

# The Economist

Who's winning in Pennsylvania?

How the world's poor stopped catching up

Asia's ferocious tutors

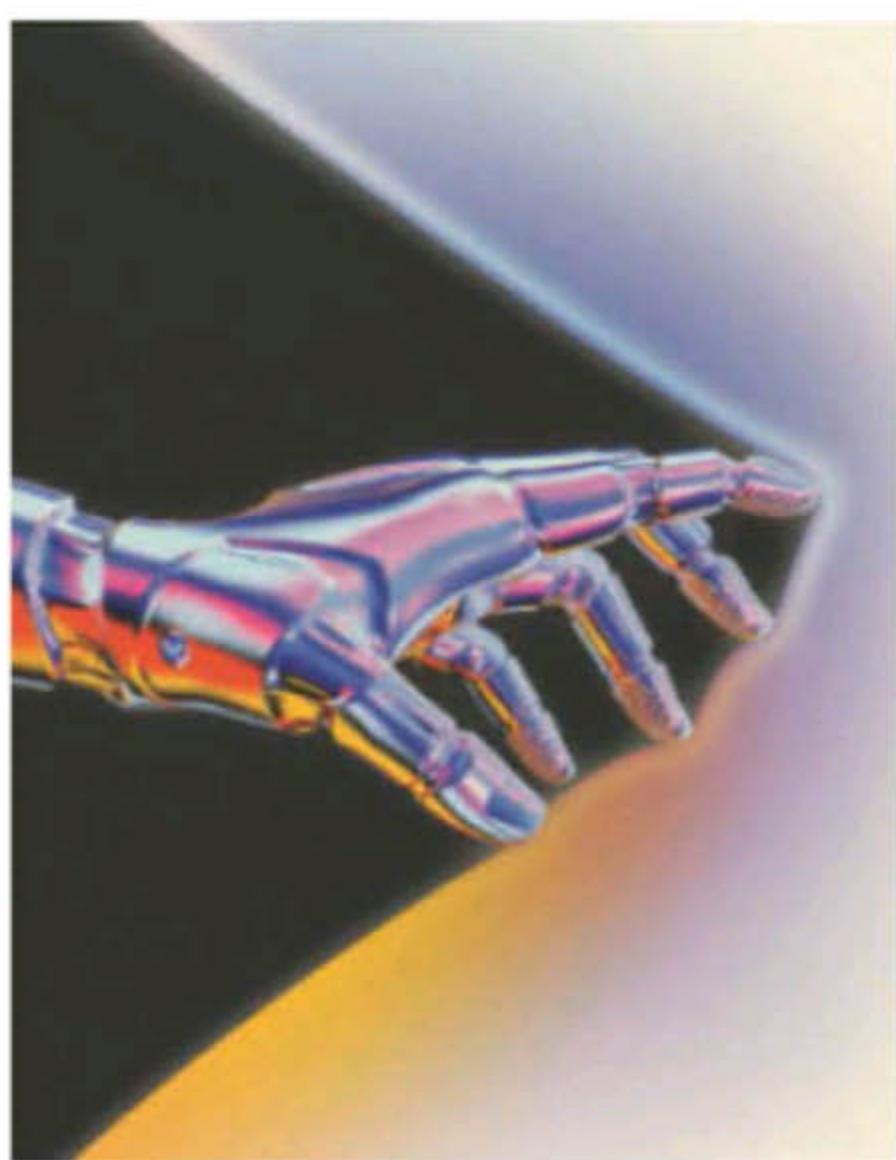
Peak woke: the numbers

SEPTEMBER 21ST-27TH 2024



THE  
**BREAKTHROUGH**  
**AI NEEDS**

# Contents



## On the cover

A race is on to push AI beyond today's limits: leader, page 13. How Silicon Valley is being transformed, page 56. Chinese firms are innovating around hardware bans, page 71. AI has returned chipmaking to the heart of computer technology, says Shailesh Chitnis. See our Technology Quarterly, after page 40

**Who's winning in Pennsylvania?** Buckets of money and vicious ad wars have left the race there a virtual tie, page 23. Kamala Harris's debate win is showing up in the polls, page 26

