸福水平，而是从一些“中立”参考点出发来评估自己的得失。

参考点的选择并不总是显而易见的。在资产负债表的每一行上，鲁滨逊都考虑了其他选择。他遭遇海难，与世隔绝，这代表着他相对于之前身处之地是遭受了严重损失。但这相对于另一种情景来说则是收益——不难想象，他也可能被淹死或被冲到更危险的海岸上。卡尼曼和特沃斯基指出，在想象另外这些场景时，人们会遵循某些规则。他们重新想象导致他们陷入困境的一系列事件，消除任何奇怪或令人惊讶的命运转折。

鲁滨逊抛弃了失事的船后，船漂到了离岸更近的地方，这让他可以回到船上，把能拿的东西扒了个精光。鲁滨逊意识到这是极为难得的好运气（他说是十万分之一的几率）。这就使他很容易想象出另一个参照点：他从沉船上什么也没拿回来。这对他的心理很有帮助。

行为经济学家强调，选择并非越多越好。人们可能无法抵抗明知从长远来看会伤害自己的选择。选择的存在也会让人心生遗憾。它迫使我们把自己的命运与我们本可以选择的其他方案比来比去。当鲁滨逊被迫留在岛上，他可能会很快乐。但如果他是自己选择了与世隔绝，那他本可以选择的另一种生活就会让他难以释怀。

事实上，鲁滨逊后来得出结论，他在自己小岛的狭小范围内比在外面的世

界更快乐，因为他曾经在外面的世界过着“邪恶、受诅咒的、可憎的生活”。但他也立即向自己承认，如果有机会逃离，他还是会抓住的。

正如这些例子所显示的，经济学家可能会从更了解鲁滨逊的故事中获益。这种受益可以是双向的。对笛福的研究也可以（而且已经）受益于对经济学的更深入了解。笛福作品中有几个角落需要一定的经济学知识才能鉴赏。

当鲁滨逊踏上前往几内亚购买奴隶的命运多舛的航程时，他在巴西留下了一个正在生长的烟草种植园，很快就会价值“三四千英镑”。今天的读者很难理解这样一个数字意味着什么。曾任教于宾夕法尼亚州立大学的戴维·斯皮尔曼（David Spielman）根据经济史学家的研究，计算出这样一笔收入将使鲁滨逊跻身当时英国家庭收入的前5%。面对如此丰厚的财富，鲁滨逊没有理由冒险。他的航行就像他自己承认的那样是“荒谬的”。

经济学家还可能解开其他一些谜团。从岛上回来后，鲁滨逊收回了他的种植园并将其出售。在该书的前六版中，他收到了328,000个西班牙银洋，价值约72,000英镑。但在后来的版本中，一个零被删掉了。这对于故事的解释很重要。小说结尾时，鲁滨逊是个有钱人，还是个超级有钱的人？

文学学者为自己对文本每一处细微差别的敏感而自豪。但鲁滨逊的财富十去其九却无人在意。斯皮尔曼指出：“尽管《鲁滨逊漂流记》的文本历史受到了仔细的关注，但没有人注意到有这么个问题。”经济学家可能忽视了鲁滨逊其人的丰富性。但文学学者却忽视了他的大部分财富。 ■



## Desert island dismal science

### Why economists love “Robinson Crusoe”

*The classic yarn of a shipwrecked sailor reveals a lot about scarcity*

AFTER SPENDING 28 years, two months and 19 days marooned on an island, Robinson Crusoe does not lose his nose for adventure or his “native propensity to rambling”. He crosses the Pyrenees, stalked by “hellish wolves”, witnesses the “pomp and poverty” of China and battles Tartars on the Russian steppe.

The character’s strangest adventure, however, is none of these. It is surely his centuries-long ramble through the literature of economics. Crusoe has appeared in Karl Marx’s “Das Kapital”, John Maynard Keynes’s “General Theory” and Milton Friedman’s Chicago lectures on “Price Theory”. He has an entry in the New Palgrave Dictionary of Economics. And he often washes up in economics textbooks.

Crusoe’s economic appeal is unsurprising. The sailor spends a few pages escaping pirates and shooting cannibals. But his real battle is against scarcity, which he defeats through careful deployment of the resources at his disposal, including his own labour.

After being shipwrecked, Crusoe makes his island prison habitable, even hospitable. Salvaging what he can from the wreck, he fortifies a cave (his “castle”), erects a tent (“my country house”), plants crops, tames goats (and a parrot) and fills his improvised shelves with pigeon, turtle and other foodstuffs.

Scarcity also stalked Daniel Defoe, the novelist who created Crusoe in 1719. Over a chequered career he traded in bricks, wines, pickles, tobacco and the glands of civet cats. He dabbled in horse-trading. Literally. He defaulted on

his debts. Twice. “No man has tasted differing fortunes more,” he wrote. “And thirteen times I have been rich and poor.”

He wrote allegories that turned dry economic variables into colourful characters like “Count Tariff”, an English nobleman dressed in domestically manufactured cloth, and “Lady Credit” (“if she be once Disoblig’d; no Entreaties will bring her back again). His publication “The Compleat English Tradesman” has been described as the first business textbook.

But it is his island fable that has most resonated, as Michael White of Monash University has documented. Economists are eager to find behavioural laws that apply anywhere. Crusoe’s isolation thus provides a useful thought experiment. Principles that hold true on his island must be elemental, not socially incidental.

William Forster Lloyd, for example, was keen to show that economics had something to say about value even in the absence of markets and exchange. In a publication in 1834, he pointed out that Crusoe prizes his goods more dearly as they become more scarce (“my ink beginning to fail me”, Crusoe says, “I contented myself to use it more sparingly”). He took that as evidence for the principle of diminishing marginal utility: a second bottle of ink is worth less than the first.

Most economists have turned to the tale not to corroborate a theory but merely to illustrate it. Textbook authors, for example, want to introduce the principles of supply and demand in the simplest possible case, and nothing is simpler than a one-person “Robinson Crusoe” economy.

Such an economy features in a textbook by Hal Varian, chief economist at Google. Crusoe must decide how to divide his day between gathering coconuts and working “on his tan”. In keeping with diminishing marginal utility, each extra coconut or hour of sunbathing is worth less than the



last. Each hour of work also yields fewer coconuts than the last. Under these assumptions, Crusoe should stop working at the point when an extra coconut is worth no more to him than the additional leisure he must sacrifice to gather it.

A one-person economy has several things going for it. There is no waste. If an extra coconut is not wanted, it will not be collected—supply implies its own demand. There is no unemployment. If Crusoe wants the extra coconut more than the leisure, he will employ himself to gather it. Such an economy, Keynes pointed out, cannot suffer the kind of slump that cursed the 1930s—when people fail to spend enough of their income on the goods the economy could produce.

Textbooks present Crusoe's one-man economy as a kind of benchmark, against which more sophisticated economies can be judged. Can its harmony be replicated, even when decision-making is divided up and dispersed—even when consumers and producers do not share the same mind?

The answer is yes, through the magic of flexible prices and wages. In his own more elaborate version of the parable, Daniel McFadden, a Nobel prize-winning economist who was also Mr Varian's thesis adviser, introduces a second character ("Friday"). In this version, Crusoe gathers yams not coconuts. Friday acts as a manager, hiring Crusoe's labour, paying him in yams, and giving him leftover yams as a "dividend".

Mr McFadden shows that there is an hourly wage that will reconcile the demand and supply of labour, and also, miraculously, the demand and supply of yams. But things can go wrong if wages get misaligned or expectations sink too low. If the wage gets stuck at too high a level, for example, Crusoe might find himself unable to work as long as he wants. The yams he could collect in an extra hour may be worth more to him than the

leisure he would lose. But if the wage he must receive is higher still, Friday will deny him the extra employment. The island would suffer a recession, combining unmet needs (for yams) with unused resources (Crusoe's spare labour).

If Friday worries that he will not be able to sell as many yams as he can produce, he may limit his demand for labour. That will curb his customer's purchasing power, thereby seeming to bear out his pessimistic sales forecast. Crusoe will lack work, because Friday lacks sales. And Friday will lack sales, because Crusoe lacks work.

An obvious objection to these parables is their cartoonishness. The concept of a Crusoe economy has become "another cuss-word to people who crave realism and are contemptuous of theory" noted Frank Knight, a Chicago economist, in 1960. But simplification can often aid understanding. Mr McFadden's parable, for example, illustrates that recessions are not necessary or salutary, but absurd and inefficient.

For Crusoe-lovers, however, what is most striking about these exercises is not their distance from reality, but their distance from Defoe's original tale. Neither coconuts nor yams appear in the book. And far from working on his tan, Crusoe took a "world of pains" to hide from the sun, making a "clumsy, ugly, goat's-skin umbrella" to ward off its rays. His island is not in the South Seas, as Mr McFadden maintains, but near Trinidad. And Friday and Crusoe do not bargain over labour or anything else. After Crusoe saves him from the cannibals who have carried him to the island by canoe, Friday in effect indentures himself to the sailor. One of the first English words he is taught is "Master".

Obliviousness to Defoe's tale does not invalidate the textbook parables. Little of importance hangs on whether Crusoe gathers coconuts, yams or grapes, in the South Seas or anywhere else. But the neglect is nonetheless a

missed opportunity. There is a lot of economic incident and insight in the original story. Economists might enjoy rediscovering it.

They could start not with coconut-gathering but with bread-making. “Few people have thought much upon...the strange multitude of little things necessary in the providing, producing, curing, dressing, making, and finishing [of] this one article of bread,” Crusoe says, as he struggles to make some for himself. In trying to start from near-scratch, Crusoe discovers that even the simplest product is a minor miracle of economic choreography. His thoughts resemble the classic essay, “I, Pencil”, written by Leonard Read in 1958, which details the “genealogy” of the humble pencil, with its wood from Oregon, graphite from Sri Lanka and rubber from Indonesia, all collected, transported and refined by machines that have their own even more complex genealogy.

After bread-making, economists could turn to Crusoe’s pottery. It takes him about two months to make a pair of jars—“two large, earthen ugly things”—in which to store his grain. Preserving resources is no easy matter: pests threaten his crops and decay unravels his clothes. In his 1916 book “The Natural Economic Order”, Silvio Gesell imagines how grateful Crusoe would be to lend his spare provisions to another islander, like Friday, in return for similar provisions a few years hence. He would accept the deal even if Friday pays no interest, because merely keeping wealth intact represents a victory against the relentless forces of decay. It is a useful thought experiment for anyone who resents today’s financial system, which for all its flaws, allows people to preserve their wealth in convenient savings accounts, not misshapen jars.

The Crusoe in the textbooks is a rational man, always equating marginal this with marginal that. He is the stock character of economics 101. The Crusoe in Defoe’s story is more mercurial and conflicted. As such, he lends himself to more recent, psychologically informed theories of decision-making. He

could become an icon of “behavioural economics”.

At one point, Crusoe uses his scarce ink to take stock of his predicament, drawing up a kind of balance-sheet of comforts and miseries, credits and debits. He is a lone castaway (a debit), but he is alive (a credit). The island is uninhabited, but it is not barren. He has no defences, but the island has no obvious predators. No companion survived the wreck, but provisions could be salvaged from it.

Daniel Kahneman, a psychologist who won the Nobel prize in economics, and Amos Tversky have shown that when assessing their lives, people often evaluate not their level of well-being, but their gains or losses from some “neutral” reference point.

The choice of reference point is not always obvious. On each line of his balance sheet, Crusoe entertains alternatives. His shipwrecked isolation represents a grievous loss from where he was. But it counts as a gain from an alternative scenario—not hard to imagine—in which he drowned or washed up on a more perilous shore. Mr Kahneman and Tversky point out that in dreaming up these alternative scenarios, people follow certain rules. They reimagine the chain of events leading up to their predicament, removing any strange or surprising twists of fate.

After Crusoe abandons the wrecked ship, it drifts closer to shore, allowing him to return to it and strip it bare. That, Crusoe recognises, was unlikely (100,000 to one, he says). It is therefore easy for him to imagine an alternative reference point in which he rescued nothing from the wreck. That helps him psychologically.

Behavioural economists stress that more choice is not always better. People may be unable to resist choices they know will hurt them in the long run. Choice also invites regret. It obliges us to compare our fate with the

alternative we could have chosen. Forced to stay on his island, Crusoe can be happy. But if he were to choose his isolation, he would be haunted by the alternative life he could have chosen elsewhere.

Indeed, Crusoe later concludes that he can be happier within the tight compass of his island than he would be in the outside world, where he had once lived a “wicked, cursed, abominable life”. He also immediately admits to himself that if offered the chance to escape, he would nonetheless take it.

As these examples show, economists might profit from greater familiarity with the Crusoe story. And the trade could be two-way. Defoe scholarship could and has benefited from a closer acquaintance with economics. There are several corners of Defoe’s works that require some economic knowledge to appreciate.

When Crusoe embarks on his ill-fated voyage to Guinea to buy slaves, he leaves behind a growing tobacco plantation in Brazil that would soon be worth “three or four thousand pounds”. It is hard for a reader today to make sense of such a figure. Drawing on the work of economic historians, David Spielman, formerly of Penn State University, calculates that the income on such a sum would have put Crusoe in the top 5% of English families at the time. With so much wealth in prospect, Crusoe has no reason to take risks. His voyage was as “preposterous” as he himself admits.

Economists might also resolve some other mysteries. After his return from the island, Crusoe reclaims his plantation and sells it. In the first six editions of the book, he receives 328,000 pieces of eight, worth about £72,000. But in later ones, a zero is deleted. That matters for the interpretation of the story. Does Crusoe finish the novel a rich man or a very rich one?

Literary scholars pride themselves on their sensitivity to every nuance of a

text. But the decimation of Crusoe's wealth has barely registered. "Despite the careful attention that the textual history of Robinson Crusoe has received, no one has even noticed a problem," Mr Spielman has pointed out. Economists may have lost sight of Robinson Crusoe's richness. But literary scholars have overlooked most of his riches. ■



## 好莱坞和AI

### 人工智能盯上了好莱坞最后几头狮子

#### 因AI失业的第一批演员是四条腿的家伙们【深度】

卢克（Luke）在洛杉矶郊外山上宽敞的牧场里转悠，一副好莱坞大腕的趾高气昂的派头。经过六年成功的电影生涯后，他住在一户开放式山景寓所，配有一个大游泳池，工作人员会在有需要时送上牛排或冰沙。当他接到拍摄广告或出席有偿活动的电话时，会有司机把他送进城，他收取的报酬相当于普通演员一周的工资。卢克所到之处，吸睛水平难有匹敌。他的经纪人唯一的抱怨是，一有机会，他可能就试图把他的合作演员吃了。

身为一头重达500磅的非洲狮，卢克（如图）必须应对其他演员没有经历过的挑战。但最近，他和他的同事开始共进退。2023年的一半时间里，美国的编剧和演员的罢工此起彼伏。他们与制片厂争执的原因之一是人工智能（AI）在影视制作中的应用。编剧们担心AI很快就会开始大量创作剧本，演员们则害怕随着技术让计算机生成图像（CGI）的质量越来越好，他们可能会被数字替身取代。

这对于大多数人类演员来说仍然只是个假设性的担忧，但对于四条腿的银幕明星来说已经成为现实。动物演员的工作正趋枯竭，因为计算机图形技术为在银幕上塑造动物形象提供了更简便（而且一些人认为更为人性化）的方法。随着AI使这些特效更加逼真和易于制作，在电视、广告和高端电影中，数字动物正在加速取代真实的动物。对动物演员的需求减少后，它们的主人和驯兽师正纷纷离开这个行当。卢克和他躺在附近围栏里打盹的同事马赛（Maasai）是好莱坞最后两头还在工作的狮子。

自一只狮子出现在戈德温影业（Goldwyn Studios，后来成为米高梅的一部分）的商标上起，动物就成为了好莱坞演艺人才库中不可或缺的一部分。20世纪20年代，拯救华纳兄弟免于破产的明星是任丁丁（Rin Tin Tin），他是一只德国牧羊犬，曾出演过20多部影片，票房非常出色，制

片人戏称它为“能还贷的角儿”。从1950年代起，一年一度的形同奥斯卡的颁奖礼会向海豚飞宝（Flipper）等明星颁奖，一位名叫罗纳德·里根的演员主持了第一届典礼。1993年，《娱乐周刊》发布“娱乐圈最具影响力的非人类”排行榜，上榜的包括《欢乐一家亲》（Frasier）中的狗子演员穆斯（Moose，与他合作的人类演员身上涂满了肝酱，以吸引他用鼻子蹭他们）。

拥有适当技能的动物仍有机会名声大噪。狮子卢克的主人兼驯兽师史蒂夫·马丁（Steve Martin）从事这一行已有50多年，供应过的动物林林总总，从《猎鹿人》（The Deer Hunter）中的鹿，到一对名为爱丽丝（Alice）和库珀（Cooper）的臭鼬等。他最早为卢克争取到的重要角色之一是在一部关于哈里王子和梅根·马克尔的电视电影《皇家情缘》（A Royal Romance）中。卢克在片中饰演了博茨瓦纳的一头野生狮子，影片暗示这头狮子可能是戴安娜王妃转世。马丁的另一头狮子，已故的“少校”（Major），在米高梅公司90周年庆典上与神色紧张的史泰龙一同亮相，爪印被刻在了好莱坞的星光大道上。

在卢克和马赛旁边的围栏里，11岁大的泰格（Tag）笨拙地移步过来，舔了舔马丁向他问好。为了在派拉蒙影业于2018年上映的电影《行动时刻》（Action Point）中扮演一个角色，这只重达1000磅的熊接受了从啤酒罐里喝水的训练。“他甚至没有弄瘪过一个罐头。”马丁自豪地说。今年早些时候，泰格不得不在一部名为《灰熊之夜》（Night of the Grizzly，泰格是棕熊，但它可以扮灰熊）的独立电影里袭击睡袋里的一个假人。这场戏的训练花费了两周时间和大量饼干。和其他优秀的电影明星一样，泰格变得对饮食有些挑剔，他不碰熊在野外可能会吃的生鲑鱼，而选择沃尔玛超市里的熟鸡肉。

如此成功的动物表演生涯日益罕见。马丁曾经在他占地60英亩的牧场里饲养了100多只动物，配有15名驯兽师。现在，他的员工只剩下核心三人团，牧场里的大部分围栏都空了。其他企业也纷纷关闭或大幅削减饲养的动物数量。驯兽师也越来越少。位于洛杉矶周边的莫尔帕克学院（Moorpark College）自1974年以来通过其“奇珍动物训练管理”课程为好



莱坞提供驯兽师。该学院教师加里·穆伊（Gary Mui）估计，当他1995年从该课程毕业时，约有70%的同学进入了娱乐业。如今，只有一成左右的毕业生进入该行业。

行业萎缩的原因之一是公众对动物福利日益敏感。自动物首次出现在镜头前以来，动物福利一直都是好莱坞的热门话题。早期的电影制作人将动物视为一次性道具；西部片使用绊索让马匹摔倒，制造出中弹倒地的效果。1939年，牛仔电影《杰西·詹姆斯》（Jesse James）故意将一匹马赶下悬崖，掉进湖里淹死，引发了公众强烈不满。次年，慈善机构美国人道协会（American Humane Society）开始提供到今天大家都已很熟悉的“没有动物受到伤害”认证，证明影片的制作过程通过了其现场检查。

自《杰西·詹姆斯》时代以来，好莱坞对待动物的方式有了很大改善。但虐待动物的现象并未消失，引发丑闻的风险也让制片厂感到紧张。在三匹马死在片场后，HBO中途砍掉了其赛马题材剧集《幸运》（Luck）（收视率不佳可能是另一个因素；一位剧评人打趣说它们可能是被无聊的剧情闷死的）。目前正在制作中的《角斗士2》因使用猕猴和马而遭到抗议。如今许多驯兽师都不大愿意提起自己的工作。一位驯兽师说，动物权利活动人士曾经叫了一支特警队到他家。他（在一片震耳欲聋的动物叫声中）坚持说，出于安全考虑，他不能再透露他是否在这里饲养了动物。

对于谨慎的制片厂而言，真正可信的数字替身如今已成为真实动物的一种替代选项。多年来，电脑制作的动物只有在某些情况下看着令人信服。1993年，《侏罗纪公园》的特效令观众叹为观止，但它使用的更多是仿真恐龙而不是CGI恐龙。在那之后的多年里，计算机模型一直难以制作出逼真的毛发，而动物往往有很多毛。穆伊回忆说，CGI制作出来的毛茸动物看起来很奇怪，滑溜溜的“就像小熊软糖”。1998年，迪士尼的《无敌大猩猩》（Mighty Joe Young）上映，该片的主角是一只用动画和CGI制作的巨猿。穆伊看得垂头丧气。“当时我说，‘哦，这下我们的日子可不多了’。”他回忆道。这是动物的毛发头一回看起来对劲了。

随着效果越做越好，导演们也越来越依赖它们。迪士尼已经制作了一系列

经典动物动画的真人翻拍版，包括《奇幻森林》（The Jungle Book，2016年）和《小飞象》（Dumbo，2019年），其中人类角色由真人演员出演，动物主角则是在显示屏上制作出来的。在翻拍大片《狮子王》（The Lion King，2019年）中，从疣猪到角马的每一种动物都是电脑制作的。这样做的不只是迪士尼。环球影业去年2月推出的卖座喜剧恐怖片《可卡因熊》（Cocaine Bear）的主角就是由CGI制作的。泰格甚至连试镜的机会都没有。“过去有这种角色他们会给我们打电话，”马丁说，“那些家伙真把我们逼得没事干了。”

到目前为止，“奇珍品种”丢掉的工作最多。自2013年派拉蒙出品的《华尔街之狼》（The Wolf of Wall Street）之后，黑猩猩就再没出演过美国大片。据称最后一批大象也是在同一时期沉重出走好莱坞的。马丁说，制片厂越来越不愿意与大型猫科动物合作。“对于野生动物来说，基本上已经玩完了。”他总结道。

小型动物明星的驯兽员们想知道数字化趋势会走多远。距狮子卢克的牧场约一小时车程的制片厂动物服务公司（Studio Animal Services）的前院设有障碍训练场，里头有多种狗咬胶和苍蝇拍。公司所有者卡琳·麦克尔哈顿（Karin McElhatton）自20世纪70年代以来一直在好莱坞训练动物。不过，白色的北京鸭“流言”（Rumor）似乎相信自己才是这里真正的主人，他游完泳摇摇摆摆地进屋，在一台风扇前搔首弄姿，扬起一阵羽毛和绒毛。

“娱乐业想要使用的动物品类越来越窄。”麦克尔哈顿说。她曾经带着五只从小养大的松鼠飞往匈牙利拍摄一支健达巧克力广告，广告要求它们把一枚硬币拿到自动售货机上。如今这类工作几乎都是由计算机完成了，她解释说。

麦克尔哈顿的35只猫和25只狗仍然有活干。阿尔伯特（Albert）是一只安详的棕色虎斑猫，套着粉红色的牵绳，大部分时间都在为宠物食品广告做模特，不过最近还参演了一部恐怖电影，假装吞食一具尸体。坦克

（Tank）是一只德国牧羊犬，在《海军罪案调查处》（NCIS）和《911》

等节目中扮演嗅探犬（他的训练师大卫·迈耶斯 [David Meyers] 拥有美国演员工会会员证，因此可以扮演随行警官）。两只金毛猎犬帕克（Parker）和波特（Porter）常扮演家庭宠物。两年前，他们去墨西哥参演喜剧电影《室友》（El Roomie），坐头等舱，还有自己的移动化妆拖车。

家畜在某种程度上免受数字竞争的影响。观众对家畜的真身更熟悉，因此假狗比假熊更容易看出来。动物权利抗议者对它们的参与也更宽容些。但即使是人类最好的朋友现在也在被数字分身取代。2020年上映的迪士尼电影《野性的呼唤》（The Call of the Wild）请电脑动画师制作了与哈里森·福特共同出演的圣伯纳-苏格兰牧羊犬巴克（Buck）。观众们不大喜欢这只数码狗。目前而言，导演们仍然更倾向于用动物真身。不过，“我们那次可是紧张死了，”麦克尔哈顿说。直到这部片子票房惨淡，她才松了一口气。

CGI能否取代处于表演食物链顶端的两足动物？在西雅图附近，一支不同寻常的驯兽师团队已经看到了这种可能性的迹象。最近，驯兽师教一只幼狮爬到它的父亲头上，然后从父亲的背上滚到地上。不过，这些狮子并不生活在笼子里，而是生活在硬盘上，它们的训练也不是用饼干完成的，而是用生物力学弹性体解算器和准静态积分器。

这些数字驯狮者为Unity工作，该公司为视频游戏创建虚拟环境和角色，还涉足电影（包括2022年的《阿凡达》续集）。在迪士尼的皮克斯担任动画师后加入Unity的艾伦·普尔（Allan Poore）表示，创造可信的动物仍然比创造逼真的人类更容易。“毕竟我们整天都盯着面孔和人看……我们会看出来的。”

眼睛就很难做好，而如果没有精致复杂的光漫射技术，皮肤看起来会像是蜡像。但创造数字人类正变得越来越容易。在AI加入动画师的工具包后，进展已经提速，“操纵”一个人脸数字模型（想想提线木偶）现在可能只需要一两个小时，而以前要一个月。“我们已经在这条路上走了很久，我认为离目标越来越近了，”普尔说，“我已经见过一些真假难辨的东西。而你

会看到更多这种东西。”

老演员们已经在被“减龄”，去扮演那些本来可能得找长得像他们的年轻人来演的角色。在6月上映的《夺宝奇兵：命运之盘》（Indiana Jones and the Dial of Destiny）中，动画师利用AI挖掘哈里森·福特在《夺宝奇兵》第一部时期的镜头，让已经八旬高龄的福特变回三十多岁。罗伯特·德尼罗在奈飞的《爱尔兰人》（The Irishman, 2019年）中实现了类似的容颜转变，塞缪尔·杰克逊在同年上映的迪士尼的《惊奇队长》（Captain Marvel）中也是如此。背景演员（群演）担心自己可能很快就完全不被需要了。

那么，什么样的工作等待着人类明星呢？这些动物预告了即将到来的精彩节目。它们有些仍在表演，但后来经过了数字增强。迪士尼的真人版《小姐与流浪汉》（Lady and the Tramp, 2019）将真狗的镜头与CGI镜头混剪，包括让狗的嘴巴模拟出讲话的效果（过去，训练师会在镜头启动前给狗喂一些有嚼劲的东西来达到这种效果）。真狗出演了华纳兄弟的《猛禽小队》（Birds of Prey, 2020年），但在后期制作中变成了鬃狗。美国人道协会解释说，一群100匹的CGI马很可能是以10匹真马为原型制作出来的。

其他动物已经从参演电影长片转向更日常平淡的工作。社交媒体博主们推崇高冲击力、低预算的特技表演，已经成为了奇珍动物的常见雇主。棕熊泰格曾与YouTube博主洛根·保罗（Logan Paul）英勇“搏斗”，在男性体育娱乐网站Barstool Sports组织的吃热狗比赛中挑战人类。现场活动也不会受到AI的威胁。泰格在2021年受聘与自称“野兽”的加州共和党人约翰·考克斯（John Cox）一起出席竞选集会。但由于对动物福利的担忧，连这样的工作也变得稀缺。马丁因泰格参加了这次集会被动物权利组织告上了法庭。

好莱坞最后一批驯兽师中的许多人如今已近退休。麦克尔哈顿说：“等这一代驯兽师去世了，我不知道美国还会有什么动物演员。”

动物权益倡导者很高兴。游说团体PETA主张更多使用CGI制作的动物，认为“文艺创作者可以利用特效来讲述引人入胜的情感故事，而无需利用任何动物真身”。“我理解动物权益人士的某些动机。但他们要明白，我们和他们的共识要比分歧多。”穆伊伤感地说。“我希望为动物谋福利，但我并不反对动物与人合作，只要方式正确。”但现在，“一切都快没了。”

在卢克的牧场，长长的车道尽头竖起了一块写着待售的牌子。76岁的马丁计划带着他剩下的动物搬去俄勒冈州。他认为，它们从银幕上消失最终会损害动物福利事业，因为观众与真实动物的连结断了。“这些家伙是野生动物的形象大使。”他说。很快，卢克和马赛将乘坐带空调的拖车和他一起北上。然后，好莱坞就只剩下数字狮子了。■



## Hollywood and AI

### AI is stalking the last lions of Hollywood

*The first actors to lose their jobs to artificial intelligence are four-legged*

PADDING AROUND his spacious ranch in the hills outside Los Angeles, Luke has the swagger of an actor who has made it in Hollywood. After six successful years in the movies he lives in an open-plan home with mountain views, a large swimming pool and staff who bring him steak or smoothies when required. A driver is on hand to take him into the city when he gets a call to shoot an ad or make a paid appearance at an event, for which he commands a fee equal to a week's pay for a lowlier actor. Luke turns heads like few other artists. His agent's only complaint is that, given half a chance, he might try to eat his co-stars.

As a 500lb African lion, Luke (pictured) has to deal with challenges not experienced by other actors. But lately, he and his human colleagues have found common cause. America's screenwriters and actors spent half of 2023 on overlapping strikes. One of the reasons for their bust-up with the studios was the use of artificial intelligence (AI) in film and television production. Writers worry that AI will soon be churning out scripts, while actors fear that, as the technology improves the quality of computer-generated imagery (CGI), they may be replaced by digital stand-ins.

For most human actors that is still a hypothetical worry. But for four-legged screen stars it is already a reality. Work for animal actors is drying up as computer graphics offer an easier—and, some argue, more humane—way to portray creatures on screen. As AI makes those special effects still more realistic and easier to produce, the replacement of real animals with digital ones is accelerating, in television and advertising as well as in high-end movies. As demand for animal actors declines, their owners and trainers are

leaving the business. Luke and his colleague, Maasai, who lies snoozing in a nearby enclosure, are the last two working lions in Hollywood.

Ever since a lion appeared on the title card of Goldwyn Studios, later part of MGM, animals have been an essential part of the Tinseltown talent pool. The star who saved Warner Bros from bankruptcy in the 1920s was Rin Tin Tin, a German shepherd who was in more than 20 pictures and was so bankable that producers dubbed him “the mortgage lifter”. From the 1950s an annual Oscars-style awards ceremony, first compered by an actor called Ronald Reagan, gave out gongs to stars such as Flipper the dolphin. In 1993 Entertainment Weekly ranked “the most powerful non-humans in entertainment”, including Moose, a dog-actor in “Frasier” (whose human co-stars were smeared with liver pâté to encourage him to nuzzle them).

Animals with the right skills can still find fame. Steve Martin, Luke the lion’s owner and trainer, has been in the business for more than 50 years, supplying everything from the deer in the “The Deer Hunter” to a pair of skunks named Alice and Cooper. One of the first big roles he landed for Luke was in “A Royal Romance”, a TV movie about Prince Harry and Meghan Markle. Luke played a wild lion in Botswana who, the film implied, may have been Princess Diana reincarnated. Another of Mr Martin’s lions, the late Major, had his paw prints set in Hollywood’s Walk of Fame, during an appearance alongside a nervous Sylvester Stallone to mark MGM’s 90th anniversary.

In an enclosure next to Luke and Maasai is Tag, an 11-year-old bear who lumbers over to greet Mr Martin with a lick. For a role in “Action Point”, a film released by Paramount Pictures in 2018, the 1,000lb bear was trained to drink from a beer can. “He never dented one, even,” says Mr Martin, proudly. Earlier this year Tag had to maul a dummy inside a sleeping bag, for an independent movie called “Night of the Grizzly” (Tag is a Kodiak, but he can play a grizzly). Training for that scene took two weeks, and a lot of

biscuits. Like any good film star, Tag has become somewhat fussy about his diet, shunning the raw salmon that a bear might eat in the wild in favour of cooked chicken from Walmart.

Such successful animal-acting careers are increasingly rare. Mr Martin once kept 100 or so animals at his 60-acre ranch, looked after by 15 trainers. Now his staff is down to a core of three, and most of the enclosures on the ranch are empty. Other businesses have closed or radically reduced their stock. Trainers are fewer, too. Moorpark College, on the edge of Los Angeles, has supplied animal wranglers to Hollywood through its Exotic Animal Training Management course since 1974. Gary Mui, a faculty instructor, estimates that when he graduated from the programme in 1995, about 70% of his classmates went into the entertainment industry. These days only about 10% of graduates do.

One reason for the industry's contraction is a growing public sensitivity to animal welfare, a hot topic in Hollywood since animals were first put in front of the camera. Early moviemakers treated animals as disposable props; Westerns used tripwires to make horses fall as if they had been shot. Public outcry greeted a cowboy film, "Jesse James", in 1939 in which a horse was deliberately driven off a cliff into a lake, where it drowned. The following year the American Humane Society, a charity, began providing its now-famous certification that "No animals were harmed" in the making of productions that passed its on-set inspections.

Animals' treatment in Hollywood has vastly improved since the days of "Jesse James". But abuse has not disappeared, and the risk of scandal makes studios nervous. HBO cancelled its racing drama, "Luck", after three horses died on set (poor ratings may have been another factor; one critic quipped that the animals may have died of boredom). "Gladiator 2", currently in production, has faced protests for using macaque monkeys and horses. These days many trainers are reluctant to talk about their work; one, who



says that animal-rights activists once called a police SWAT team to his home, insists (amid deafening squawking) that for security reasons he can no longer disclose whether he keeps animals on the premises.

Truly plausible digital stand-ins are now an alternative to real animals for wary studios. For many years, computer-generated creatures were convincing only in limited circumstances. “Jurassic Park” wowed audiences with its special effects in 1993, but used animatronic dinosaurs more than CGI ones. For years after that, computer models struggled to create realistic hair, which animals tend to have a lot of. Furry CGI creatures looked weirdly smooth—“like Gummi Bears”, recalls Mr Mui. Then, in 1998, came Disney’s “Mighty Joe Young”, whose star is a giant ape created from animatronics and CGI. Mr Mui watched it in dismay. “I said, ‘Oh, our days are numbered now,’” he recalls. For the first time, the hair looked good.

As the effects have got better, directors have relied on them more often. Disney has produced a series of live-action remakes of classic animal-based animations, including “The Jungle Book” (2016) and “Dumbo” (2019), in which it has cast real actors in the human roles but created the leading animals on a screen. In its blockbuster remake of “The Lion King” (2019) every creature, from warthog to wildebeest, was computer-generated. Disney is not alone. The star of Universal’s comedy-horror hit in February, “Cocaine Bear”, was a CGI creation. Tag never even got to audition. “They used to call us for stuff like that,” says Mr Martin. “Those guys really pushed us out of business.”

So far the “exotics” have lost the most work. Chimps have not acted in a big American movie since Paramount’s “The Wolf of Wall Street” in 2013. The last elephants are thought to have lumbered out of Hollywood around the same time. Studios are increasingly unwilling to work with big cats, says Mr Martin. “For wild animals, it’s basically finished,” he concludes.

Trainers of smaller stars are wondering how much further the digital trend will go. An hour or so from Luke the lion's ranch is Studio Animal Services, with an obstacle course in its front yard and multiple dog chews and fly swatters inside. Karin McElhatton, who has trained animals in Hollywood since the 1970s, is the company's owner—though Rumor, a white Pekin duck, appears to believe that he is its real proprietor, as he waddles in from a swim and preens in front of a fan, filling the room with a cloud of feathers and down.

"The business is getting more and more narrow in terms of the animals they want to use," says Ms McElhatton. She once flew a team of five squirrels, raised from babies, to Hungary for a Kinder chocolate ad, which required them to carry a coin to a vending machine. These days such jobs are nearly always computer-generated, she explains.

Ms McElhatton's 35 cats and 25 dogs still find work. Albert, a serene brown tabby on a pink lead, spends most of his time modelling for pet food commercials, though he also scored a recent role in a horror film pretending to devour a corpse. Tank, a German shepherd, is in demand as a sniffer dog on shows like "NCIS" and "911" (his trainer, David Meyers, has a Screen Actors Guild card so that he can play the accompanying police officer). Two golden retrievers, Parker and Porter, are often cast as family pets. Two years ago they went to Mexico for a comedy movie called "El Roomie"; they were flown first-class and got their own trailer.

Domestic animals have been somewhat protected against digital competition. Audiences are more familiar with the real thing and thus quicker to spot a fake dog than a fake bear. Animal-rights protesters seem somewhat less bothered by their involvement, too. Yet even man's best friend is now losing work to digital doppelgangers. "The Call of the Wild", a Disney movie released in 2020, called in computer animators to create Buck, the St Bernard-Scotch shepherd who co-stars alongside Harrison Ford.

Audiences didn't much like the digital dog; for now, directors still prefer to cast the real thing. Nonetheless, "it was extremely disconcerting for us," says Ms McElhatton, who was relieved when the movie fizzled at the box office.

Could CGI replace the two-legged animals at the top of the acting food chain? Near Seattle, an unusual team of animal trainers has seen signs that it might. The trainers recently taught a lion cub to climb onto its father's head, before rolling off his back and onto the ground. Yet the lions in question do not live in a cage, but on a hard drive, and their training is not done with biscuits, but with biomechanical elastic-body solvers and quasi-static integrators.

The digital lion-tamers work for Unity, which creates virtual environments and characters for video games and has dabbled in movies (including 2022's sequel to "Avatar"). Creating believable animals is still easier than creating realistic humans, says Allan Poore, who moved to Unity after working as an animator at Disney's Pixar. "We stare at faces and people all day...so we're going to notice."

Eyes are hard to get right, and skin can look waxy without elaborate light-diffusion techniques. But creating digital humans is getting easier. The addition of AI to the animator's toolkit has sped things up, meaning that "rigging" a digital model of a human face (think the wires on a puppet) might take an hour or two, down from a month. "We've been on this journey a long time, and I think we're getting closer and closer," Mr Poore says. "I've seen some stuff [where] it's hard to tell the difference. And you'll see more of that."

Actors are already being "de-aged" for roles which might once have gone to young lookalikes. In "Indiana Jones and the Dial of Destiny", released in June, the octogenarian Mr Ford was rejuvenated by half a century by animators who used AI to mine footage of the actor in his "Raiders of the

Lost Ark” days. Robert DeNiro underwent a similar transformation in Netflix’s “The Irishman” (2019), as did Samuel L. Jackson in Disney’s “Captain Marvel”, released in the same year. Background actors, or extras, fret that they may soon not be needed at all.

What kind of work awaits human stars then? The animals offer a preview of the coming attractions. Some still give performances that are later digitally enhanced. Disney’s live-action remake of “Lady and the Tramp” (2019) mixes footage of real dogs with CGI shots, including animating their mouths to simulate talking (an effect that trainers used to achieve by feeding the dog something chewy before the cameras rolled). Real dogs acted in Warner Bros’ “Birds of Prey” (2020), only to be morphed into a hyena in post-production. American Humane explains that a herd of 100 CGI horses is likely to be modelled on ten real ones.

Others have moved away from feature films to focus on more humdrum work. Social-media influencers, prizing high-impact, low-budget stunts, have become regular employers of exotic animals. Tag the bear has gamely “wrestled” with Logan Paul, a YouTuber, and taken on humans in a hot-dog eating contest organised by Barstool Sports, a blokeish entertainment site. Live events are also fairly safe from AI interlopers. Tag was hired in 2021 to appear at campaign rallies alongside John Cox, a California Republican who called himself “the beast”. Even this kind of work is becoming scarce, however, amid animal-welfare concerns. Mr Martin is being sued by an animal-rights group over Tag’s appearance at the rallies.

Many of Hollywood’s last animal-handlers are now near retirement. “When this generation of trainers kicks the bucket, I don’t know that you’re going to have hardly anything in America,” says Ms McElhatton.

Animal-rights advocates are delighted. PETA, a lobby group, advocates more use of CGI creatures, arguing that “creative people can tell compelling,

emotional stories using special effects and without exploiting any real animals.” “I understand some of the motivations of animal-rights people. And they need to understand that we have more in common with them than we don’t,” says Mr Mui sadly. “I want what’s best for animals, but I don’t have an issue with animals working with people as long as it’s done correctly,” he says. But now, “it’s all fading away.”

At Luke’s ranch, a for-sale sign has gone up at the end of the long driveway. Mr Martin, 76, is planning to move to Oregon with his remaining animals. He believes that their absence from the screen will ultimately harm the cause of animal welfare, by removing the audience’s connection to real, living creatures. “These guys are ambassadors for the ones in the wild,” he says. Soon, Luke and Maasai will head north with him in their air-conditioned trailer. And then the only lions left in Hollywood will be digital.