**How the world's poor stopped catching up** Convergence has stalled, with dire consequences. To restart it, liberalise: leader, page 14, and analysis, page 62

**Asia's ferocious tutors** In the poorer countries private lessons are booming, page 36

**Peak woke: the numbers** By all sorts of measures, America is becoming less woke: briefing, page 19. That creates an opportunity: leader, page 16. The right is taking the culture wars to culture itself: Lexington, page 28

→ The digital element of your subscription means that you can search our archive, read all of our daily journalism and listen to audio versions of our stories. Visit [economist.com](http://economist.com)

## The world this week

- 10 A summary of political and business news

## Leaders

- 13 **AI** Breakthrough needed  
14 **Catch-up growth** Arrested development  
15 **Ukraine** Unshackle the defenders  
15 **British universities** Fees must rise  
16 **American politics** After peak woke

## Letters

- 18 On bitcoin mining, orange juice, social care, country music, dogs, Arnold Schoenberg

## Briefing

- 19 **Peak woke** America goes back to sleep

## Technology Quarterly: Chipmaking

- Silicon returns to Silicon Valley  
*After page 40*



**Bartleby** How nice should managers be? *Page 58*



## United States

- 23 Pennsylvania polls  
24 Ryan Routh  
25 Eric Adams's friends  
25 College admissions  
26 Campaign calculus: the debate bump  
27 Never Trumpers  
28 **Lexington** Culture and culture wars



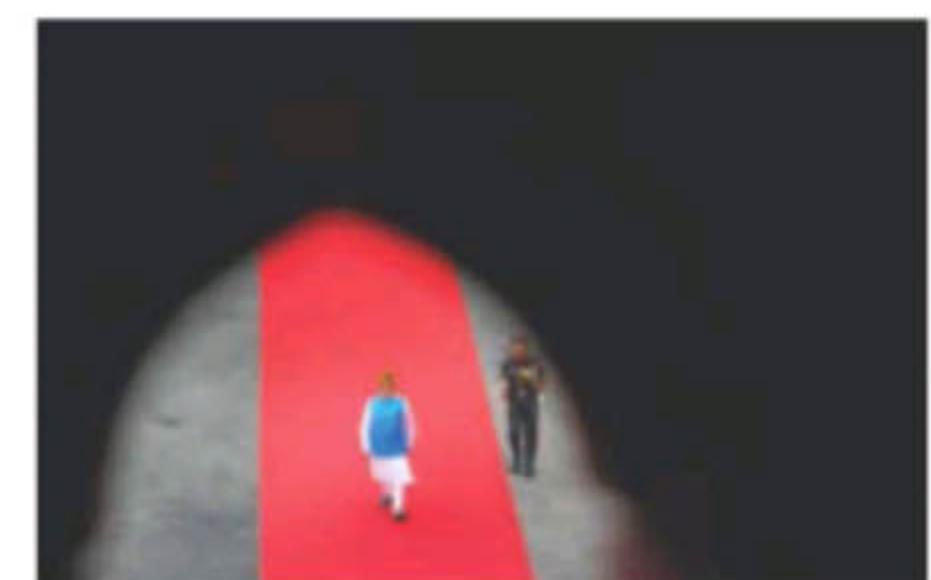
## The Americas

- 29 Carbon markets and the Amazon  
30 Brazil's greedy Congress  
31 Justin Trudeau in trouble



## Asia

- 33 Modified Modi  
34 Pacific policing  
35 Afghan women crushed  
36 Private tuition booms  
37 **Banyan** Geopolitical gaslighting



## China

- 38 A higher retirement age  
39 Child-care challenges  
40 Prisoner diplomacy  
40 A typhoon hits Shanghai



## Middle East & Africa

- 41 Attacks on Hezbollah  
42 A theatre in Jenin  
43 Hobbling Israel's Supreme Court  
43 Falling crime in Kenya  
44 Floods in Nigeria



► **Contents continues overleaf**

# Contents

## Europe

- 45** Near-shoring in eastern Europe
- 46** Friedrich the Great
- 47** Balkan arms boom
- 47** The new commissioners
- 48** Finland's vulnerable islands
- 49** Charlemagne Shrinking Schengen



## Britain

- 50** Universities challenged
- 52** Bagehot The Lib Dems



## International

- 53** America and the UN



## Business

- 56** The age of the hectocorn
- 57** Boeing v the workers
- 58** Bartleby Niceness
- 59** China's steel onslaught
- 60** FIFA 0, Electronic Arts 1
- 60** The hype for hybrid cars
- 61** Schumpeter Auditing the auditors



Volume 452 Number 9415

Published since September 1843  
to take part in "a severe contest between intelligence, which presses forward, and an unworthy, timid ignorance obstructing our progress."

### Editorial offices in London and also:

Amsterdam, Beijing, Berlin, Brussels, Cape Town, Chicago, Dubai, Lagos, Madrid, Mexico City, Montevideo, Mumbai, Nairobi, New Delhi, New York, Paris, San Francisco, São Paulo, Shanghai, Singapore, Taipei, Tokyo, Washington DC

### Subscription service

For our full range of subscription offers, including digital only or print and digital bundled, visit: [Economist.com/offers](http://Economist.com/offers)

If you are experiencing problems when trying to subscribe, please visit our Help pages at: [www.economist.com/help](http://www.economist.com/help) for troubleshooting advice.

## Finance & economics

- 62** Development failures
- 64** The Fed cuts rates
- 65** Buttonwood Markets and monetary policy
- 66** Chinese privatisation
- 67** European regulation
- 68** Free exchange Lessons from the history of money



## Science & technology

- 69** Better battery recycling...
- 70** ...and innovative designs
- 71** Earth's lost planetary ring
- 71** China's progress in AI
- 72** Baobabs and bush pigs



## Culture

- 73** Sex and Christianity
- 74** Britain's elite
- 75** World in a dish: martinis
- 76** Ozempic and diet books
- 76** An elusive arms dealer
- 77** How horses shaped history



## Economic & financial indicators

- 78** Statistics on 42 economies

## Obituary

- 80** Francisco Lopera, leader of Alzheimer's research



PEFC certified  
This copy of The Economist is printed on paper sourced from sustainably managed forests certified by PEFC  
[www.pefc.org](http://www.pefc.org)

## The world this week Politics



At least 12 people were killed, including two children, and 2,800 injured when thousands of pagers used by members of **Hizbulah**, an Iranian-backed militia, exploded in Lebanon and Syria. The next day walkie-talkies blew up across Lebanon, killing another 20 people and injuring 450. **Israel** is assumed to be behind the attacks. It is thought that Israeli agents planted explosive substances inside the devices before they were imported into Lebanon. Israel had just expanded its war aims to include the safe return of 60,000 evacuees, displaced by Hizbulah rockets, to the country's north.

### A 2,000km punch

A missile fired by the **Houthis** in Yemen struck central Israel for the first time. Going by shrapnel from the blast, it seems that Israel's air-defence systems failed to destroy the missile before it entered the country's airspace.

A terrorist group linked to al-Qaeda claimed responsibility for attacks in Bamako, the capital of **Mali**. Militants stormed a military-police school and an air base where aircraft and mercenaries from the Wagner Group, a Russian network, were present.

**Bassirou Diomaye Faye**, Senegal's president, dissolved parliament. The anti-corruption crusader wants a fresh slate of MPs to carry out reforms, such as renegotiating oil and gas contracts with foreign firms. The dissolution worried investors and sent Senegal's bond yields jumping, but Mr Faye's party is expected to win an election in November.

**South Sudan** postponed until 2026 elections that were due to take place in December, adding to a growing sense of crisis in the country. Since it took office after independence from Sudan in 2011, South Sudan's government has repeatedly avoided going to the polls.

Arvind Kejriwal stepped down as chief minister of Delhi's regional government, after **India's** Supreme Court freed him on bail from six months detention in an alleged corruption case. Mr Kejriwal says the allegations against him are politically motivated and he wants a clean mandate from voters in a forthcoming election. Mr Kejriwal is from the Aam Aadmi Party and is a fierce critic of the Bharatiya Janata Party, which heads India's federal government.