## 机器人技术

# 送货机器人带来别样圣诞节

### 圣诞老人的高科技小助手

一名店员从米尔顿凯恩斯（Milton Keynes）的一家Co-op便利店走出来，打开一个白色箱子的盖子。这个箱子的大小和一个小行李箱差不多，上面插着一面小红旗，底下装着六个轮子。店员把一袋商品放进箱子、扫描完条形码，箱子就缓缓滑走了。它以比路人散步略快的速度沿着人行道滑行，在一个路口停下来，等两辆车经过后，才安全穿过路口。无论是过往行人还是司机都不会多看它一眼。自2018年以来，这样的送货机器人就开始穿梭在这个位于伦敦西北向约80公里处的小镇，成为镇上的一道风景。

“当人们对它熟视无睹的时候，”埃德·洛夫洛克（Ed Lovelock）表示，“你就知道一项新技术取得了成功。”洛夫洛克是加州公司Starship Technologies的产品经理。截至目前，该公司已经使用其自主移动机器人Starship为欧美的商店和餐馆完成了500多万单外送服务。

在有些地方，这些配送是从空中送达的。“它很快就会成为你日常生活的一部分。”同样位于加州的无人机送货公司Zipline老板凯勒·里纳乌多·克利夫顿（Keller Rinaudo Clifton）表示。2016年，Zipline开始在卢旺达使用无人机运送血液和医疗用品。它正在向食品杂货和餐饮领域扩张，现在除了在美国和日本，它也在非洲其他地区开展业务。2024年，Zipline将为英国国家医疗服务体系（NHS）提供服务，开始向英格兰北部的医院和诊所送货。

和许多新技术一样，送货机器人也经历了某种程度上的技术成熟度曲线。十年前，许多人预测它们很快就会无处不在。例如，亚马逊在2013年大张旗鼓地宣布了其雄心勃勃的Prime Air无人机送货服务，但该计划后来进展缓慢，并未取得多少成就。现在情况正在改变，亚马逊的无人机似乎也终于要一飞冲天了。

一些因素促成了这些改变。Starship和Zipline等公司起步都较为谨慎，选择了监管机构对机器人送货较为包容的地区。例如，米尔顿凯恩斯是新城镇，这里有宽阔步道和自行车道可供机器人行驶；在卢旺达的上空几乎没有低空飞行的飞机可担心，无人机因而可以安全飞行。

在这类公司稳步积累了扎实的运营经验后，官员们开始放宽对它们的服务的限制。这意味着越来越多的货物正由机器人送达，而不是由货车司机把节日礼物和其他商品送到居民家门口，尤其是在每年的圣诞季。

Starship后续在英国的十个城镇推出了服务，包括曼彻斯特、利兹和剑桥等一些街道狭窄的较古老城镇。它还在美国50多所大学的校园里送货。Starship并非个例。2022年，由拼车平台优步（Uber）支持的Serve Robotics公司开始在洛杉矶使用“人行道送货机器人”为餐馆送外卖，并计划在美国其他城市部署约2000台。

顾客一般会通过应用下单，送货公司会加收少许送货费。在米尔顿凯恩斯，送货费根据距离远近而定，起步价为99便士（1.20美元）。米尔顿凯恩斯大约有100台Starship，每台最多可携带十公斤物品，为好几家商店送货。它们利用卫星定位沿着预先规划好的路线行进。包括十二个摄像头和雷达在内的传感器在机器人周围形成一个“感知气泡”。到达目的地后，顾客用手机解锁机器人的储物箱，取走自己购买的物品。

Starship萌萌的外型设计也是一个加分项。米尔顿凯恩斯的顾客可以选择一首歌曲（比如《生日快乐》），让机器人在到达时播放。逢年过节时，一些机器人还会被装饰成不同造型，比如万圣节的“南瓜机器人”或圣诞节的“驯鹿机器人”。因此，洛夫洛克补充道，居民很护着它们，很少有机器人被蓄意破坏。如果有人试图偷走它们或者它们运送的物品，这些机器人会发出刺耳的尖叫声。

人们对送货机器人不断接受度的提高有助于让这个创意传播开来。2024年春季，芬兰首都赫尔辛基将扩大一项使用人行道机器人的试验计划的范围。在韩国首都首尔，7-11连锁便利店已经在测试由三星支持的创业公司

Neubility生产的四轮电动送货机器人。对于首尔街头出现的越来越多的送货机器人，韩国政府在去年11月提醒民众“无需惊讶”。

送货无人机的情况大致相同，尽管它们还没有被装扮起来或是被安排唱歌。美国联邦航空管理局（FAA）不久前允许包括Zipline在内的一些公司进行“超视距”飞行。根据美国和许多其他国家的规定，无人机不准飞出操控员的视线，除非地面观察员能够监视它们，以防它们碰到附近的其他飞行器。这一规定限制了无人机的飞行距离，推高了成本。

技术上的进步帮助无人机争取到了新的自由度。执行超视距飞行的无人机可以内置新的微型传感设备以探测和避开其他飞行器。Zipline的系统使用了专门研发的麦克风，可以捕捉到其他飞行器靠近时发出的声音并确定其位置，从而让无人机在必要时采取规避行动。

在英国，一条连接英格兰南部和中部地区的165英里（265公里）长的无人机高速通道将于2024年开始运营。它将依靠沿途的一系列地面站与无人机建立通信，让无人机相互保持距离，同时避开其他所有飞行器。

因为具备了超视距飞行的能力，Zipline能够为其在非洲的业务提供类似的服务。Zipline使用的是一架单次能够往返飞行约200公里的固定翼无人机。它最大载重1.8公斤，通过一个巨大的弹射器起飞，并使用降落伞投放物品。

Zipline开始与美国的一些医疗中心合作。根据不久前与克利夫兰诊所（Cleveland Clinic）达成的协议，Zipline将把药品直接送到俄亥俄州各地的居民家中。为此，Zipline将使用一种新型悬停式无人机，单次能够往返飞行约30公里，最大载重3.6公斤。这款无人机使用的是一种叫作“机器人”的载货装置，而不是降落伞。“机器人”被缆绳放下后，会启动一个小型风扇马达来让自己移动，从而将包裹精准放在指定位置，比如房门口的台阶上。这种“无人机+机器人”的系统也将被用来运送食品杂货和餐食。

无论是人行道机器人还是无人机，都还需要一定程度的人类监督。通常是由控制中心里的人员监控，并在必要时干预。对于Starship来说，一般只



有当机器人停下来并试图确认自己打算采取的行动（比如穿过一个复杂的十字路口）是否安全时，才会进行干预。Zipline的无人机在遇到问题时可以被召回基地，或者在紧急情况下按指令立即停止飞行并使用降落伞着陆。不过，这种情况“极为罕见”，里纳乌多·克利夫顿表示。

至于亚马逊，它于2022年在加州和得克萨斯州的两小块区域开始了有限的无人机送货服务。此后，亚马逊开发了一种名为MK30的新型无人机，计划在2024年底前在美国、英国和意大利投入使用。这些无人机将从亚马逊的配送中心起飞，并且同样使用了“感知回避”系统来执行超视距飞行。它的噪音比亚马逊的现有机型小，最多可携带2.2公斤的包裹，并能在小雨等不稳定的天气条件下飞行。

亚马逊正在谈论在2030年前实现每年用无人机运送数百万个包裹。如果这家在线零售巨头最终能够攻克这项技术，那么自动化配送可能会遍布几乎世界各地。就算做不到这一点，也已经有足够多的公司证明，至少在某些地方，使用轮子、机翼或螺旋桨的各种送货机器人正在向我们走来。■



## Robotics

### Delivery robots will transform Christmas

#### *Santa's hi-tech little helpers*

A SHOP ASSISTANT leaves a Co-op convenience store in Milton Keynes and opens the lid of a white box, about the size of a small suitcase, with a red flag on top and six wheels. After the assistant drops a bag of shopping inside and scans a bar code, the box trundles off. Travelling at a brisk walking pace along the footpath, it pauses at a road junction until two cars have passed before crossing safely. Neither pedestrians nor car drivers give it a second glance. Delivery robots like this have become part of the scenery since they started work in this town, some 80km north-west of London, in 2018.

“That’s when you know a new technology is successful,” says Ed Lovelock. “People don’t notice it any more.” Mr Lovelock is product manager for Starship Technologies, a Californian firm that has so far delivered more than 5m shopping orders and restaurant meals in Europe and America using its autonomous Starships.

In some places such deliveries arrive by air. “It soon becomes a normal part of your life,” says Keller Rinaudo Clifton, the boss of Zipline, a drone-delivery firm also based in California. Zipline began using drones to deliver blood and medical products in Rwanda in 2016. It is expanding into groceries and meals and now operates in other parts of Africa as well as America and Japan. In 2024 Zipline will begin deliveries to hospitals and clinics in the north of England for Britain’s National Health Service.

Like many new technologies, delivery bots have gone through something of a hype cycle. A decade ago many predicted they would soon be everywhere. Amazon, for one, announced with great fanfare ambitious plans for its

Prime Air drone-delivery service in 2013, but progress was slow and not much happened. That is changing, and even Amazon's drones finally look like they are about to take off.

A number of things have brought this about. Companies like Starship and Zipline began modestly in areas where regulators were more comfortable with robotic deliveries. Milton Keynes, for instance, is a new town with wide paths and cycleways for bots to drive along, and with few low-flying aircraft to worry about in the sky above Rwanda, drones can operate safely.

Having steadily gained solid operating experience, officialdom is becoming more relaxed about such services. What that means is, particularly at this time of year, instead of fleets of delivery vans with drivers hauling seasonal gifts and shopping to people's front doors, an increasing number of goods are arriving by robot.

Starship has gone on to launch services in ten British towns, including older places with narrower streets like Manchester, Leeds and Cambridge. It also makes deliveries on more than 50 university campuses in America. Nor is it alone. Serve Robotics, which is backed by Uber, a ride-sharing platform, began using "sidewalk robots" for restaurant deliveries in Los Angeles in 2022 and aims to deploy some 2,000 in other American cities.

Customers typically use an app to order, with the firms adding a small delivery fee. Depending on distance, this starts at 99 pence (\$1.20) in Milton Keynes. Around 100 Starships, each able to carry up to 10kg, serve a number of stores. They navigate along pre-mapped routes using satellite positioning. Sensors, including a dozen cameras and radar, create a "bubble of awareness" around the robot. On arrival, customers use their phone to unlock the robot's storage compartment and collect their shopping.

It helps that Starships have been made cutesy. Customers in Milton Keynes

can choose a song, like “Happy Birthday” for the bot to play on arrival. Some are also decorated for festive occasions, such as “pumpkinbots” during Halloween or “reindeerbots” at Christmas. As a result, adds Mr Lovelock, residents are protective of them and few are tampered with. The bots emit a high-pitched screech if anyone tries to steal them or their contents.

The growing acceptance of delivery bots is helping the idea spread. A trial scheme using sidewalk robots in Helsinki, the Finnish capital, is due to be expanded in the spring of 2024. In November the South Korean government warned people “not to be surprised” by more of them appearing in the capital, Seoul, where the 7-Eleven convenience chain has been testing four-wheel models produced by Neubility, a startup backed by Samsung.

Much the same is happening with drones, although they are not yet dressing up and singing songs. America’s Federal Aviation Administration recently allowed some firms, including Zipline, to fly “beyond-visual-line-of-sight” (BVLOS). In America and many other countries drones are not allowed to be flown out of sight of their operators unless ground observers monitor them in case other aircraft are in the vicinity. This restricted how far drones could fly and drove up costs.

Advances in technology helped win these new freedoms. For BVLOS flights, new miniaturised sensing devices can be built into drones to detect and avoid other aircraft. Zipline’s system uses specially developed microphones which can pick up the sound of an approaching aircraft and determine its position, allowing the drone to take evasive action if necessary.

In Britain a 165-mile (265km) superhighway for drones, connecting southern England with the Midlands, will start operating in 2024. It will rely on a series of ground stations along the route to communicate with the drones to keep them apart and avoid any other aircraft.

The ability to fly BVLOS allows Zipline to offer similar services to its African operations. For these, the company uses a fixed-wing drone capable of a round trip of some 200km. Carrying up to 1.8kg, it is launched with a giant catapult and drops its delivery using a parachute.

The company is starting to work with a number of medical centres in America. In a recent deal with the Cleveland Clinic, it will deliver medicines directly to people's homes in locations throughout Ohio. For this Zipline will use a new type of hovering drone, able to make round trips of some 30km carrying up to 3.6kg. Instead of a parachute, this drone uses a load-carrying device called a "droid". After being lowered on a cable, the droid employs a small fan motor to manoeuvre, allowing it to set packages down in precise locations, such as the front steps of a home. This drone-plus-droid system will also be used to deliver groceries and meals.

Both sidewalk robots and drones still require some level of human supervision. Usually this involves people in a control centre monitoring them and intervening if necessary. For Starships, these interventions tend only to come when a bot stops and seeks confirmation that a manoeuvre it intends to undertake, like crossing a tricky road junction, is safe. Zipline's drones can be called back to base in the event of a problem, or ordered to stop flying immediately and deploy a parachute to land in an emergency. Such events, however, are "extraordinarily rare", says Mr Rinaudo Clifton.

As for Amazon, it began a limited drone-delivery service in two small areas of California and Texas in 2022. It has since developed a new drone, called the MK30, which it plans to put into service in America, Britain and Italy by the end of 2024. These will operate out of the company's delivery centres and also use a sense-and-avoid system for BVLOS flights. It is quieter than the firm's existing model, can carry packages up to 2.2kg and will be able to fly in unsettled weather, including light rain.

Amazon is talking about delivering millions of packages by drone every year by the end of the decade. If the giant of online retailing can finally crack the technology, then automated delivery could spread almost everywhere. If not, there are already enough firms demonstrating that, at least in some areas, delivery bots using wheels, wings or rotors are coming your way. ■



Xi-3PO

## 中国追求成为机器人超级大国

面对人口萎缩，中国希望机器人能填补空缺

中国打造人形机器人的第一次尝试并不理想。2000年，国防科技大学的一个团队开发了一台机器，看起来就像是会走路的烤面包机。它有圆溜溜的眼睛，胯部附近有炮筒一样的突起。这台名为“先行者”的机器人被当时机器人技术远远领先的邻国日本大加嘲笑。日本网民说它是中国的秘密武器——能让敌人笑死。

但中国坚持了下来。2023年11月，中国政府公布了一项计划，提出要在2025年实现大规模生产人形机器人。中国对机器人的热爱远不限于那些会走路说话的。据行业机构国际机器人联合会（International Federation of Robotics）的数据，2022年中国的工业机器人装机量占到了全球的50%。按平均每名工人配备的机器人数量计算，中国目前是全球自动化程度第五高的国家。受荣誉感的驱动，加上紧迫的人口挑战，中国正在努力成为机器人超级大国。

中国新安装的机器人有许多是经设置程序后可在生产线上焊接、钻孔或组装部件的机械臂。不过2022年中国还制造了600多万台“服务机器人”，辅助人类完成工业自动化以外的任务。这些机器人在仓库内穿行，搬运货箱。还有一些在酒店里打扫卫生。在南方城市广州的一家餐厅里，烹饪和传菜都由机器人完成。

这里面有些可能看起来只是营销噱头，但对习近平领导的共产党来说，机器人是件很严肃的事情。官员们认为，中国在19世纪落后于西方列强并遭受它们欺辱，一定程度上是因为没有接纳发生在其他地方的技术革命。现在，中国要力求在技术上保持领先。在过去，官员们用钢铁产量来衡量经济发展水平，如今他们看重的是机器人装机量，恒生银行的王丹指出。

中国近几十年来令人瞩目的经济增长归功于三大因素：城市劳动力激增，

资本存量大幅增加，以及生产率不断提升。但到了今天，对新基础设施的需求减少了。而15至64岁的劳动年龄人口日渐萎缩，预计到2050年将减少超过20%。2023年初，政府公布了一份清单，列出了“最缺工”的100个职业，其中与制造业相关的就有41个。曾经有大量年轻的廉价劳动力从事这些职业，而现在工资更高了，工人却不再充足。

因此，习已经把提高中国的生产率列为要务。政府认为机器人能在这方面发挥重要作用。多年来，政府一直在推动工业从劳动密集型向机器人密集型转型。多省投入数十亿美元计的资金帮助制造企业做这种升级。新冠疫情期间的经历更是强化了这一思路。无休止的封控导致工厂关闭，让西方企业重新考虑供应链部署。2022年所有管制解除后，一波疫情让员工纷纷病倒，再度打断了公司运作。有了机器人，就不会受制于员工的身体状态了。

工厂面临的许多挑战也是农业面对的难题。中国农民的平均年龄是50多岁。很少有年轻人愿意接手务农。陷于类似困境的国家通常会进口粮食或者引进廉价劳动力。但中国执着于保障粮食安全，也无意引进劳工。机器人可能是个出路。农业的某些工作要实现自动化并不难，比如挤奶，其他工作的自动化虽然比较棘手，但似乎也可以小规模实现。西南部城市成都开发了一个无人蔬菜农场，理论上一年可以收获十茬蔬菜。

假以时日，机器人也许能取代日渐年迈的人力，还可能在照顾他们方面发挥作用。中国入住养老院的老人达810万，而照护他们的专业人员远远还不够。国家卫健委于2021年发布的一项计划呼吁发展智慧养老服务。其中一些设想雄心勃勃，比如为体弱者提供电子外骨骼帮助其行动，但同时也可使用更简单的机器人帮助老人洗澡或站立。中国的科技巨头正迎向这一挑战。2022年，大型人工智能公司科大讯飞表示，希望把机器人送入老人家中，提供陪伴和健康管理服务。据上海媒体报道，在当地一家养老院，一台机器人会一边转悠一边唱老人们年轻时传唱的革命歌曲，把他们逗得很开心。

会让政府开心的是中国的机器人产业能变得更自给自足。本地企业仍依赖



外国公司提供零部件和专门技术。中国有充分理由担心被西方市场拒之门外。美国已禁止中国企业购买先进半导体和用于制造这些半导体的设备（机器人需要芯片，但通常不是最先进的芯片）。因此，中国政府一直努力推动机器人研究。8月，北京市宣布成立一项100亿元的基金用于机器人研发。

这些努力正初见成效。2022年中国安装的工业机器人中有36%是国产的，高于2013年的25%。大型企业深圳汇川技术制造的机器人用于生产LED灯和手机。公司董事长朱兴明表示，他们可能在五年内就能从中国企业采购到所需的全部零部件。

不过对于大多数的中国机器人公司而言，要达到自给自足仍有一段距离。这也是中国政府大力发展人形机器人的原因之一。短期内，这些机器人可能不太实用，价格也太高。但官员们希望在开发这些机器人的过程中能形成一条国内供应链。

政府不必担心其计划会遭到很多反对。调查显示，大多数中国人认为机器人创造的就业机会将多于它们会破坏掉的。由此看来，中国是一个技术乐观主义者的国度。当然了，这也得益于这里禁止成立独立工会。■



Xi-3PO

## China's quest to become a robot superpower

*As its population shrinks, China hopes machines can pick up the slack*

CHINA'S FIRST attempt at building a humanoid robot did not hit the mark. The machine produced in 2000 by a team at the National University of Defence Technology looked like a walking toaster. It had googly eyes and cannon-like protuberances near its crotch. Called Xianxingzhe, or Forerunner, it was mocked in neighbouring Japan, which at the time boasted far sleeker robots. Japanese netizens described it as China's secret weapon—designed to make its enemies die of laughter.

China has stuck with it, though. In November the government published a plan calling for the mass production of humanoids by 2025. The country's love of robots goes beyond those that can walk and talk. Last year half of all the industrial robots installed worldwide were fitted in China, according to the International Federation of Robotics, an industry body. It is now the fifth most automated country in the world when measured by robots per worker. Motivated by pride and pressing demographic challenges, China is on a mission to become a robot superpower.

Many of the country's newly installed robots are mechanical arms that can be programmed to weld, drill or assemble components on a production line. But last year China also produced over 6m "service robots", which help humans with tasks apart from industrial automation. Such machines scoot around warehouses, moving boxes. Others clean hotels. At a restaurant in the southern city of Guangzhou meals are cooked and served by robots.