The initial stage of voting began in the first regional election in **Jammu & Kashmir** for a decade. The results are expected on October 8th.

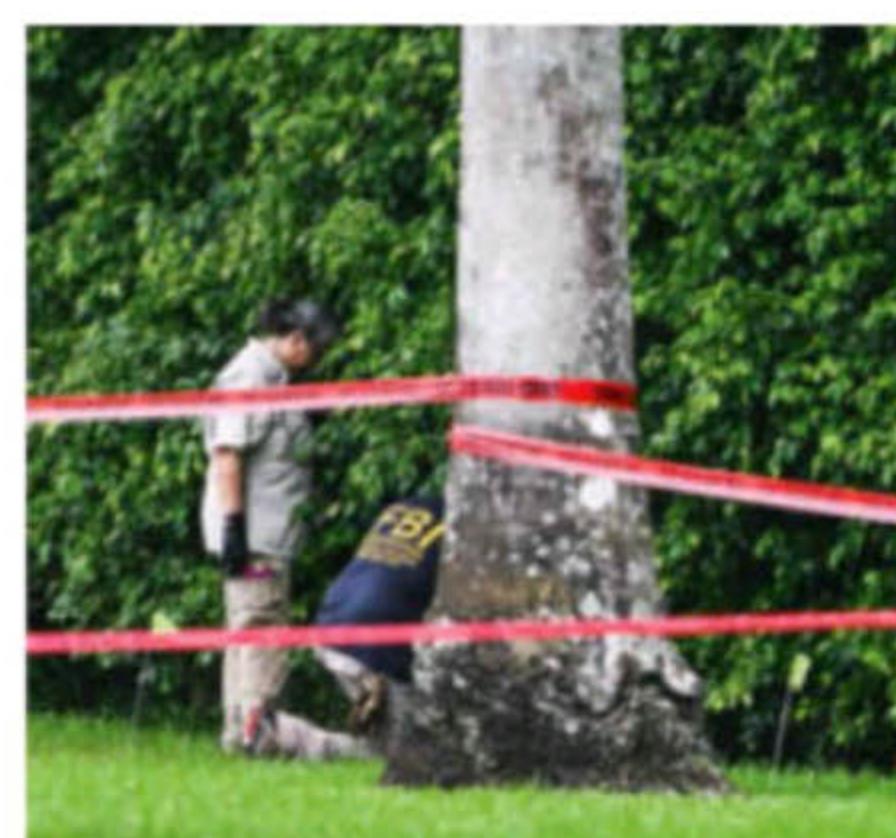
The UN High Commissioner for Human Rights reported that at least 5,350 civilians had been killed by **Myanmar's** army since the coup that brought the junta to power in 2021, and that 2,414 of those had been killed between April 2023 and June 2024 alone. Adding to the country's misery, at least 260 people have died in floods and landslides in the aftermath of **Typhoon Yagi**. In Vietnam the death toll from the storm rose to almost 300.

Joe Biden and Sir Keir Starmer, the British prime minister, held talks at the White House aimed at finding a way of allowing Ukraine to use **Western missiles** against targets inside Russia. The talks were inconclusive. Vladimir Putin said recently that permitting Ukraine to fire the weapons at Russia would be a direct act of war. In an attempt to increase pressure on Britain, Russia expelled six British diplomats shortly before the White House meeting.

Meanwhile, Ukraine expanded its **drone attacks** inside Russia. People were evacuated from the town of Toropets, which lies 470km (292 miles) north of the border with Ukraine, after a weapons warehouse targeted in the attacks exploded. Russia continued to bombard Ukrainian cities.

**Georgia's** parliament approved a law curtailing the few rights gay people have in the country. If enforced it will outlaw Pride marches, ban the rainbow flag and censor films and books with a gay theme.

Ursula von der Leyen, the president of the **European Commission**, unveiled her new commissioners. The biggest surprise was the resignation of Thierry Breton, a French heavyweight who was in charge of the internal market. He had fallen out with Mrs von der Leyen and she reportedly said she could no longer work with him. Teresa Ribera, an environmental minister in Spain, is the new competition commissioner. She will replace Margrethe Vestager, who imposed huge fines on American tech firms.