Some of this may seem gimmicky, but to the Communist Party led by Xi Jinping robots are serious business. Officials believe China fell behind and

was humiliated by Western powers in the 19th century in part because it did not embrace technological revolutions happening elsewhere. Now China aims to stay ahead of the game. Whereas officials once used steel production as a gauge of economic advancement, today they look at the number of robots installed, says Dan Wang of Hang Seng Bank.

China's impressive economic growth in recent decades was a result of three main factors: a soaring urban workforce, a big increase in the capital stock and rising productivity. Today, though, less new infrastructure is needed. And the working-age population, those between 15 and 64, is shrinking. It is projected to drop by over 20% by 2050. Earlier this year the government released a list of 100 occupations for which there is a shortage of labour. Manufacturing-related positions accounted for 41 of them. A surfeit of young and cheap workers once did these jobs; now wages are higher and workers less abundant.

As a result, Mr Xi has made boosting China's productivity a priority. The government sees robots playing a big part in this effort. For years it has pushed industry to go from being labour-intensive to robot-intensive. Provinces have spent billions of dollars helping manufacturers upgrade in this way. China's experience during the pandemic reinforced this mindset. Endless lockdowns caused factories to close and Western firms to reconsider their supply chains. When all of the controls were lifted in 2022, a wave of covid-19 again disrupted businesses as workers fell ill. With robots, health is not a concern.

Many of the challenges faced by factories apply to agriculture, too. The average Chinese farmer is in his or her 50s. Few young people want to take their place in the fields. Countries that face similar predicaments often import either their food or cheap labour. But China is paranoid about food security and uninterested in immigration. Robots could be the answer. Some aspects of agriculture, such as milking cows, can be automated fairly

easily. Others are trickier, but appear possible on a small scale. The south-western city of Chengdu has developed an unmanned vegetable farm which could, in theory, produce ten harvests a year.

In time, robots might replace ageing workers. They might also play a role in caring for them. China has far too few professionals looking after its 8.1m care-home residents. A plan from the National Health Commission, published in 2021, called for developing smart elderly care. Some of it is aspirational, such as providing frail people with electronic exoskeletons to aid their movements. But simpler robots could be used to help old folk bathe or stand up. China's tech giants are looking into the challenge. In 2022 iFlytek, a big artificial-intelligence firm, said it wanted to send robots into the homes of seniors to offer companionship and health management. Residents of a care home in Shanghai are kept happy by a robot that zips around singing revolutionary songs from their youth, according to local media.

What would make the government happy is if China's robotics industry became more self-sufficient. Local firms still rely on foreign companies for parts and know-how. China is fearful of being shut out of Western markets, for good reason. America has blocked Chinese firms from buying advanced semiconductors and the equipment used to make them (robots require chips, but usually not the most advanced kind). So the government has been trying to stimulate robotics research. In August the city of Beijing announced a 10bn-yuan (\$1.4bn) fund for robot development.

Such efforts are having some effect. Last year 36% of the industrial robots China installed were made at home, up from 25% in 2013. Shenzhen Inovance Technology, a big Chinese firm, builds robots that are used to make LED lights and mobile phones. It may be able to source all of the components it needs from Chinese companies within five years, says Zhu Xingming, its chairman.

For most Chinese robotics firms, though, self-sufficiency is still some way off. That is part of the reason why the government is pushing the development of humanoids. These may not be very practical or affordable in the near term. But officials hope the process of manufacturing them will create a domestic supply chain.

One thing the government does not have to worry about is much pushback against its plans. Surveys suggest most Chinese people think robots will create more jobs than they destroy. China, it seems, is a land of techno-optimists. It helps, of course, that independent labour unions are banned.





## 技术经济学

### 英语拖拉机简史

#### 从拖拉机和马的对峙看生成式人工智能来袭

它就是当年的ChatGPT。“来看看拖拉机吧！”1915年，《草原农场主》（Prairie Farmer）杂志上的一篇文章恳请道，它在为伊利诺伊州展示这项新技术的展销会做广告。“这将标志着农业的新纪元，让农场主从只能依靠疲倦的马匹中解放。”“拖拉机比马更经济，”一位农业专家在大约同一时间发布的一份政府报告中坚称，“它不仅让农业劳作的成本更低，也让农活更轻松。”这项技术显然让人们惊叹不已，但也让他们害怕。一位美国观察家在英国观摩拖拉机作业时说，它“喷着响鼻，像一头巨兽般在大地上横行”。拖拉机预示着美国农业的一场革命，该行业在1900年雇用了约三分之一的劳动力，创造了约15%的GDP。

如今，许多人预期另一场革命到来，这次是与生成式AI的发展相关。和当年一样，今天的公众对这项技术又敬又怕。高盛认为，生成式AI可能在十年内将全球年GDP提高7%。一些经济学家正大谈“爆炸性增长”。其他人则表示，用不了多久，千百万工作岗位将被淘汰。然而拖拉机的经济史让人对这些预测心生怀疑。纵观历史长河，拖拉机确实对人们的生活产生了巨大的影响。但它是悄无声息地征服了世界，而非轰轰烈烈地席卷而来。

历史学家对于谁发明了拖拉机存在分歧。有人说是英国工程师理查德·特里维希克（Richard Trevithick）在1812年发明的。另一些人认为是1890年代初在南达科他州工作的约翰·弗罗利希（John Froelich）。还有更多人指出，在20世纪初之前很少能看到“拖拉机”这个词。要等到进入20世纪后人们才开始认真讨论普通农场主购买拖拉机的事宜。那会儿，从犁到收割机等各种令人眼花缭乱的农具都是由马和骡子来拉动的。

马儿们遭遇了一种更高大威猛的巨兽。参观一下吉恩·琼斯（Gene Jones）位于阿拉巴马州乡村小城米尔布鲁克（Millbrook）的拖拉机博物馆，你

就能体会到20世纪早期马儿们的感受了。这家博物馆内收藏了数十台拖拉机，其中包括20世纪的Farmall系列和福特（Ford）拖拉机。它们都很漂亮，这一部分要归功于琼斯对它们的精心修复，还给它们刷上了深浅各异的赤褐色。它们也很吓人，有些重达数千磅，还有一些需要用摇动曲柄来启动发动机——要是你不知道怎么操作，可能会弄折了自己的胳膊。

事后看来，拖拉机显然产生了深远的影响。有了它，同样面积的农田就可以养活更多的人。有了拖拉机，农场主不再需要牧马，而饲养每匹马每年需要大约三英亩的耕地来种植草料。更集约化的农业也有其弊端。一些研究人员认为，拖拉机的应用是20世纪30年代沙尘碗（Dust Bowl）灾害事件发生的原因之一。它们强大的犁耕技术破坏了以往防止风蚀的表层土壤。

拖拉机的经济影响最终也变得清晰起来。拖拉机效率更高，让农场主能够用相同数量的雇工管理更多的土地，从而可以扩大经营。农场规模开始扩大，较小的家庭农场被规模更大的机械化农场取代。据一项估计，到1960年，美国农场的平均面积要比假如没有拖拉机的情况下大58英亩（相当于今天十家大型沃尔玛的占地）。拖拉机还让生产食物所需的工人减少了约200万，相当于1960年农场就业人数的25%。所有这些进步累积起来产生了巨大影响。在2012年发表的一篇论文中，经济学家理查德·斯特克尔（Richard Steckel）和威廉·怀特（William White）认为，到20世纪50年代中期，农业机械化让美国GDP提高了约8%。

然而，在20世纪上半叶的大部分时间里，拖拉机引发的变化并没有让人感觉非常深刻。这是因为拖拉机在美国经济中的普及速度比琼斯的老旧福特拖拉机穿越积水田地的速度还要慢。1920年，尽管《草原农场主》大加好评，仍只有4%的美国农场有拖拉机（见图表）。即使到了1940年也只有23%的农场有。在1910年代，投机商人纷纷涌入拖拉机制造业，希望能赚笔快钱（就像在如今的硅谷，每两家科技公司就有一家自称“以AI为先”）。许多厂家无人光顾，只能关门收场。

马儿坚持的时间之久出人意料。在20世纪30年代的大部分时间里，美国农

场上马类役畜的总生产力（可谓真正的“马力”）仍然大于拖拉机。1945年，四分之一的农场同时拥有役畜和拖拉机。拖拉机普及缓慢，导致生产率的提高同样缓慢。虽然缺乏完整数据，但可以知道在20世纪上半叶，农业生产力的年增长率可能从未高过3%。推动GDP提高8%的作用确实有，但要历经好几十年才感受得到。至于说推动爆发式增长？几乎没有。

拖拉机缓慢的普及速度是经济史上的一大谜题。如果拖拉机这么好，为什么农场主不赶紧买呢？他们并不是从原则上抵制新技术的卢德派。确实，美国马协会（Horse Association of America）等反拖拉机游说团体曾警告说，购买一辆拖拉机将使农场主陷入难以负担的债务。但在1910年代和1920年代，许多没有拖拉机的农场主却拥有汽车，表明他们是愿意尝试新技术的。1917年，《机械农业》（Power Farming）期刊发表了15位使用拖拉机的农场主的来信。虽说这些来信可能是应邀写的，但起到了敦促他人效仿的作用。

三个原因解释了为什么拖拉机的胜利花了这么长时间。首先，早期的拖拉机并没有人们最初以为的那么有用，它需要改进。其次，采用拖拉机需要改变劳动力市场，而这需要时间。第三，农场本身也需要改造。

先说说拖拉机的性能。1900年代的早期拖拉机都是些庞然大物。它们可用于开垦荒地和其他一些作业，但不适用于耕作已种植作物的田地。许多早期的机型都使用金属轮子，而不是轮胎，所以会陷在泥里。而且它们价格高昂。然而在1910年至1940年间，拖拉机变得功能更多样，体积也更小，能适用于更广泛的任務。

1927年，约翰·迪尔（John Deere）为其拖拉机设计了一个动力升降装置。这样农场主就可以拉动操作杆来拉起农具（例如犁），而无需手动操作。橡胶轮胎在1933年前后出现在拖拉机上。在很长一段时间里，通用拖拉机无法实现玉米和棉花收割的机械化，这便是琼斯居住的地区是采用拖拉机最慢的地区之一的一个原因。但到了20年代，美国有了玉米采摘机，第二次世界大战后又出现了机械采棉机。到战争结束时，拖拉机经通胀调整后的价格也比1910年的水平下降了约一半。



工资是第二个因素。用马从事农业生产要耗费很多劳动——马需要喂养、清洁和医护，即便是在它们不工作时。1930年代初经济大萧条期间，农业平均实际工资下降。因此，对于许多农场主来说，雇人管理马匹比花大钱买拖拉机更容易，雇工还可以随时解雇。但到了第二次世界大战时，劳动力变得日渐短缺，导致实际工资迅速上涨。突然间，用机器似乎更划算了。

第三个因素是农场重组。拖拉机在大型农场中效果最好，因为农场主可以摊薄巨额前期投资。因此，扩大农场规模和购买拖拉机变成了事情的一体两面。例如，在1916年伊利诺伊州的一项调查中，使用拖拉机获利的农场主也谈到了要增加农场面积。但扩大农场需要时间。想要扩大规模的农场主必须筹集所需的资金，接着还要与土地所有者协商购买事宜。

拖拉机的历史透露出生成式AI可能会以怎样的速度占据主导。目前，大多数AI模型采用的仍旧是“金属轮子”，而不是“橡胶轮胎”，它们的速度、动力或可靠性都还不足以应用于商业环境中。过去两年，随着通胀飙升，实际工资几乎没有增长，限制了企业寻找劳动力替代选择的积极性。而且企业尚未开启全面重组业务和内部数据，而这是充分利用AI模型所必需的。无论一项新技术可能有多么好，社会都需要很长很长的时间来调整适应。





## The economics of technology

### A short history of tractors in English

#### *What the tractor and the horse tell you about generative AI*

IT WAS THE ChatGPT of its day. “Come and see the tractors”, entreated an article in the *Prairie Farmer* in 1915, advertising a trade show in Illinois showing off the new tech. “It will mark a new epoch in farming—the farmer’s liberation from sole dependence on the weary horse.” “Tractors are more economical than horses,” insisted an agricultural expert in a government report around the same time, “not only making farm work cheaper but easier.” The tech clearly impressed people, but it also scared them. One American observer, watching a tractor in England, said it “walked over the earth like some huge animal, puffing and snorting”. Tractors promised a revolution in American agriculture, an industry which in 1900 employed about a third of workers and produced about 15% of GDP.

Today many people expect another revolution, linked to developments in generative artificial intelligence (AI). Like then, the general public today view the technology with a mixture of awe and fear. Goldman Sachs, a bank, reckons generative AI could raise annual global GDP by 7% over ten years. Some economists now talk about “explosive growth”. Others say that before long, jobs will be eliminated in their millions. Yet the economic history of the tractor casts doubt over these predictions. Over the sweep of history the tractor has indeed had an immense impact on people’s lives. But it conquered the world with a whimper, not a bang.

Historians disagree about who invented the tractor. Some say it was Richard Trevithick, a British engineer, in 1812. Others credit John Froelich, working in South Dakota in the early 1890s. Still more point out that the word “tractor” was little used until the start of the 20th century; and that only

then did people start seriously talking about the average farmer buying one. At the time horses and mules pulled around an impressive array of farm implements, from ploughs to reapers.

The horses faced up to a bigger, more powerful beast. You can put yourself in the shoes of an early 20th-century horse by visiting Gene Jones's tractor museum in Millbrook, a small city in rural Alabama, which contains dozens of machines, including Farmalls and Fords, from the 20th century. The tractors are beautiful—and not just because Mr Jones has lovingly restored them, painting them in a variety of rich auburn-reds. They are also intimidating. Some weigh thousands of pounds. Others have cranks to start the engine which can break your arm if you don't know what you're doing.

With hindsight, it is clear that the tractor had profound impacts. It meant that a given quantity of farmland could feed more people. Tractor-owning farmers no longer needed to pasture horses, each of which required about three acres of cropland for feed each year. More intensive farming also had downsides. Some researchers have argued that tractors helped bring about the Dust Bowl of the 1930s. Their powerful ploughing techniques damaged the topsoil that had once prevented wind erosion.

The economic impact eventually became clear, too. The greater efficiency afforded by tractors allowed farmers to expand their operations, as they could manage more land with the same number of workers. Farms began to grow in size, with smaller family farms giving way to larger, mechanised operations. According to one estimate, by 1960 the average American farm was 58 acres (equivalent to the land occupied by ten big Walmarts today) larger than it would have been without tractors. The tractor also reduced the number of workers needed to produce food by about 2m, or 25% of farm employment in 1960. All these improvements added up. In a paper published in 2012 Richard Steckel and William White, two economists, argue that by the mid-1950s farm mechanisation had raised American GDP

by about 8%.

And yet for much of the first half of the 20th century, tractor-induced changes did not feel very profound. This is because the tractor diffused across the American economy slower than one of Mr Jones's old Fords trying to cross a waterlogged field. In 1920, despite rave reviews in the *Prairie Farmer*, just 4% of American farms had a tractor (see chart). Even by 1940 only 23% had them. In the 1910s opportunistic businessmen had piled into the tractor-making business, hoping to make a quick buck (just as every second tech firm in Silicon Valley now describes itself as "AI-first"). Many had no customers and were forced to close.

The horse endured for a surprisingly long time. For much of the 1930s the total productive capacity of equine animals—quite literally, horsepower—across American farms still exceeded that of tractors. In 1945 a quarter of farms reported both draft animals and tractors. The slow diffusion of the tractor produced slow productivity gains. The data are spotty, but in the first half of the 20th century annual productivity growth in agriculture probably never exceeded 3%. That 8% GDP effect is real, but it made itself felt only over decades. Explosive growth? Hardly.

The tractor's plodding progress is one of the big puzzles of economic history. If they were so good, why did farmers not buy them more quickly? They were not Luddites who resisted new technologies on principle. True, anti-tractor lobby groups, such as the Horse Association of America, warned that buying one would land the farmer in unmanageable debt. But in the 1910s and 1920s many tractorless farmers did own cars, suggesting that they were willing to try new tech. In 1917 *Power Farming*, a journal, published letters from 15 farmers who used tractors. They were probably solicited, but these letters urged others to follow suit.

Three reasons explain why the triumph of the tractor took so long. First,

early versions of the technology were less useful than people had originally believed, and needed to be improved. Second, adoption required changes in labour markets, which took time. And third, farms needed to transform themselves.

Take capabilities first. The early tractors of the 1900s were behemoths. They were useful for ploughing, and a few other things, but not for cultivating fields of growing crops. Many early models had metal wheels, not tyres, so they got stuck in the mud. They were also costly. Between 1910 and 1940, however, the machines became both more versatile and smaller, making them suited to a wider range of tasks.

In 1927 John Deere released a power lift for its models. This meant that a farmer could pull a lever to raise an implement (such as a plough), rather than doing it manually. Rubber tyres came along in about 1933. For a long time the general-purpose tractor could not mechanise corn and cotton harvests, one reason why the area in which Mr Jones lives was one of the slowest to adopt tractors. But by the 1920s America had the corn-picker, followed by the mechanical cotton-picker after the second world war. By the end of the fighting, tractor prices had also fallen from their level in 1910, after adjusting for inflation, by about half.

Wages were the second factor. Horse technology was labour-intensive: horses require feeding, cleaning and medical care, even when they are not working. In the early 1930s, during the Depression, average real wages in agriculture fell. So for many farmers it became easier to hire someone to manage a horse—you could always fire them—than it was to splurge on a tractor. But by the second world war, labour shortages mounted, leading real wages to rise quickly. Suddenly, machines seemed like a better deal.

The third factor was corporate restructuring. Tractors worked best on big farms, where the farmer could spread out the expense of a huge upfront

investment. As a result, enlarging the size of their holdings and buying a tractor were two sides of the same coin. In a survey in Illinois in 1916, for instance, farmers who used tractors profitably also talked about increasing their acreage. But growing a farm takes time. A farmer looking to expand had to gather the necessary capital, and then negotiate the purchase with the owners.

The history of the tractor hints at how quickly generative AI may take over. At present most AI models still have metal wheels, not rubber tyres: they are insufficiently fast, powerful or reliable to be used in commercial settings. Over the past two years real wages have hardly grown as inflation has jumped, limiting companies' incentives to find alternatives to labour. And companies have not yet embraced the full-scale reorganisation of their businesses, and in-house data, necessary to make the most of AI models. No matter how good a new technology may be, society needs a long, long time to adjust. ■



## 经济史

### 弗里德曼的时代终结了吗？

也许有人这么认为。但我们仍生活在他的时代【《弗里德曼传》书评】

《弗里德曼传》，詹妮弗·伯恩斯著。Farrar, Straus and Giroux出版社，592页；35英镑。

无论你认为对米尔顿·弗里德曼（Milton Friedman）的思想是应该诅咒还是讴歌，宣称弗里德曼思想已死都很时髦。在美国，民主党要员提起他的名字时都语带轻蔑。这位20世纪最具影响力的美国经济学家经常被贬斥为安·兰德式资本主义的冷血信徒，在国内宣扬企业贪婪，在国外宣扬威权主义。弗里德曼是美国总统拜登的心头之患。在2020年竞选总统时，他宣称“米尔顿·弗里德曼已经不再是主角了”。

与此同时，美国保守主义（弗里德曼终其一生被视为这一政治运动的一员）当前的民粹主义旗手们也持相同的观点，他们已经背弃了财政纪律和开放市场。

也许人们会很容易听信弗里德曼的思想已经过时的观点，甚至庆幸终于从中解脱了。但这会是个错误。很少有思想家像弗里德曼一样重要（也很少像他那样被如此荒诞地歪曲丑化）。他批判凯恩斯主义、倡导央行的重要性、强调货币供应在解释通胀中的首要作用，以及优先考虑实际利率而非名义利率，这些观点一度都是非正统的。现在，它们已经成了主流。

斯坦福大学教授詹妮弗·伯恩斯（Jennifer Burns）最近出版的一本传记驳斥了种种谬误。由于弗里德曼的长寿（生于1912年，卒于2006年），以及学术生涯成果丰硕且参与了现代最重要的经济辩论，伯恩斯花了近十年研究档案文献写就的这本书可以充当整个20世纪的知识指南。

书中呈现的弗里德曼具有惊人的经济学才华，是他将货币政策确立为一个值得认真研究的领域。这本书描绘了一位有惊人非正统思想的经济学家，

也许是最后一位伟大的政治经济学家，对政治自由和经济自由之间的关联有深刻的思考。

弗里德曼最为人熟知的是关于货币对宏观经济的重要性的开创性思想，这一点在当今显而易见，但在当时却不然。他和除了妻子罗斯·戴瑞克特·弗里德曼（Rose Director Friedman）之外最重要的智力伙伴安娜·施瓦茨（Anna Schwartz）共同撰写了《美国货币史》（A Monetary History of the United States, 1963年出版），通过计算货币供应总量来证明美联储对大萧条负有责任。

在庆祝弗里德曼90岁生日的聚会上，后来领导美联储渡过2007至2009年全球金融危机的本·伯南克（Ben Bernanke）在发言时顽皮地致敬了他的观点：“说到大萧条，你说得对，是我们干的。我们非常抱歉。但多亏了你，下次不会再犯了。”

到了1980年代，弗里德曼在全球名声鹊起，获得了诺贝尔奖，为《新闻周刊》撰写专栏，甚至还制作了一部热门电视系列片。他永远都在给美联储挑刺。如果他今天仍然在世，恐怕也会抨击鲍威尔认为大幅增加货币供应不会导致通胀上升的想法。（他一生都骄傲地挂着一张自选车牌，车牌号就是他的货币数量论公式 $MV=PY$ ，等号是用黑胶带贴出来的，还因此吃了几张交通罚单。）

他曾访问智利六天，为独裁者奥古斯托·皮诺切特（Augusto Pinochet）出谋划策，因而被左派视为妖魔。不过伯恩斯认为，尽管他“没有意识到这么做给外界的观感”，但“事实上，他在政策设计中几乎没有发挥任何作用”。他的其他出访，例如前往中国和铁幕以东的其他国家，并没有引起如此多的阴谋论、愤怒或对他声誉的贬损。

虽然伯恩斯钦佩弗里德曼，但她的书并不是一本歌功颂德之作。她认为，作为他政治哲学名义上的核心，弗里德曼的自由观可能“薄弱得可怜”。他曾公开反对1964年禁止种族歧视的《民权法案》，而且“从未重新审视过自己在民权问题上的立场”，她失望地写道。



正如三大亚伯拉罕宗教都宣称救世主在自己这边一样，保守主义者、自由意志主义者和古典自由主义者都将弗里德曼归入自己的阵营。但要给他归类并不容易。与一些自由意志主义者不同，弗里德曼接受国家的合法性（尽管他也与国家抗争并主张取消一些政府部门）。与许多保守主义者不同，他认为可以接受通过再分配来减轻贫困。事实上，弗里德曼设想的教育券和医疗保健计划仍然在美国实施，还有补贴工人阶级工资的税收政策——这也许是美国最重要的脱贫措施。

尽管曾为巴里·戈德华特（Barry Goldwater）、里根和撒切尔做过顾问，弗里德曼仍将自己视为一名古典自由主义者。他在1951年写道：“我们这些信奉自由主义的人.....有一种新的信仰要奉上；我们有责任向每个人阐明这种信仰是什么。”他批评过于教条的自由放任主义哲学，认为它“除了维持秩序和执行契约之外，几乎没有赋予国家任何作用”。

伯恩斯坚持将弗里德曼称为“最后的保守派”，因为“弗里德曼所代表的以自由市场经济、个人自由和全球合作为基础的综合理念在政治上已经分崩离析”。弗里德曼也许不再是主角，但他仍然是经济学舞台上最有影响力的角色之一。■



## Economic history

### Is the age of Milton Friedman over?

*Some may say so. But we are still living in it*

Milton Friedman. By Jennifer Burns. Farrar, Straus and Giroux; 592 pages; \$35

IT IS VOGUISH to declare the ideas of Milton Friedman dead, whether you think they deserve damnation or eulogy. In America, prominent Democrats spit out his name contemptuously. The most influential American economist of the 20th century is routinely disparaged as a heartless fetishist of Ayn Randian capitalism, who evangelised corporate greed at home and authoritarianism abroad. Friedman is a special bugbear of President Joe Biden. While running for office in 2020, he declared that “Milton Friedman isn’t running the show anymore.”

Meanwhile, the current, populist standard-bearers of American conservatism—the political movement with which Friedman was identified throughout his life—agree, having turned their backs on fiscal discipline and open markets.

It might be tempting to buy into the thesis that Friedman’s ideas are passé and even to wish them good riddance. But that would be a mistake. Few thinkers are as important (and as grotesquely caricatured) as Friedman. His critiques of Keynesianism, his advocacy of the importance of central banks, his emphasis on the primacy of the monetary supply in explaining inflation and his prioritisation of real interest rates over nominal ones were once unorthodox. They are now mainstream.

A recent biography by Jennifer Burns, a professor at Stanford University, dispels fallacies. Because of Friedman’s long life (he was born in 1912 and

died in 2006) and prolific career involving the modern era's most important economic debates, Ms Burns's book functions as an intellectual guide to the entire 20th century, benefiting from nearly a decade of archival research.

The Friedman who emerges here is one of astonishing economic brilliance, establishing monetary policy as a field worthy of serious study. It is a portrait of a surprisingly heterodox economist, who was perhaps the last great political economist and thought deeply about the connection between political and economic freedom.

Friedman is best known for revolutionary ideas on the importance of money to the macroeconomy, which is now seen as blindingly obvious but once was not. With Anna Schwartz—his greatest intellectual partner other than his wife, Rose Director Friedman—he wrote “A Monetary History of the United States” (1963), which computed aggregate monetary supply to argue that the Federal Reserve had contributed to the Great Depression.

Ben Bernanke, the man who would lead the Fed through the global financial crisis of 2007-09, gave cheeky tribute to this argument in a speech at a gathering celebrating Friedman's 90th birthday: “Regarding the Great Depression, you're right, we did it. We're very sorry. But thanks to you, we won't do it again.”

By the 1980s Friedman was catapulted to global renown, claiming a Nobel prize, a column in Newsweek and even a popular TV series. He was a perpetual gadfly at the Fed. Were he alive today, he would probably jab at Jerome Powell for thinking that dramatic growth in the monetary supply would not manifest in higher inflation. (During his life, he sported a vanity licence plate with the formula of his quantity theory of money,  $MV=PY$ ; the equals sign was drawn with the help of black tape, which resulted in several traffic tickets.)

He became a bogeyman of the left for a six-day trip to Chile to advise Augusto Pinochet, its dictator, though Ms Burns argues that while he “failed to appreciate the optics”, that “in truth, he played almost no role in policy design”. Other trips, to China and to countries east of the Iron Curtain, did not provoke so much conspiracism, outrage or damage to his reputation.

Although Ms Burns admires Friedman, her book is not a hagiography. She argues that his concept of freedom, the nominal core of his political philosophy, could be “woefully thin”. Friedman was vocally opposed to the Civil Rights Act of 1964, which outlawed racial discrimination, and “never revisited his position on civil rights”, she writes with disappointment.

Much as the three Abrahamic religions lay claim to one saviour, conservatives, libertarians and classical liberals all claim Friedman. But he defies easy categorisation. Unlike some libertarians, Friedman accepted the legitimacy of the state (though he fought against it and advocated eliminating some government departments). Unlike many conservatives, he deemed redistribution acceptable to alleviate poverty. Indeed, Friedman envisioned the school-voucher and health-care programmes still in effect in America, as well as the tax policies that top up working class wages—perhaps the country’s most important anti-poverty programme.

Despite consulting for Barry Goldwater, Ronald Reagan and Margaret Thatcher, Friedman considered himself a classical liberal. “Those of us who believe in liberalism...have a new faith to offer; it behoves us to make it clear to one and all what the faith is”, he wrote in 1951. He was critical of overly doctrinaire, laissez-faire philosophy that “assigned almost no role to the state other than the maintenance of order and the enforcement of contracts”.

Ms Burns insists on dubbing Friedman “the last conservative” because “the

synthesis Friedman represented—based in free-market economics, individual liberty and global co-operation—has cracked apart” in politics. Friedman may no longer be running the show, but he is still one of economics’ most influential acts. ■



## 【首文】郁闷科学的郁闷一年

### 经济学家经历了一个糟糕的2023年

对衰退的错误预测只是糟心事之一

体谅下经济学家的处境吧。2022年圣诞节时，这个群体异常悲观：他们对2023年美国增长的预计是55年来第四季度调查中的第四低。许多人预期会出现衰退；本刊也奉上了一些惨淡预测。到了2023年的圣诞节，经济学家们只能把圣诞布丁换成一盘尴尬的苦果，因为2023年美国的增长可能达到了3%，高于长期平均水平，大约与2005年的繁荣时期相当。再加上大多数分析师在12月13日被美联储的鸽派转向打了个措手不及，纷纷匆忙地改写自己对新一年的展望，更让人觉得这群人已经茫然无措。

不仅仅是做预测的人经历了糟糕的一年。从事严谨实证工作的经济学家们的结论也受到了挑战。看看关于不平等的研究。过去20年里最著名的经济学研究或许是由托马斯·皮凯蒂及其合著者所做的研究，他们发现富人与穷人之间的差距在扩大。但去年11月，一篇论文发现，经过税收和转移支付之后，美国的收入差距几乎与1960年代相当，该论文被一家顶级经济学期刊接受待发表。现在皮凯蒂一派摆出防御姿态，指责其批评者“否认不平等”。

经济学家长期以来一致认为，如果美国允许在热门城市的周围建造更多住房，美国会更加富裕。有很多证据支持这一点。但关于限制建筑的代价的最知名估计受到了质疑。芝加哥大学的谢长泰和加州大学伯克利分校的恩里科·莫雷蒂（Enrico Moretti）曾认为，放宽纽约、旧金山和圣何塞的建筑限制将会使2009年的美国GDP增长3.7%。现在，华盛顿大学的布赖恩·格里尼（Brian Greaney）声称，在纠正错误后，真实的影响估计仅为0.02%。如果建筑商们在屋顶测量上有这么大的分歧，那房子就得塌了。

你觉得美国的社会流动性低于自由奔放的19世纪（那时年轻人可以到西部去）？那你得再想想了——贝勒大学（Baylor University）的扎卡里·沃德

（Zachary Ward）指出。他的研究更新了对1850年到1940年间代际流动性的估计，考虑了过去的研究往往只关注白人这一问题，同时纠正了其他测量错误。现在看起来，如今的机会平等性要好于过去（尽管这只是因为过去比人们原本以为的更糟糕）。

自杀、药物过量和肝病的增加降低了美国白人的预期寿命。普林斯顿大学的安格斯·迪顿（Angus Deaton）和安妮·凯斯（Anne Case）在过去普及了一种观点：这些都属于“绝望之死”，其根源在于那些没有大学学位的人面对更加晦暗的生活前景。但经济学家开始不大相信药物过量——可能是18至49岁美国人的第一大杀手——与劳动力市场的变化有很大关系。新的研究将这类大量死亡归咎于仅仅是很容易到手的走私芬太尼，一种强效阿片类药物。

其他发现如今看起来也不大站得住脚了。研究非理性行为的行为经济学曾经风靡一时，之后声望持续下降，在2023年延续了这种趋势。哈佛商学院在6月表示，经调查认为，在行为科学家、经济学博士弗朗西斯卡·吉诺（Francesca Gino）与他人共同撰写的四篇论文中，部分结果由于“篡改数据”而“无效”。（曾著书解释为何违反规则有好处的吉诺正在控告哈佛以及曝光她涉嫌造假的博文作者诽谤。）

从经济学家动荡纷乱的一年里，应该吸取什么教训？有一点是，尽管经济学家富有智识自律，但他们终究是人。重复已有研究并检查其中的错误是至关重要的工作。

另一个教训是，蔑视经济理论、偏爱实证研究所谓的求真务实可能走过了头。在2007至2009年的全球金融危机之后，评论员对理论家认为人们会对世界做出理性预测的普遍假设大加指责；对不现实的、追求效用最大化的“理性经济人”的嘲弄帮助提升了行为经济学的地位。然而在理性预期模型中，通胀是有可能迅速下降却不引发衰退的——正是这种情景在2023年打了预测者的脸。

最后一个教训是经济学家应该振作起来。过去这一年受到质疑的这些研究

激发了对现代资本主义状态的许多悲观情绪。而躲过了衰退、不平等趋势走平，以及人们没那么绝望都应该是好消息。也许这门郁闷的科学应该变得稍微不那么郁闷些了。 ■





## A dismal year for the dismal science

### Economists had a dreadful 2023

*Mistaken recession calls were just part of it*

SPARE A THOUGHT for economists. Last Christmas they were an unusually pessimistic lot: the growth they expected in America over the next calendar year was the fourth-lowest in 55 years of fourth-quarter surveys. Many expected recession; The Economist added to the prognostications of doom and gloom. This year economists must swap figgy pudding for humble pie, because America has probably grown by an above-trend 3%—about the same as in boomy 2005. Adding to the impression of befuddlement, most analysts were caught out on December 13th by a doveish turn by the Federal Reserve, which sent them scrambling to rewrite their outlooks for the new year.

It is not just forecasters who have had a bad year. Economists who deal in sober empirical work have also had their conclusions challenged. Consider research on inequality. Perhaps the most famous economic studies of the past 20 years have been those by Thomas Piketty and his co-authors, who have found a rising gap between rich and poor. But in November a paper finding that after taxes and transfers American incomes are barely less equal than in the 1960s was accepted for publication by one of the discipline's top journals. Now Mr Piketty's faction is on the defensive, accusing its critics of "inequality denial".

Economists have long agreed that America would be richer if it allowed more homes to be built around popular cities. There is lots of evidence to that effect. But the best-known estimate of the costs of restricting construction has been called into question. Chang-Tai Hsieh of the University of Chicago and Enrico Moretti of the University of California,

Berkeley, found that easing building rules in New York, San Francisco and San Jose would have boosted American GDP in 2009 by 3.7%. Now Brian Greaney of the University of Washington claims that after correcting for mistakes the true estimated effect is just 0.02%. If builders disagreed as wildly about roof measurements, the house would collapse.

Think social mobility in America is lower than it was in the freewheeling 19th century, when young men could go West? Think again, according to research by Zachary Ward of Baylor University. He has updated estimates of intergenerational mobility between 1850 and 1940 to account for the fact that past studies tended to look only at white people, as well as correcting other measurement errors. It now looks as if there is more equality of opportunity today than in the past (albeit only because the past was worse than was thought).

A rise in suicides, overdoses and liver disease has reduced life expectancy for white Americans. Angus Deaton and Anne Case of Princeton University popularised the idea that these are “deaths of despair”, rooted in grimmer life prospects for those without college degrees. But economists have been losing faith in the idea that overdoses, which are probably the biggest killer of Americans aged 18-49, have much to do with changes in the labour market. New research has instead blamed the carnage on simple proximity to smuggled fentanyl, a powerful opioid.

Other findings are also looking shaky. The long decline in the prestige of the once-faddish field of behavioural economics, which studies irrationality, continued in 2023. In June Harvard Business School said it believed, after an investigation, that some of the results in four papers co-written by Francesca Gino, a behavioural scientist and PhD economist, were “invalid”, owing to “alterations of the data”. (Ms Gino, who has written a book about why it pays to break rules, is suing for defamation the university and the bloggers who exposed the alleged fiddling.)

What lessons should be drawn from economists' tumultuous year? One is that for all their intellectual discipline they are still human. Replicating existing studies and checking them for errors is crucial work.

Another lesson is that disdain for economic theory in favour of the supposed realism of empirical studies may have gone too far. After the global financial crisis of 2007-09, commentators heaped opprobrium on theorists' common assumption that people make rational predictions about the world; gibes about an unrealistic, utility-maximising Homo economicus helped raise the status of behavioural economics. Yet rational-expectations models allow for the possibility that inflation can fall rapidly without a recession—exactly the scenario that caught out forecasters in 2023.

A last lesson is that economists should cheer up. The research that has been called into question this year inspired much pessimism about the state of modern capitalism. But a dodged recession, flatter inequality trends and less despair would all be good news. Perhaps the dismal science should be a little less so. ■



## 自由交流

### 现代国家从何而来？

#### 经济学家试图回答一个深奥的政治问题

那种状态一部分是隐喻，一部分是神话，一部分是历史。托马斯·霍布斯认为那种状态下的生活恶劣、野蛮而又短暂。约翰·洛克不认同，他宣称正是在那种状态中人们第一次学会了拥有财产。让-雅克·卢梭称那种状态下的人们生而自由，直至被锁链束缚。罗伯特·诺齐克认为，人们如此迫切地想要逃离那种状态，而导致了不可避免的结果：国家被创造了出来。

几个世纪来，有关“自然状态”（state of nature）——也就是政治活动组织成政府之前人们的生活状态——究竟是怎么回事一直吸引了哲学家的关注。要想查明其状貌是否如人们想象的那样几乎是不可能的。然而，思考“假如没有政府，人们的生活会是什么样”有助于回答一些深刻的问题。政治权力的局限性在哪里？现代国家是公民会自愿选择的东西吗？

如今，三位经济学家经过如此种种理论分析，认为他们得出了一些实证答案。纽约大学阿布扎比分校的罗伯特·艾伦（Robert Allen）、西北大学的利安德·赫尔德林（Leander Heldring）和诺丁汉大学的马蒂亚·贝尔塔齐尼（Mattia Bertazzini）认为，理解现代政治何以出现的关键不是什么隐喻，而是伊拉克古代河流不断变化的河道。他们在《美国经济评论》（American Economic Review）上发表的一篇文章中提出，最早的国家并不是像霍布斯认为的那样是作为躲避暴力的庇护所而被组织起来，发挥粘合作用的其实是经济因素。

在伊拉克最长的两条河流底格里斯河和幼发拉底河的沿岸，世界上一些最古老的定居点曾分布于此。美索不达米亚于5000年前完善了第一个已知的文字体系，为该地区赢得了“文明的摇篮”的美誉。由于洪水和干旱导致河床被淹没，这些河流的路径发生了变化。一旦河流改道，一些古代农民就无法灌溉庄稼了。

艾伦和他的合著者调查了河道变迁的时间与定居点数量和规模发生增长的时间是否存在关联。他们的方法是研究有记录的第一次河流变道的影响，这次改道发生在公元前2850年。当时农民面临的选择与哲学家对自然状态进行理论分析时所想象的差不多。那些被改道的河流抛在身后的人们可以回归游牧生活。或者他们可以联合起来修建灌溉系统，从遥远的河流取水。

一个哲学问题就这样转化成了类似于实验室实验的东西，只不过实验时间是在数千年前，实验范围绵延数百英里。而且，实验的结果十分清晰。将河道变迁后留下的盆地划分为一个个5公里乘以5公里的方格，每个方格在河流改道150年后比改道前50年出现定居点（以拥有一个公共建筑为标志，如寺庙或市场）的可能性要高14%。每个方格修建运河的可能性也会高12%，这种人工灌溉形式使得在远离河流的地方发展农业成为可能。五个新城市被创建，只有三个被废弃。位于该河一条新支流沿岸的城市埃什努纳（Esnunna）规模大大扩张了。

艾伦及其合著者说，这证明最初的国家是由农民出于经济原因展开合作而形成的。运河网络的成本太高，任何人都无法独自承担。但分摊了成本后，这项建设对每个人来说都是划算的。这样的决定意义重大。它们代表了政府在征税后提供基础设施的一些最早的例子，也就代表着最早那批国家的起源。

作者随后将关于国家起源的几个世纪的思考分为两个阵营。他们说，从麻省理工学院颇具影响力的经济学家达龙·阿西莫格鲁（Daron Acemoglu）到卡尔·马克思都属于第一个阵营，这一派认为国家说到底是在社会层面的讨价还价过程中产生的。富人和地位高的人为了个人利益而夺取权力，并不时提供道路、学校或警力等服务，以换取民众的合作。但如果美索不达米亚是属于这种情况，那也应该发生在改道河流最新流经的地方所形成的定居点才对。毕竟，它们开垦出了更肥沃的农田，也就创造出了更多的税收。

当河流改道流走时，美索不达米亚的农民似乎选择了团结起来，这为第二

个阵营提供了支持。这一派的哲学家包括洛克和卢梭，他们认为，当人们选择互相协调、放弃为所欲为的自由而选择建立起一种能调解争端并提供一定程度安全保障的国家形态时，政府便出现了。艾伦和他的合著者只分析了伊拉克美索不达米亚，但他们认为他们的研究成果应该能更普遍地适用于其他新生国家。换句话说，政府是人们自发选择的，而不是强加给公民的。

这着实是经济学家在抢地盘了，他们抢占了更常由政治理论家占据的领地。这项研究并非毫无瑕疵。也许某次未知的征服可以解释在研究所覆盖的时期内定居点的扩展。也许作者是错的，这种模式在其他地方并不成立。在其境内的河流真正开始改道之前，美索不达米亚的大河流域就已经有六座城市和多得多的定居点，有些已经存在了一千年。作者们坚称，他们只对新政府如何形成感兴趣，但他们实际上有可能捕捉到了那些更早形成的政府的扩展情况。

尽管如此，这篇论文还是大胆且有价值的。哲学家们花了几百年的时间解释国家为何出现。而花在考虑经济因素是否可能发挥了作用上的时间仍少之又少。尽管将自然状态具体化为一个特定的时间和地点会损失一些复杂性，但这样的操作为开展对早年的哲学家而言只能想想而已的那种实验打开了方便之门。如果霍布斯或洛克当初有办法研究一下跟自己推断的自然状态近似的東西，他们肯定乐于一试。■



## Free exchange

### Where does the modern state come from?

*Economists attempt to answer a profound political question*

IT IS PART metaphor, part myth and part history. Thomas Hobbes thought life there was nasty, brutish and short. John Locke disagreed, proclaiming that it was where people first learnt how to own things. Jean-Jacques Rousseau described it as the place where people were born free, before they became ensnared in chains. Robert Nozick thought that people were so desperate to escape it, there was an inevitable result: the creation of a state.

Ideas about the “state of nature”—how people lived before politics organised itself into governments—have held the attention of philosophers for centuries. Discovering whether it played out as imagined was nigh-on impossible. And yet thinking about what people would do without a government helped answer profound questions. What are the limits of political power? Is the modern state something that citizens would freely choose?

Now, after all this theorising, three economists think they have some empirical answers. According to Robert Allen of New York University, Abu Dhabi, Leander Heldring of Northwestern University and Mattia Bertazzini of the University of Nottingham, the key to understanding the emergence of modern politics is not a metaphor, but the constantly shifting courses of ancient rivers in Iraq. The first states, they argue in a paper published in the *American Economic Review*, were glued together not as shelters from violence, as Hobbes believed, but by economics.

The banks of the Tigris and the Euphrates, Iraq’s two longest rivers, are home to some of the world’s oldest settlements. Mesopotamia, which 5,000

years ago refined the first known system of writing, earned the area the reputation of “the cradle of civilisation”. The paths of these rivers shift, as floods and droughts cause their beds to flood. When a shift came, some ancient farmers were left without water for their crops.

Mr Allen and his co-authors investigate whether the timing of changes to a river’s course had anything to do with when the number and size of settlements grew. They do so by looking at the effect of the first recorded shift in 2,850BC. This presented farmers with something close to the choice imagined by philosophers when theorising about the state of nature. Those left behind by the river could revert to nomadism. Or they could band together to build irrigation systems to ferry water from distant rivers.

A philosophical question is therefore transformed into something akin to a laboratory experiment, only one set thousands of years ago and extending hundreds of miles across. Moreover, the results of the experiment are clear. A 5km-by-5km square in the basin left behind by a river was 14% more likely to have a settlement, marked by a public building such as a temple or marketplace, 150 years after the shift than in the 50 years before it. Each square was 12% more likely to have a built canal, a form of artificial irrigation that made farming far from rivers possible. Five new cities were created, and only three abandoned. Esnunna, one city along a new tributary of the river, became much bigger.

This, Mr Allen and his co-authors say, is evidence that that the first states were formed by farmers co-operating for economic reasons. A canal network would have been too large a cost for any to bear alone. But by spreading the cost, the construction was worth it for each. Such decisions were momentous. They represent some of the earliest examples of governments providing infrastructure in return for taxes, and thus the genesis of the earliest states.



The authors then divide centuries of thinking on the origins of states into two camps. The first, which they say ranges from Daron Acemoglu, an influential economist at the Massachusetts Institute of Technology, to Karl Marx, supposes that states ultimately emerge from a process of social bargaining. The rich and high-status seize power for personal gain, and periodically dole out services, such as a road, school or police force, in order to keep populations on board. But if this had been the case in Mesopotamia then it would have been in the areas that a river shifted towards that settlements would have formed. After all, they developed richer and more fertile farmland, yielding a bigger tax take.

That Mesopotamian farmers seem to have chosen to band together as the river shifted away lends support to the second camp. Philosophers in this group, who include Locke and Rousseau, contend that governments emerged when people chose to co-ordinate themselves, swapping their freedom to do whatever they wanted for a state that mediates disputes and provides a degree of safety. Mr Allen and his co-authors analyse only Mesopotamian Iraq, but they argue that their results ought to apply more generally to other fledgling states. Governments, in other words, are chosen rather than foisted upon their citizens.

This is quite the landgrab by economists, seizing terrain that is more commonly occupied by political theorists. The study is not flawless. Perhaps an unknown conquest explains the spread of settlements in the period under consideration. Maybe the authors are wrong and the pattern does not hold elsewhere. There were already six cities and many more settlements in the Mesopotamian Valley before its rivers really began to move, and some had existed for a thousand years. The authors insist that they are only interested in how new governments form, but there is a chance they have in fact captured older ones spreading.

The paper is nevertheless bold and valuable. Philosophers have sought for

centuries to explain why states emerge. Too little time has been spent considering whether economic factors might have been at play. Although transforming the state of nature into a specific time and place means losing some of its complexity, doing so opens the door to the sort of experiment that could only have been imagined by earlier philosophers. If Hobbes or Locke could have studied something approximating the state of nature about which they were theorising, they surely would have tried. ■



## 造娃

### 如何说服日本夫妇生孩子

有几个城市正在对抗这个国家的低出生率

岸城乃理世（Kishiki Noriyo，音译）把车停在日本西部的明石市的一栋房子前，这是一辆绘有爱心标志的卡车，上面还印着一句口号：“送纸尿裤，也送温暖。”她走下车，拿着两袋纸尿裤。年轻的母亲樋口三希（Higuchi Miki，音译）到门口迎接，怀里抱着个宝宝。明石市十年来一直鼓励当地居民生孩子，岸城就在这项工作的第一线忙碌。该市的政策包括免费提供婴儿食品、纸尿裤、医疗保健和学校午餐。努力似乎得到了回报，明石的人口已经连续增长了十年，如今达到三十多万。

这让这个小城与众不同。日本的出生率在20世纪70年代中期降至人口更替水平（每位妇女生育2.1个孩子）以下，之后一直持续下降。2022年，出生人口自1899年有记录以来首次降至80万以下。在日本的1800个自治市中，只有200个左右的人口在增长。日本首相岸田文雄表示，这已经让日本站在了“悬崖边上”。

即便在明石市（从这里到大阪和神户的通勤都很方便），人口增长也主要来自移民，而不是本地出生。这里的生育率为1.65。不过考虑到全国的平均值是1.3，这仍代表着某种程度上的成功。因为生源不足，日本各地都有学校在关闭；明石市则是入学名额短缺。

从高昂的教育成本到僵化的家庭法，组建家庭的日本年轻人面临诸多障碍，其中许多只能通过国家政策来解决。但明石展示了地方社区能如何发挥作用。首先要做的就是提供更方便的托儿所和日托服务。类似岸城所从事的那种协助幼儿父母的小项目也能帮上忙。

在东京外围的通勤城镇流山市，人口也在迅速增长。过去的十年中，这里的人口增长了24%，达到了21.1万。这很大程度上要归功于2005年通往东京的特快列车开通。但流山对儿童保育的承诺——当地政府的“重中之重”

一一也吸引了年轻家庭。2007年，流山启动了一项公共汽车服务，从火车站接上孩子并将他们送往日托中心。在过去的15年里，流山市托儿所的数量已经从17个增加到了100多个。市长井崎义治表示：“我们的目标是创造一种环境，让父母在抚养孩子的同时能够继续工作。”

儿童保育匮乏的问题在日本普遍存在。中央政府在这方面取得了一些进步，将等待入托的儿童人数减少了90%。政府还出台了税收优惠和其他经济激励措施，鼓励人们生育。但正如明石和流山等零星例子所示，要想真正改变现状，需要一种更加根本性的转变。

明治大学的加藤久和认为，日本“要培养一种对儿童更包容的文化”。建造更多儿童保育设施的行动常常遭到本地居民的阻挠，担心会产生噪音。去年4月，当知名餐饮连锁店Soup Stock开始为婴儿提供免费食品时，遭到了一些网友的强烈反对，他们不想以后吃饭时旁边有婴儿哭闹。

居住在流山的田中佑美（Tanaka Yumi，音译）是两个孩子的母亲，她说日本的年轻父母习惯了邻居嫌幼儿太吵的“冷眼”，但流山有很多年轻家庭，加上有本地政府的支持政策，让他们感到安心。“我在流山有好多朋友都决定生二胎或第三胎。”

明石对育儿的支持意在推动同样的文化转变。该市儿童保育部门的森冈和美（Morioka Kazumi，音译）表示，送纸尿裤更多是为了“减轻孤独感”，而不是为了纸尿裤本身。年轻的母亲樋口很感激这一点。“有人来看我真好，”她说，“这让我觉得自己走在正确的路上。”■



## Baby-making

### How to entice Japanese couples to have babies

*A few cities are bucking the country's low birth rate*

KISHIKI NORIYO pulls up outside a house in Akashi, a city in western Japan, in a truck emblazoned with a heart logo and the slogan: “Diaper delivery: we also deliver kindness.” She steps out with two bags of nappies. Higuchi Miki, a young mother, appears at the front door with a baby on her hip. Ms Kishiki is on the front line of a ten-year push by Akashi to encourage its residents to have children. It includes delivering free baby food as well as nappies, free medical care and school lunches. The effort seems to be paying off. Akashi’s population has increased for ten years in a row, to more than 300,000.

This makes the town exceptional. Japan’s birth rate dipped below the replacement level of 2.1 children per woman in the mid-1970s and has been steadily declining ever since. In 2022 the total number of births dropped below 800,000 for the first time since records began in 1899. Of Japan’s 1,800 municipalities, only around 200 have a rising population. According to Kishida Fumio, the prime minister, this has put the country on “the brink”.

Even in Akashi, which is an easy commute from the cities of Osaka and Kobe, most of the growth is from migration, not births. The town’s birth rate is 1.65. Yet given that the national figure is 1.3, this represents success of a sort. Schools are closing across Japan for want of pupils; Akashi is short of school places.

Many of the obstacles to young Japanese forming families, from high education costs to inflexible family laws, can only be tackled with national policies. But Akashi shows how local communities can make a difference.

That starts with improving access to nurseries and day care. Smaller projects such as Ms Kishiki's, which assist parents of young children, also help.

The population of Nagareyama, a commuter town outside Tokyo, is also booming. Over the past decade it has grown by 24%, to 211,000. The opening of an express-train service to Tokyo in 2005 largely explains that. But Nagareyama's commitment to child care—the “utmost priority” of its local government—has also attracted young families. In 2007 the town launched a bus service that picks up children at train stations and takes them to day-care centres. Nagareyama has increased its number of nurseries from 17 to more than 100 in the past 15 years. “Our aim was to create an environment in which parents can continue to work while raising children,” says Izaki Yoshiharu, the town's mayor.

Lack of child care is endemic across Japan. The central government has made some improvements in this regard, reducing the number of children waiting for a nursery place by 90%. It has also introduced tax and other economic incentives to encourage people to reproduce. But, as scattered examples like Akashi and Nagareyama suggest, making a real difference requires a more fundamental shift.

Kato Hisakazu of Meiji University reckons Japan “needs to foster a culture that is generous to children”. Efforts to build more child-care facilities are often blocked by locals who worry about increased noise. When Soup Stock, a popular restaurant chain, started offering free food for babies last April, it encountered a fierce online backlash from people who objected to the prospect of sitting next to crying infants.

Tanaka Yumi, a mother of two in Nagareyama, says young Japanese parents are used to receiving a “cold look” from their unsympathetic neighbours. But the abundance of young families in the town and the supportive policies of its local administration provide reassurance, she says. “I have many

friends in Nagareyama who decided to have a second or a third.”

Akashi’s pro-child efforts are intended to drive the same cultural change. Morioka Kazumi of the town’s child-care department says the nappy deliveries are more about “alleviating loneliness” than the goods themselves. Ms Higuchi, the young mother, appreciates that. “It’s nice when someone checks on me,” she says. “It makes me feel I’m on the right track.”





## 从废墟中崛起

### 哪个经济体在2023年表现最好？

#### 又一次意想不到的凯旋

由于各国央行加息以抑制通货膨胀，几乎所有人都预计2023年会出现全球经济衰退。这个共识是错误的。全球GDP可能增长了3%。就业市场保持坚挺。通胀正在下降。股市上涨了20%。

但这一整体表现掩盖了个体间的很大差异。《经济学人》根据五个指标——通胀、“通胀广度”、GDP、就业和股市表现——给35个以富裕经济体为主的国家编制了数据。我们根据它们在这些指标上的表现给它们排名，创建了一个综合得分。下表显示了排名，以及一些出人意料的结果。

希腊在这个排行榜上连续第二年蝉联榜首——这对于一个前些年还是管理不善的代名词的经济体来说是一个引人瞩目的成绩。除了韩国，其他排名前列的经济体大都位于美洲。美国排名第三。加拿大和智利与它相差不远。与此同时，许多表现疲软的国家位于北欧，包括英国、德国、瑞典，还有垫底的芬兰。

控制物价上涨是2023年的大挑战。我们关注的第一个指标是“核心”通胀，它不包括能源和食品等价格波动较大的项目，能很好地显示根本性的通胀压力。日本和韩国成功控制了物价。在瑞士，核心价格同比仅上涨了1.3%。然而在欧洲其他地方，许多国家仍然面临严重的通胀压力。在匈牙利，与一年前相比，核心通胀达到11%。严重依赖俄罗斯能源的芬兰也在艰难应对。

以“通胀广度”来衡量，在大多数国家，通胀正在变得不那么顽固。该指标计算了消费价格篮子中价格同比上涨超过2%的商品所占的份额。智利和韩国等国央行在2022年积极加息，动作比许多富裕国家的央行更快，现在似乎正在收获成果。在韩国，通胀广度从73%降至60%。美国和加拿大的央行官员成绩也不错，这两国的通胀广度降幅还要更大。



然而在其他一些地方，对抗通胀的战斗还远未接近胜利。比如澳大利亚。那里的通胀仍然顽固，普通人的购物篮中近90%的商品价格同比上涨超过2%。更糟糕的是，通胀广度也没能缩减下来。法国和德国也陷入了困境。西班牙也是如此，该国的通胀似乎变得越来越顽固。

接下来的两个指标是就业和GDP增长，它们显示了这35个经济体为普通人带来多少好处。没有哪个地方表现得特别出色。全球范围内生产率增长疲弱，制约了GDP的潜在增长。劳动力市场在2023年初就已经很紧张，意味着就业方面的提升空间很小。

不过只有少数几个国家实际上出现了GDP下降。爱尔兰表现最差，下降了4.1%（对此要持保留态度：爱尔兰GDP的测量存在很大问题）。另一个受俄罗斯入侵乌克兰影响的国家爱沙尼亚表现也很差。英国和德国同样表现不佳。德国正受困于能源价格冲击和中国进口汽车造成的竞争加剧。英国仍在应付脱欧的后果——大多数经济学家预计未来几年该国经济增长疲弱。

相比之下，美国在GDP和就业方面都表现良好。它受益于创纪录的能源产量以及2020年和2021年实施的慷慨财政刺激。这个世界上最大的经济体可能也拉动了其他国家的增长。加拿大的就业率大幅上升。以美国为最大贸易伙伴的以色列在总排名中位列第四，尽管该国与哈马斯于10月开始的战争让它在2024年的前景存在很大的不确定性。

你可能认为美国股市应该表现不错，因为它里头满是准备从人工智能革命中大赚一笔的公司。事实上，经过通胀调整后，它的表现只能算是中等水平。澳大利亚股市表现不佳，其中很多大宗商品公司正在应对2022年高价以后的跌落。芬兰股市度过了惨淡的一年，龙头企业诺基亚的股价延续了长期缓慢下滑的走势。相比之下，日本的公司可以说正在经历一场复兴。这要感谢企业治理方面的改革，它似乎终于开始见效。该国的股市是2023年表现最佳的股市之一，实际涨幅接近20%。

但说到亮眼的股本回报，还要看向西数千英里的希腊。在那里，股市的实

际价值增长超过40%。政府实施了一系列亲市场的改革，令投资者重新审视了希腊企业。尽管该国相比2010年代初经济大崩溃之前仍要穷得多，但希腊曾经的“报应女神”国际货币基金组织（IMF）最近在一份声明中赞扬了“该经济体的数字化转型”和“市场竞争加大”。当表现不佳的芬兰人在圣诞节时穿着内衣独自借酒消愁的时候（按当地的说法，就是 päntsdrunk[穿着内裤喝个大醉]），世界其他地方应该向希腊这个最意想不到的冠军敬上一杯茴香酒。 ■



## From the ruins

### Which economy did best in 2023?

#### *Another unlikely triumph*

ALMOST EVERYONE expected a global recession in 2023, as central bankers raised interest rates to cool inflation. The consensus was wrong. Global GDP has probably grown by 3%. Job markets have held up. Inflation is on the way down. Stockmarkets have risen by 20%.

But this aggregate performance conceals wide variation. The Economist has compiled data on five indicators—inflation, “inflation breadth”, GDP, jobs and stockmarket performance—for 35 mostly rich countries. We have ranked them according to how well they have done on these measures, creating an overall score. The table shows the rankings, and some surprising results.

Top of the charts, for the second year running, is Greece—a remarkable result for an economy that was until recently a byword for mismanagement. Aside from South Korea, many of the other standout performers are in the Americas. The United States comes third. Canada and Chile are not far behind. Meanwhile, lots of the sluggards are in northern Europe, including Britain, Germany, Sweden and, bringing up the rear, Finland.

Tackling rising prices was the big challenge in 2023. Our first measure looks at “core” inflation, which excludes volatile components, such as energy and food, and is a good indicator of underlying inflationary pressure. Japan and South Korea have kept a lid on prices. In Switzerland core prices rose by just 1.3% year on year. Elsewhere in Europe, though, many countries still face serious pressure. In Hungary core inflation is running at 11% year on year. Finland, which is heavily dependent on Russian energy supplies, is

also struggling.

In most countries inflation is becoming less entrenched—as measured by “inflation breadth”, a measure that calculates the share of items in the consumer-price basket where prices are rising by more than 2% year on year. Central bankers in places including Chile and South Korea increased interest rates aggressively in 2022, sooner than many of their peers across the rich world, and now appear to be reaping the benefits. In South Korea inflation breadth has fallen from 73% to 60%. Central bankers in America and Canada, where inflation breadth has dropped even more sharply, can take some credit, too.

However, in other places, the battle against inflation is not even close to being won. Take Australia. Inflation there remains firmly entrenched, with the price of close to 90% of the items in the average person’s shopping basket rising by more than 2% year on year. Worse, inflation breadth is not coming down either. France and Germany are also in trouble. And so is Spain, where inflation seems to be becoming more entrenched over time.

Our next two measures—growth in employment and GDP—hint at the extent to which the 35 economies are delivering for ordinary folk. Nowhere fared spectacularly well. Across the world productivity growth is weak, limiting potential increases in GDP. Already tight labour markets at the start of 2023 meant there was little room for improvement when it came to jobs.

Only a few countries, though, actually saw their GDP decline. Ireland was the worst performer, with a drop of 4.1% (take that with a pinch of salt: there are big problems with the measurement of Irish GDP). Estonia, another country whacked by the fallout of Russia’s invasion of Ukraine, did badly. Britain and Germany also underperformed. Germany is struggling with the consequences of the energy-price shock and rising competition from imported Chinese cars. Britain is still dealing with the aftermath of

Brexit—most economists expect the country to suffer from weak economic growth in the coming years.

America, by contrast, did well on both GDP and employment. It has benefited from record-high energy production as well as a generous fiscal stimulus implemented in 2020 and 2021. The world's largest economy may have pulled along other countries. Canada's employment has risen smartly. Israel, which counts America as its largest trading partner, comes fourth in the overall ranking, although its war with Hamas, which began in October, makes the outlook for 2024 deeply uncertain.

You might think that the American stockmarket, stuffed with firms poised to benefit from the revolution in artificial intelligence, would have done well. In fact, adjusted for inflation it is a middling performer. The Australian stockmarket, filled with commodities firms managing a comedown from high prices in 2022, underperformed. The Finnish stockmarket had a poor year, with the share price of Nokia, a national champion, continuing its long, slow decline. Japan's firms, by contrast, are experiencing something of a renaissance. For that, thank reforms to corporate governance, which finally seem to be bearing fruit. The country's stockmarket was one of the best performers in 2023, rising in real terms by nearly 20%.

But for glorious equity returns, look thousands of miles west—to Greece. There the real value of the stockmarket has increased by more than 40%. Investors have looked afresh at Greek companies as the government implements a series of pro-market reforms. Although the country is still a lot poorer than it was before its almighty bust in the early 2010s, the IMF, once Greece's nemesis, praised "the digital transformation of the economy" and "increasing market competition" in a recent statement. While underperforming Finns can console themselves this Christmas by drowning their sorrows alone in their underwear (or getting päntsdrunk, as it is known locally), the rest of the world should raise a glass of ouzo to this

most unlikely of champions. ■



Toko-Tok

## TikTok联姻GoTo能否拯救其印尼业务？

这个视频应用如何应对数字业监管震荡

全球年轻人越爱看TikTok上的爆红视频，他们国家掌权的长辈们就越憎恶这个应用。他们谴责它可能侵蚀年轻人的思想，更严重的是，还谴责它与中国的关联，因为其母公司字节跳动来自中国。美国的许多政客想把它禁掉。印度已经这样做了。去年10月，另一个潜力大市场印尼规定社交媒体公司须获得许可（并不保证能成功获批）方可开启电子商务交易，从而叫停了TikTok新生但利润丰厚的视频带货业务。

这些障碍迫使TikTok采取战略行动，例如将其全球总部迁至新加坡，并聘请了一位新加坡籍的首席执行官，从而与中国母公司拉开距离。它还使出了另一个精明的招数，于12月11日宣布将支付8.4亿美元收购印尼科技企业集团GoTo旗下电商平台Tokopedia75%的股份。它还承诺将在这次合作中投资15亿美元。

这笔交易有点像是一场无奈的联姻，但对双方都有利。近年来一直难以盈利的GoTo将不再需要贴补亏损的零售业务。而TikTok将获准重新启动其电商业务。TikTok平台上的销售将由Tokopedia的物流网络履行（尽管与印尼的所有电商一样，它现在必须对国外制造的产品限定最低价格）。

根据数据公司Momentum Works的统计，在印尼快速增长的电商市场上，TikTok和Tokopedia分别占到10%和28%的份额。合在一起，它们是一支强大的力量，市场份额堪比目前印尼最大的在线商城虾皮购物（由新加坡科技企业集团冬海集团所有）。

最重要的是，与本土领军企业建立亲密联系使TikTok看起来不那么像是一个擅闯的外来者。如果该公司能够在全球人口第四多的国家中让这一新伙伴关系顺利推进，它就能以此为模板，在其他目前对它怀有戒心的国家扩张和巩固地位，比如马来西亚和菲律宾。

这将是一场艰苦的进军，不仅仅是因为TikTok特有的挑战。在全球各地，支持数字商务国际开放的人们都在输掉人心之战。去年，在其热门手机游戏“Free Fire”被禁后，冬海在监管压力之下暂停了向印度的扩张。欧洲对云计算出台了严厉的新规定，包括要求在本地存储本地用户数据，就是在直接针对美国的科技巨头。

美国自身的孤立主义氛围也日益浓厚。11月，它放弃了之前要求在《印太经济框架》（Indo-Pacific Economic Framework）中实现数字商品和服务贸易自由化的要求，拜登政府一直在与13个亚洲盟国谈判的这个协议本就已经脆弱不稳。想要在不断高涨的保护主义浪潮（无论是数字经济还是其他方面）中蓬勃发展，TikTok及其竞争对手将需要走出很多高难度的外交步伐。■





## Toko-Tok

### Will TikTok's GoTo gambit save its Indonesian business?

*How the video app is navigating around a digital shakedown*

THE MORE the world's youngsters love TikTok's viral videos, the more their elected elders hate the app. They decry it for supposedly corroding young minds and, worse, for its links to China, home to its parent company, ByteDance. Many in America want to ban it. India already has. In October Indonesia, another big and promising market, shut down TikTok's fledgling but lucrative sideline of selling goods via its videos, by requiring social-media firms to obtain an e-commerce licence—with no guarantee of success.

Such obstacles have forced TikTok to act strategically, for instance by moving its global headquarters to Singapore and hiring a Singaporean chief executive, which has put distance between it and its Chinese parent. In another canny move, on December 11th it announced that it was paying \$840m for a 75% stake in Tokopedia, the e-commerce arm of GoTo, an Indonesian tech conglomerate. It has also pledged to invest \$1.5bn in the tie-up.

The deal is something of a shotgun marriage, but it benefits both sides. GoTo, which has struggled to turn a profit in recent years, will no longer need to subsidise its loss-making retail arm. TikTok, for its part, will be allowed to restart its e-commerce operations. Sales on TikTok's app will be fulfilled by Tokopedia's logistics network (though, like all e-merchants in Indonesia, it must now charge minimum prices for products made abroad).

TikTok and Tokopedia separately account for 10% and 28%, respectively, of Indonesia's fast-growing e-commerce market, according to Momentum

Works, a data firm. Together, they are a powerhouse, matching the market share of Shopee, hitherto the country's biggest online emporium (owned by Sea Group, a Singaporean technology conglomerate).

Most important, an intimate link with a domestic champion makes TikTok look less like a foreign interloper. If the firm can make its new partnership work in the world's fourth-most-populous country, it could use this as a model for expansion and consolidation in other countries where it is greeted with wariness, such as Malaysia and the Philippines.

It will be an uphill struggle, and not just because of challenges particular to TikTok. All over the world, the advocates of international openness in digital commerce are losing the battle for hearts and minds. Last year Sea halted its expansion to India in the face of regulatory pressure, after its popular mobile game, "Free Fire", was banned. Stringent new European rules on cloud computing, including requirements to store local users' data locally, are aimed squarely at the American tech giants.

Last month America, itself in an increasingly isolationist mood, dropped earlier demands to liberalise trade in digital goods and services as part of the Indo-Pacific Economic Framework, the already flimsy pact which President Joe Biden's administration has been negotiating with 13 Asian allies. To thrive amid rising protectionism—digital and otherwise—TikTok and its rivals will need to show plenty of delicate diplomatic footwork. ■



巴托比

## 如何掌握授权的艺术

你可以放心地让下属去做决策而不后悔

良好的授权就像保持六块腹肌：人人渴求，但随着年龄增长愈发难实现。理论上，将适当的决策交给下属能让公司里的各方皆大欢喜。老板们有更多时间专注于真正值得关注的问题。中层管理人员和员工享受更大的自主权。让那些对手头的事务进展更清楚的人更快地做出决策，整个组织都能从中受益。然而在实践中，授权是个雷区。

有些老板连试都不试一下。他们可能不信任下属，或者渴望掌控一切。他们在事业上的成功可能就是会让他们相信自己是天才。但也有更客气的解释。创业公司创始人习惯于亲力亲为，至少在公司达到一定规模之前是这样。为了不让团队不堪重负，许多管理者承担了额外的工作。

另一些管理者确实在授权，但出发点是错误的。研究表明，当难以抉择、后果影响他人，以及想避免为糟糕的结果担责时，人们更有可能把决策甩手给他人。东北大学（Northeastern University）的玛丽·斯特费尔（Mary Steffel）及其合著者在2016年发表了一篇论文。这项研究中的志愿者被告知他们必须为一次会议预订酒店房间，有的是为自己订，有的是为他们的老板订，然后问他们是想自己预订房间还是将这件事交给办公室经理。结果发现，当他们是想要为老板选房间并且酒店条件糟糕时，他们更有可能把它推给倒霉的办公室经理去干。

阿姆斯特丹商学院（Amsterdam Business School）的维克多·马斯（Victor Maas）和石贝所做的一项新研究再次证实了人类动机的这种阴暗面。该研究发现，当某项任务的绩效目标挑战较大时，人们更有可能把工作交给下属；而对于目标较易达成的任务，留给自己的意愿就高多了。换句话说，如果一个惯于微观管理的上司突然要求你去负责某件事情，那么最好赶紧躲开。

大多数管理者处于灰色地带。他们可能满怀好意地想授权别人做决定，但仍觉得这做起来很难。如果你信任团队成员，让他们去做决定，但后来发现自己极不喜欢他们的选择，那该怎么办？如果你想授权下属做一些决策，但又知道你自己的上司会把它们算在你的头上，那又该怎么办？这些问题很容易导致“假自主”——一种表面上的授权，即管理者实际上并没有让团队自己决定事情，或者下属拥有的自由仅够用来猜老板喜欢什么。

应对这些问题的一种方法是使用一个清楚明白的决策框架，尽量明确谁对什么事情负责。这些框架并不完美。项目管理者经常使用称为RACI模型的东西。它的前两个字母将“负责”的人与“负有责任”的人区分开来，这可能会让一般人感到“困惑”和“难以理解”。还有其他更清晰的框架。它们有响亮的名字，如DACI、DARE和DICE：你可能正在选择云计算供应商，但会感觉自己有点像在特种部队里。

除了弄清谁做什么之外，有一套区分哪些决策可以授权、哪些不可以的方法也会有帮助。在贝索斯开始穿上太空服、为《Vogue》杂志拍摄好笑的照片之前，他喜欢在每年给亚马逊股东的信中表达自己的管理理念。在2015年，他对重要且不可逆转的第一类决策（“单向门”）和可以在不奏效时撤销的第二类决策（“双向门”）做了有用的区分。第一类决策要审慎，可以做得慢一些；第二类决策应由较小的团队迅速做出。有了一套决策理论，可以在授权时做出更好的选择，减少后悔的机会。

良好的授权还需要做很多的判断。授权并非撒手不管。和微观管理者一样，冷漠的老板也可能会让人感到泄气；你必须保持对决策的了解，并在必要时出手干预。但是，以正确的节奏了解状况，并允许人们做出你自己不会做出的决策，这需要自我克制和纪律。就像保持腹肌那样。■



Bartleby

## How to master the art of delegation

*You can entrust decisions to subordinates without regretting it*

DELEGATING WELL is the six-pack of management: widely desired and harder to achieve the older you get. In theory, handing appropriate decisions off to people lower down the corporate ladder means greater satisfaction all round. Bosses get more time to concentrate on the issues that really deserve their attention. Middle managers and workers enjoy a greater sense of autonomy. And the organisation benefits from faster decision-making on the part of people who are better informed about the matter at hand. In practice, however, delegation is a minefield.

Some bosses do not even try to delegate. They may mistrust people below them or crave control. Their career success may simply have persuaded them of their own genius. But there are kinder explanations, too. Startup founders are conditioned to do everything, at least until firms get to a certain size. Plenty of managers shoulder more work than they should in order to protect their teams from overload.

Other managers do delegate but they do so for the wrong reasons. Studies suggest that people are likely to hand off decisions when choices are hard, when the consequences affect others and when they want to avoid being blamed for a bad outcome. In a paper from 2016 by Mary Steffel of Northeastern University and her co-authors, volunteers were told that they had to book hotel rooms at a conference, either for their own use or for their boss, and asked them if they would like to reserve the rooms themselves or delegate the task to an office manager. When they were choosing for the boss and the hotels were ropery, people were more likely to pass the job to the hapless office manager.

A new study, by Victor Maas and Bei Shi of Amsterdam Business School, reaffirms this bleak picture of human motivation. It found that people were more likely to hand work off to subordinates when the performance targets for that particular task were demanding; they were much happier to keep hold of tasks with targets that were easier to attain. If a habitual micromanager unexpectedly asks you to take the lead on something, in other words, run for the hills.

The great mass of managers fall into a greyer area. They may be full of good intentions to leave decisions to others but still find it hard to do so. What if you put trust in your team members but then discover you violently dislike the choices they make? What if you want to hand over some decisions but you know that your own bosses will hold you personally responsible for them? These problems can easily result in “faux-tonomy”—a lip-service version of delegation in which managers do not actually leave their teams to get on with things or underlings use their freedom solely to guess what the boss would like.

One way to navigate such problems is to use an explicit decision-making framework that tries to make it clear who is on the hook for what. These frameworks are not perfect. Project managers often use something called the RACI model. Its first two letters sort those who are “responsible” from those who are “accountable”, a distinction which normal people may find “confusing” and “incomprehensible”. Other, clearer frameworks are available. They have punchy names like DACI, DARE and DICE: you might be choosing a cloud-computing vendor but you get to feel a little like you are in the special forces.

As well as working out who does what, it helps to have a way to parse what kinds of decision can be delegated and what not. Before Jeff Bezos started hanging out in spacesuits and doing laughable photoshoots in Vogue, he liked to articulate his management philosophy in annual letters to

Amazon's shareholders. In 2015 he made a useful distinction between type-1 decisions ("one-way doors") that are important and irreversible, and type-2 decisions ("two-way doors") that can be reversed if they do not pan out. Type-1 decisions warrant slow, deliberative processes; type-2 decisions should be taken quickly by smaller groups. Having a theory of decisions improves choices on what to delegate and reduces the chance of regrets.

Delegating well requires a lot of judgment, too. Delegation is not all-or-nothing. A detached boss can be as demotivating as a micromanager; you have to stay informed on decisions and, on occasion, override them. But checking in at the right cadence, and letting people proceed with decisions that you would not have made yourself, demands self-restraint and discipline. Just like those abs. ■





## 差异盈余

### 中国是否低报了它的出口成就？

中国贸易数据的核心是一个2300亿美元的谜团

中国的经常账户盈余曾经是经济学中最具争议的统计数据之一。这个数字衡量中国的收入和支出之间的差距，它在2007年达到峰值，几乎占到GDP的10%，这主要是受到中国的贸易顺差和从海外资产中获得的收入推动。在过去二十年的大部分时间里，中国的盈余让它被指责为重商主义——即通过不公平地促进出口来窃取就业机会。一些贸易伙伴现在担心，如果中国的电动汽车产量增长过快，可能会出现类似的冲击。

但是中国的经常项目盈余现在并不算高：按照国家外汇管理局的数据，去年中国的经常项目盈余为3120亿美元，占GDP的1.5%。这低于美国财政部认为过高的3%的门槛。

这个数字可信吗？有些人，比如美国外交关系协会（Council on Foreign Relations）的布拉德·塞瑟（Brad Setser）和金融评论员马修·克莱因（Matthew Klein），认为官方数据是大大低报了。克莱因认为，中国目前的真实盈余“相对于世界经济规模而言和过去任何时候都差不多大”。他们提出了两个论据。首先，中国可能算少了其海外资产的收入。其次，它对出口的统计可能打了折扣。

根据外汇局的数据，从2021年中到2022年中，中国从它的外国资产存量中获得的收入大幅下降。考虑到全球利率不断上升，这似乎有些奇怪。塞瑟根据对中国资产的假定做了另一种估算，按照他的算法，盈余要再多出约2000亿美元。

外汇局数据里中国的商品贸易顺差也小于中国海关的数据。过去一年这两个数字的差异达到2300亿美元。“即便对中国来说，这也是一大笔钱。”塞瑟表示。



盈余实则更大可能会让中国得到一些安慰。但这透露出的隐情让人不安。中国多赚的那些美元去了哪里？既然它们没有出现在中国央行或国有银行的账簿上，那么必定是被一种隐性的资本外流抵消了。这样的流出通常最终会入在分类账的一个剩余类别里。塞瑟认为这个剩余部分应该在GDP的2%左右，而不是官方数据中的接近于零。

外汇局对此有不同的解释。它把出口额上的差异主要归因于中国的自由贸易区和类似自贸区的飞地。这些区域位于中国境内，但在官方征收关税的边界之外（见图）。从这些飞地运往世界其他地方的货物在海关被算作出口，但在外汇局不算出口。Absolute Strategy Research的亚当·沃尔夫（Adam Wolfe）指出，这些自贸区在中国出口中所占的份额越来越大。这或许可以解释为什么数字差异只在过去两年才出现。

这没能让塞瑟全然信服。如果中国的自贸区出口非常繁荣，那应该会在其他地方产生连锁反应。例如，工人挣的工资应该表现为汇款增加。但实际上汇款只增长了一点点。而正如沃尔夫指出的那样，即使官方经常项目盈余的计算是正确的，可能也无法给中国的贸易伙伴带来多少安慰。毕竟，如果中国国内的需求持续疲软，其自贸区生产的商品可能会涌向国外市场。即使中国外汇局不把它们算作中国的出口，世界其他国家还是会把它们算作从中国的进口，并体验到它们的存在。■



## A surplus of anomalies

### Is China understating its own export success?

#### *The \$230bn puzzle at the heart of the country's trade figures*

CHINA'S CURRENT-ACCOUNT surplus was once one of the most controversial statistics in economics. The figure, which peaked at almost 10% of GDP in 2007, measures the gap between China's earning and its spending, driven largely by its trade surplus and the income it receives from its foreign assets. For much of the past two decades, China's surpluses have left it open to the charge of mercantilism—of stealing jobs by unfairly boosting its exports. Some trading partners now worry about a similar shock if the country's output of electric vehicles grows too quickly.

But China's current-account surplus is now modest: \$312bn or 1.5% of GDP over the past year, according to the country's State Administration of Foreign Exchange (SAFE). That is below the 3% threshold that America's Treasury deems excessive.

Is the figure reliable? Some, such as Brad Setser of the Council on Foreign Relations and Matthew Klein, a financial commentator, believe that the official numbers are dramatically understated. China's true surplus, Mr Klein reckons, is now "about as large as it has ever been, relative to the size of the world economy". They offer two arguments. First, China may be understating income from its foreign assets. Second, it may be understating exports.

According to SAFE, the income China earns on its stock of foreign assets plunged from mid-2021 to mid-2022. This seems odd given rising global interest rates. Mr Setser's alternative estimate, based on assumptions about China's assets, would add about \$200bn to the surplus.

China's goods surplus also appears smaller in SAFE's figures than it does in China's own customs data. The gap was \$230bn over the past year. "That is real money, even for China," says Mr Setser.

China might take some comfort from a bigger surplus. But it has an unsettling implication. What is happening to the additional dollars China is earning? Since they are not showing up on the books of China's central bank or its state-owned banks, they must be offset by a hidden capital outflow. Such outflows typically end up in a residual category of the ledger. Mr Setser believes this residual should be about 2% of GDP, not the official figure of near zero.

SAFE has a different explanation. It attributes the export gap largely to China's free-trade zones and similar enclaves. These lie inside China's territory but outside its official tariff border (see diagram). Goods leaving these enclaves for the rest of the world are counted as exports by customs but not by SAFE. Adam Wolfe of Absolute Strategy Research points out that these zones account for a growing share of China's exports. That may explain why the gap has emerged only in the past two years.

Mr Setser is unconvinced. If China's free-trade zones have enjoyed a dramatic export boom, it should produce ripples elsewhere. Wages earned by workers, for example, should appear as increased remittances. In fact, they have risen only a little. And as Mr Wolfe points out, even if the official current-account surplus is correctly calculated, it may be of little comfort to China's trading partners. After all, if the country's domestic demand remains weak, goods made in its free-trade zones may flood foreign markets. The rest of the world will count them, and experience them, as Chinese imports, even if SAFE does not count them as Chinese exports. ■



## 资金流动

### 如何从中国润出千亿美元

#### 资本出逃的新时代已经开始

过去这一年实在很难看好中国。2023年迄今为止，中国的沪深300指数已下跌了13%，至低于该国上一次因疫情实施严厉封锁时的水平。房地产市场的困境促发企业违约。经济增长前景低迷，再加上要应对国内反复无常的威权领导层，还有与主要贸易伙伴国不确定的关系，让金融环境十分严峻。

这些也造成了资本大量外流。曾经对中国充满无尽热情的外国投资者正在争相撤离。大量富裕的中国人也一样。根据智库国际金融研究所

（Institute of International Finance）的数据，中国的股票和债券已连续五个季度出现资金跨境流出，创下有记录以来最长的持续外流。企业也坐不住了。2023年第三季度，中国的外商直接投资净流量自二十多年前开始统计以来首次出现负值。在某种程度上，这是因为国内制造商纷纷在海外投资建厂，以求降低劳动力成本，并规避美国的关税。关于资金外流的整体规模尚不能确定，但一些人认为，中国模糊的国际收支数据掩盖了高达5000亿美元的资金流出。

中国上一次资本外流高峰发生在2015至2016年。那一次由货币贬值引发，而货币贬值又是缘于股市崩盘。据估计，仅2015年一年就有多达1万亿美元的资金流出中国。当时，许多国家敞开怀抱欢迎中国资本到来。而现在它们心存疑虑。因此，中国的资金——无论是否合法合规——正在找到新的目的地。

焦躁的投资者要办的第一个事项是规避中国的资本管制。有些人在蚂蚁搬家似地转移资金。大陆居民可以在香港购买可交易的保单，不过按规定单笔上限仅为5000美元。2023年前九个月，面向大陆游客的保险销售额达到470亿港元，比2019年同期增长约30%。其他渠道正在被关闭。10月，

中国禁止国内经纪公司协助本国居民进行海外投资。对于企业主来说，将资金转出国外的一种方式是在夸大交易货值，虚报贸易金额。

许多地方对中国投资者不像上一次资本外流时那样热情而散发吸引力。美国数十个州的立法机构已通过法案，禁止在海外居住的外国公民购买土地和房产。在截至2023年3月的一年时间里，中国买家在美国购买的房产总值为136亿美元，不到2016至2017年同期的一半。作为另一个曾经热门的市场，加拿大现在完全禁止非居民购买房地产。欧洲以居留权换投资的黄金签证正在失宠，爱尔兰、荷兰和葡萄牙正在收紧或废除此类投资居留计划。尽管香港仍然是中国资本进入世界其他地区的门户，但自政治管控以后，它作为富裕家庭保护资产免受中国政府染指的避难所的吸引力已经减弱。

正是在这种背景下，新加坡扮演了越来越重要的角色。它能够成功吸引到中国资金的主要原因是地理位置邻近、税率低，而且很多人会讲普通话。自2021年以来，来自香港和中国大陆的直接投资增长了59%，2022年达到193亿新加坡元（144亿美元）。高盛的分析师指出，两国贸易数据的可疑差异显示存在更大规模未被记录的资本外逃。

在中国需求的推动下，新加坡的家族办公室数量从2020年的400个增长到2022年底的1100个。至于超级富有的投资者通过此类工具持有着哪些资产，这方面的透明度很低，但新加坡规模不大的资本市场意味着大部分资金最终将投资于海外。尽管如此，中国资金的流入提振了新加坡的银行，推升了星展银行和华侨银行等银行的利润。其他中立国家也受益于中国资金。尽管黄金签证在其他地区的签发数量在下降，但迪拜的签发量在2023年前六个月相比2022年同期增加了52%，其中许多签发对象被认为是中国人。

受益的不止中立国家。房地产经纪公司日本华房地产的胡凯淇表示，过去一年里，中国大陆和香港客户对日本房产的咨询量增加了大约两倍。日元疲软加速了这一趋势，过去三年里日元兑人民币汇率下跌了五分之一。胡凯淇表示，大约70%的买家通过视频通话看房，并在没有先亲自看房的情

况下购入。当地房地产中介Plus Agency的李铂表示，澳大利亚的房地产市场也出现了海外需求激增的现象，主要是来自想要自住的业主，而不是像前几波热潮中那样来自投资者。房地产公司居外IQI（Juwai IQI）的数据似乎证实了这一趋势。自2020年以来，世界各地收到中国买家询问的房产的中位价格已从29.6万美元上涨到72.8万美元。买家不再购买较小的房产出租，而是选择宽敞的房产自住。

中国资本可能引发问题。它已经给新加坡的住房市场带来了压力，新加坡的住房要由政府供给，私人住宅不到50万套。为了给市场降温，政府在2023年4月开始对外国人购买的房产一律征收高达60%的税率。新加坡金融领域的保密政策也可能招致违规操作。8月，警方在突击搜查中查封了总价值约合20亿美元的汽车、珠宝和豪宅等资产，逮捕了十名外国人。这些人都出生在中国，但通过国际投资计划取得了他国国籍。10月，新加坡政府指出其中至少有一名被告可能与一个家族办公室有关联。柬埔寨和泰国等其他东南亚国家对接纳可能携带政治问题的中国精英公民态度谨慎。

尽管中国的资本外流还没有达到2015年至2016年的恐慌时期那么大的规模，但可能会比那会儿更持久。当时，政府推动的房地产业信贷繁荣帮助重振了经济的动物精神。而这一次，中国政府希望任该行业冷却下来。如果中国经济不发生出乎意料的突然复苏，寻求退出的资本流动不太可能会慢下来。投资者和公司将继续寻求各种外国资产，至少是仍然允许购买的那些资产。他们所到之处，必然是有人欢喜有人愁。■



## Financial flows

### How to sneak billions of dollars out of China

*A new era of capital flight has begun*

IT HAS BEEN a terrible year to be bullish on China. The CSI 300 index of Chinese stocks has dropped by 13% so far in 2023, to below the level reached during the last of the country's severe covid-19 lockdowns. Difficulties in the property market are prompting corporate defaults. The lacklustre outlook for economic growth, combined with the need to manage capricious autocratic leadership at home and uncertain relations with big trading partners, makes for a miserable financial climate.

This is also a recipe for enormous capital outflows. Foreign investors, who once had boundless enthusiasm for China, are rushing for the exits. So are numerous wealthy Chinese individuals. According to the Institute of International Finance, a think-tank, there have been cross-border outflows from the country's stocks and bonds for five consecutive quarters, the longest streak on record. Firms are getting itchy feet, too. In the third quarter of 2023 the net flow of foreign direct investment in China turned negative for the first time since the data began to be collected a quarter of a century ago. In part, this reflects investment by domestic manufacturers in overseas operations, which can lower labour costs and help skirt American tariffs. The size of the overall outflows is up for debate, but some believe up to \$500bn-worth is disguised in China's murky balance-of-payments data.

The last surge of capital out of China came in 2015-16. It was set off by a currency devaluation, which was itself sparked by a stockmarket collapse. By one estimate, as much as \$1trn escaped the country in 2015 alone. Back then, many countries welcomed Chinese capital with open arms. Now they are suspicious. New destinations for Chinese funds—both legitimate and



illicit—are therefore being found.

Dodging China's capital controls is the first task for fretful investors. Some transfers are piecemeal: mainland residents can buy tradable insurance policies in Hong Kong, though they may legally spend only \$5,000 at a time. In the first nine months of the year, sales of insurance to mainland visitors hit HK\$47bn (\$6bn), some 30% more than in the same period in 2019. Other avenues are being closed off. In October China banned domestic brokers from facilitating overseas investment by local residents. For business owners, misinvoicing trade shipments, by overstating the value of goods being transacted, is one way to get money out of the country.

Many places are less inviting to Chinese investors than during the last era of capital flight. Dozens of American state legislatures have passed bills blocking foreign citizens residing overseas from buying land and property. Chinese buyers spent \$13.6bn on American property in the year to March, less than half the amount spent during the same period in 2016-17. In Canada, another once popular market, non-residents are now banned from buying real estate altogether. Golden visas in Europe, which offer residency rights in exchange for investment, are falling out of favour: schemes in Ireland, the Netherlands and Portugal are being tightened or abolished. Although Hong Kong remains a gateway through which Chinese capital can reach the rest of the world, its appeal as a bolthole for rich families aiming to shield their assets from the Chinese state has dimmed since the territory's political crackdown.

It is in this context that Singapore has taken on an increasingly important role. Its success in attracting Chinese cash owes a lot to its relative proximity, low taxes and large Mandarin-speaking population. Direct investment from Hong Kong and the Chinese mainland has risen by 59% since 2021, reaching 19.3bn Singapore dollars (\$14.4bn) in 2022. Suspicious gaps in the trade data between the two countries suggest greater unrecorded



capital flight, too, note analysts at Goldman Sachs, a bank.

The number of family offices in Singapore rose from 400 in 2020 to 1,100 by the end of 2022, a trend driven by Chinese demand. There is little transparency about what assets ultra-rich investors hold through such vehicles, but Singapore's modest capital markets suggest that most money will eventually be invested abroad. Nevertheless, Chinese inflows have buoyed Singapore's banks, helping to lift profits at institutions like DBS and Overseas Chinese Banking Corporation. Other neutral locations are also benefiting from Chinese cash. Although golden visas are in decline elsewhere, issuance in Dubai rose by 52% in the first six months of 2023, compared with the same period in 2022, with lots of recipients thought to be Chinese.

Neutral countries are not the only beneficiaries. Inquiries about Japanese properties from clients in China and Hong Kong have roughly tripled in the past year, says Glass Wu of Japan Hana, an estate agency. The trend has been accelerated by a weak Japanese yen, which has fallen by a fifth in the past three years against the Chinese yuan. Around 70% of the buyers make viewings via video call, says Ms Wu, and buy without first visiting the property. Australia has also seen a surge in overseas demand for property, mostly from potential owner-occupiers, rather than investors as in previous waves, says Peter Li of Plus Agency, a local realtor. Data from Juwai IQI, a property firm, seem to confirm the trend. Since 2020 the median price of homes around the world receiving inquiries from Chinese buyers has risen from \$296,000 to \$728,000. Rather than buying smaller properties to let, buyers are opting for spacious ones in which they will actually live.

Chinese capital can cause problems. It has put pressure on Singapore's housing market, which is dominated by state provision and contains fewer than half a million private units. In April the state introduced an eye-watering 60% tax on all property purchases by foreigners to try to cool

things down. The city's financial secrecy may also invite the wrong kinds of activity. In August police raids resulted in the seizure of assets including cars, jewellery and luxury property, together worth around \$2bn, and the arrests of ten foreigners. The group had all been born in China, but most had acquired other citizenships through international investment schemes. In October the Singaporean government noted that at least one of the accused may have had links to a family office. Other countries in the region, such as Cambodia and Thailand, are wary of hosting elite Chinese citizens who may bring politics with them.

Although outflows from China are not yet on the vast scale of those seen during the panic of 2015-16, they might prove more enduring. Back then, a government-engineered credit boom in the property industry helped revive the economy's animal spirits. This time around, the Chinese government wants to allow the industry to cool. Without a sudden, unexpected recovery in the fortunes of the Chinese economy, the stream of capital looking for an exit is unlikely to slow. Investors and companies will continue to seek a wide variety of foreign assets—the ones, at least, they are still allowed to buy—prompting joy and headaches wherever they land. ■



## 茶馆

# 中国城市的抢娃大作战

开明的自利促使富裕地区想办法吸引农村家庭

中国的中央规划者一般很少谈“爱”。但仔细阅读一些具改革意识的省份近期出台的规划，尤其是那些试图应对人口减少的方案，会明显感受到字里行间不仅试图晓之以理，更试着动之以情。

以浙江省为例，这个富裕的沿海省份制定了一项为期五年的计划，旨在协助农业转移人口在该省各市安家落户，且最好他们年幼的子女也随迁。这份提案于7月发布，覆盖2023年至2027年，初看起来似乎索然无味。其中一个章节说明了除省会杭州以外，其他所有城市的新迁入家庭如何能获得公办学校入学名额和享受其他公共服务，而无需购房或获得当地户口。户籍制度自毛泽东时代起便被用来管理国家内部人口迁移，当时共产党担心饥饿的农民可能涌入城市。在浙江，民众对于目前这些变革在人口上的用意领会得非常清楚。

笔者走访了义乌。浙江这座190万人口的城市是一个小商品贸易中心，向全世界供应铅笔、遮阳伞、鞋带和购物车。笔者在那里听到本地人和外来工琢磨居住规定放宽会怎样影响义乌的经济、入学排队和房价。几无例外的是，本来说着数据的他们往往聊着聊着就开始述说起自己对这些改革的感受来。

尽管浙江的改革热情尤为突出，但全国各地的城市都受到敦促来放宽落户限制。一些城市正向更愿意保留农村出生地户籍的务工者开放公共服务。经济和人口结构变化都在推动变化。生育率迅速下降，2022年，中国人口自20世纪60年代初以来首次减少。一些中国最大、最富裕城市的居民对于生育奖励等政府激励措施反应冷淡。一些目光长远的省份和城市现在将关注的焦点放在了一个已经出生的年轻群体上，那就是中国6700万“留守儿童”。这些孩子的父母两人或之一远离家乡在外务工，孩子被留在乡

村、县城或小城市里，由亲属抚养或上寄宿学校。

即便是中国最大的一些城市也在为保持人口规模而忧虑，上海交通大学经济学家、户口制度改革的知名倡导者陆铭表示。此外，他指出，中国可由直接从农村迁移而来的民工填补的工厂岗位在减少，而需要从业者懂得城里人及其生活方式的服务业岗位在增多。陆铭教授列举了护理、家政、装修这样的城市工作，并表示在城市长大和受教育的工人更适合填补这些职位空缺。多年来，城市一直向大学毕业生和其他技术工人提供户口。陆铭表示，如今争夺的焦点正转向蓝领家庭。

并非每个城市都有财力参与竞争。富裕的义乌今年投入了大量资金吸引年轻家庭。为帮助外来人口，该市关闭了28所专门面向农民工子女的民办学校，其中一些学费高达2万元一年。其他一些学校在破旧的工业场地授课。该市将其中的24所转为公办学校，将2.5万名农民工子女纳入公立教育体系。此外，义乌还新建小学，其中一个校园耗资2.24亿元。

农民工父母对此反应不一。义乌宽阔的大道两旁，聚集特定行业的商业综合体一字排开。在一个文具商场外，笔者发现了三名来自湖南省同一个村落的男子。他们以卖不干胶价签为生，“柜台”就是放在电瓶车上的塑料箱。其中一人过去每年花6000多元送孩子上义乌的民办学校。这所学校现在成了公办的，费用只有过去的十分之一。义乌“想留住更多外地人”，这位幸运的父亲表示。不过，旁边比他年轻的搭档却不准备将13岁的女儿从湖南接过来。“她当然更愿意和父母在一起。”他承认。但他和妻子两人都在义乌工作，经常会忙到半夜或更晚。“我们在这里没时间照顾孩子。”这位卖标签的父亲说着，一边抽烟一边等待顾客上前。

在商场里面，一名妇女向来自世界各地的买家销售儿童日记本和笔。她来自浙江其他地方，有一个孩子。对眼下这些改革，她既感激又怀疑。她承认，即使没有完整的户口，租房子并缴纳社保的农民工如今也能让孩子入读城市里的学校。但他们很少能够进义乌最好的学校。有房者和有常住户口的人比租房的新迁人口有优先权，她解释说。在旁边一个店铺里，一位迁居义乌多年的两个孩子的母亲称，她下了血本在一所好学校附近安了

家。她提出，如果新来的人能进最好的学校，那对买了房的人就“非常不公平”。

一些外来务工者更倾向两地来回的生活。有些人保留农村户口以保持在农村的土地权益。一名来自中国南方的妇女可能会在十年后把女儿送回家乡省份参加高考。她说，在老家，竞争不像在富庶的浙江那么“激烈”。

在一所新建小学附近的操场上，一名来自湖南的退休农民工自豪地谈起她的成年子女和她现在帮忙带的四个孙辈，每个孩子都有义乌户口。二三十年前，她自己的孩子住在农村老家，她每年见他们两次。那会儿孩子们应该是想念自己的吧，她说，勉强地笑了一声。“但我不确定，也不会去问。”中国仍然有很多这样的悲伤故事。出于自身利益考虑，如今各省市正帮助更多的家庭团聚。减轻这样的内心伤痛将是它们收获的回报之一。





Chaguan

## China's cities compete for kids

*Enlightened self-interest nudges rich places to woo rural families*

AS A RULE, China's central planners do not say much about love. But look closely at recent plans from some reform-minded provinces—notably schemes that try to address a shrinking population—and appeals to hearts as well as minds leap from the page.

Take, for instance, a five-year plan to help rural migrants settle down in the cities of Zhejiang, a prosperous coastal province, and ideally to bring their young children with them. At first sight, Zhejiang's proposal, issued in July and covering 2023 to 2027, is dry stuff. One section explains how, in every city except the provincial capital, Hangzhou, recently arrived families can access places at city-funded schools and other public services. They qualify without buying a home or securing a local hukou (household registration). The hukou system has been used to regulate internal migration since Maoist times, when the Communist Party feared hungry peasants might crowd into cities. On the ground in Zhejiang the human import of these changes is well understood.

Chaguan travelled to Yiwu, a city of 1.9m in Zhejiang that is a trading hub for small commodities, supplying the world with pencils and parasols, shoelaces and shopping trolleys. He heard locals and migrants weigh the likely impact of relaxed residency rules on Yiwu's economy, on school waiting lists and on housing prices. Strikingly often, the same people then stopped talking about statistics and spoke of how the reforms make them feel.

Though Zhejiang stands out for reforming zeal, cities across China are being

encouraged to hand out hukou papers more easily. Some are opening public services to migrants who prefer to remain registered in their rural birthplaces. Both economics and demographics are driving change. Fertility rates are dropping fast and China's population declined in 2022 for the first time since the early 1960s. Natives of some of China's biggest and richest cities are proving indifferent to offers of baby-bonuses and other government incentives. Far-sighted provinces and cities are now focusing on a stock of young people who have already been born: China's 67m "left-behind children". That is the term for youngsters being raised by relatives or in boarding schools in villages, county towns or minor provincial cities, while one or both parents works as a migrant away from home.

Even some of China's biggest cities are anxious about maintaining their populations, says Lu Ming, an economist at Shanghai Jiaotong University and a prominent advocate of hukou reform. What is more, China is generating fewer of the factory jobs that can be filled by migrants straight from the countryside, and creating more service-sector jobs that require an understanding of city folk and their ways, notes Professor Lu. By way of example he cites jobs in nursing or housekeeping or as decorators, adding that workers raised and educated in cities are best placed to fill such vacancies. Cities have been offering hukous to university graduates and other skilled workers for years. Now, the contest is on for blue-collar families, the professor suggests.

Not every city has the means to compete. Yiwu, a wealthy place, has spent heavily on wooing young families this year. To help outsiders, the city closed 28 private schools that catered to migrant children, some of which charged as much as 20,000 yuan (\$2,811) a year. Others offered classes in shabby industrial premises. The city converted 24 into publicly funded schools, bringing 25,000 migrant children into the state sector. It built new primary schools, too, with one campus costing 224m yuan.

Migrant parents have mixed reactions. Yiwu's wide avenues are lined with commercial complexes devoted to specific industries. Outside a centre for stationery merchants, your columnist found three men from the same rural corner of Hunan province. They eke out a living selling adhesive price labels from plastic crates balanced on electric scooters. One used to pay over 6,000 yuan a year to send his child to a local private school. The same school is now public and costs him a tenth of that. Yiwu "wants to hang on to more outsiders", suggests that lucky father. A younger colleague will not be moving his 13-year-old daughter from Hunan to the city, however. "Of course, she'd prefer to live with her parents," he admits. But he and his wife both work in Yiwu, often till midnight or later. "We don't have time to take care of the child here," says the label-seller, smoking as he waits for customers.

Inside the mall, a mother of one from elsewhere in Zhejiang sells children's diaries and pens to buyers from around the world. The reforms leave her both grateful and sceptical. Migrants who rent homes and pay social-security contributions can now access city schools, even without a full hukou, she agrees. But they rarely land spots at Yiwu's best schools. Homeowners and longstanding hukou-holders have a higher priority than newcomers who rent, she explains. In a nearby shop, a mother of two who moved to Yiwu years ago reports that she paid a hefty premium to live near a good school. She ventures that it would be "very unfair" on homebuyers if the newcomers could access the best schools.

Some migrants prefer a life in two places. Some keep a rural hukou to maintain their rights to village land. A woman from southern China may send her daughter back to her home province to take university-entrance exams in ten years' time. Back home, the competition is less "ferocious" than in wealthy Zhejiang, she says.

In a playground near a new primary school, a retired migrant worker from



Hunan talks proudly of her grown children and the four grandchildren that she now helps to raise, each of whom has a hukou from Yiwu. A generation ago, her own children lived in her home village and she saw them twice a year. She supposes that her children missed her, she says, with a strained laugh. “But I don’t know and I would not ask.” China remains full of such sad tales. Self-interest now prompts cities and provinces to help more families stay together. Easing heartache will be one of their rewards. ■