America's Secret Service came under pressure again, after a gunman hid undetected for 12 hours on Donald Trump's golf course in Florida. Agents saw the man and fired shots at him, with Mr Trump on the course about 350 metres away. The FBI said it was an **attempted assassination**, the second in two months to target the Republican. The suspect, who is reportedly a fervent supporter of Ukraine and tried to recruit Afghans to help its fight against Russia, was arrested.

Faced with a demographic crisis and looming pension shortfalls, **China** said it would raise its strikingly low retirement ages for men and women for the first time since the 1950s. Starting next year, the pensionable age for most workers will begin to move closer to rich-world norms.

**Canada's** ruling Liberal Party lost another by-election in what had hitherto been a safe seat, this time in Montreal. The defeat adds to the pressure on Justin Trudeau, the prime minister, to call an early federal election before the next one is due in October 2025.

In **Mexico** Andrés Manuel López Obrador, the president, signed into law a constitutional amendment that will see judges elected instead of appointed. The overhaul has been roundly condemned as a blow to democracy by business groups, academics and NGOs. But Mr López Obrador is committed to pushing through a raft of reforms in his last month in power.

**Ecuador's** president, Daniel Noboa, presented a proposal to amend the constitution to once again allow foreign military bases in the country. For years Ecuador has been wracked by clashes between drug gangs and Mr Noboa wants international help. The United States operated a military base to combat drug-trafficking in Ecuador until 2009, when it was asked to leave.

### He knows his audience

In an unusual gesture Javier Milei, **Argentina's** president, presented the government's budget to Congress himself. In a televised set-piece speech he railed against the profligate "miserable rats" in the opposition and repeatedly said there would be "zero deficit". Any legislation which threatens that would be vetoed, he promised. Markets cheered the speech, sending one measure of the risk of default to its lowest level in three months.

## The world this week Business

The Federal Reserve cut interest rates for the first time since March 2020, reducing its key rate by half a percentage point to a range of between 4.75% and 5%. The central bank suggested it would cut rates again later this year. With inflationary pressures easing, the Fed is pivoting to tackle a cooler labour market.

Workers in Boeing's biggest union went on strike, after they resoundingly rejected an offer to raise pay by 25% over four years. The union has been pushing for a 40% increase. It is the first strike to hit Boeing since 2008. It has suspended hiring and furloughed white-collar staff to cut its costs during the industrial action. The strike "jeopardises our recovery in a significant way", said the company.

### Succession obsession

A hearing got under way at a courtroom in Reno, Nevada, to determine who will control Rupert Murdoch's media empire when he dies. The 93-year-old mogul reportedly wants to change the terms of the family trust so that his eldest son, Lachlan, takes full control of News Corporation and Fox. The trust currently transfers voting shares to four of his children. The court's judge has refused access to the press, determining that the Murdochs' confidential personal and financial information needs to be protected.

BP decided to get out of the wind-power business in America and put its operational wind farms, spread across seven states, up for sale. The energy company wants to focus on solar energy in its renewables portfolio instead. Solar capacity is expected to vastly exceed that of wind in America over the next decade.

BlackRock launched a \$30bn investment fund aimed at expanding the infrastructure that powers artificial intelligence at data centres and the new energy sources needed to

support AI. The fund, one of the biggest of its type ever in America, is backed by Microsoft and MGX, an investment firm in Abu Dhabi. Nvidia will offer its expertise. The \$30bn that the fund raises from private capital swells to a potential \$100bn when debt financing is included.

With its share price down by more than half this year, Intel said it would pause the expansion of its chipmaking capacity in Germany and Poland for two years. The company wants to focus on turning its foundry business, which produces processors for other chipmakers, into an independent subsidiary. The German government had promised €10bn (\$11bn) in subsidies to Intel to build a new factory.

The European Union's General Court ruled that Google should not pay a €1.5bn (\$1.7bn) fine imposed on it by the European Commission in 2019 for forcing websites to use its AdSense platform to place search ads. The court found that the commission's antitrust regulator had failed to show how innovation had been hampered. It was a big win for Google, coming a week after

the European Court of Justice upheld a €2.4bn penalty against it in a separate case.



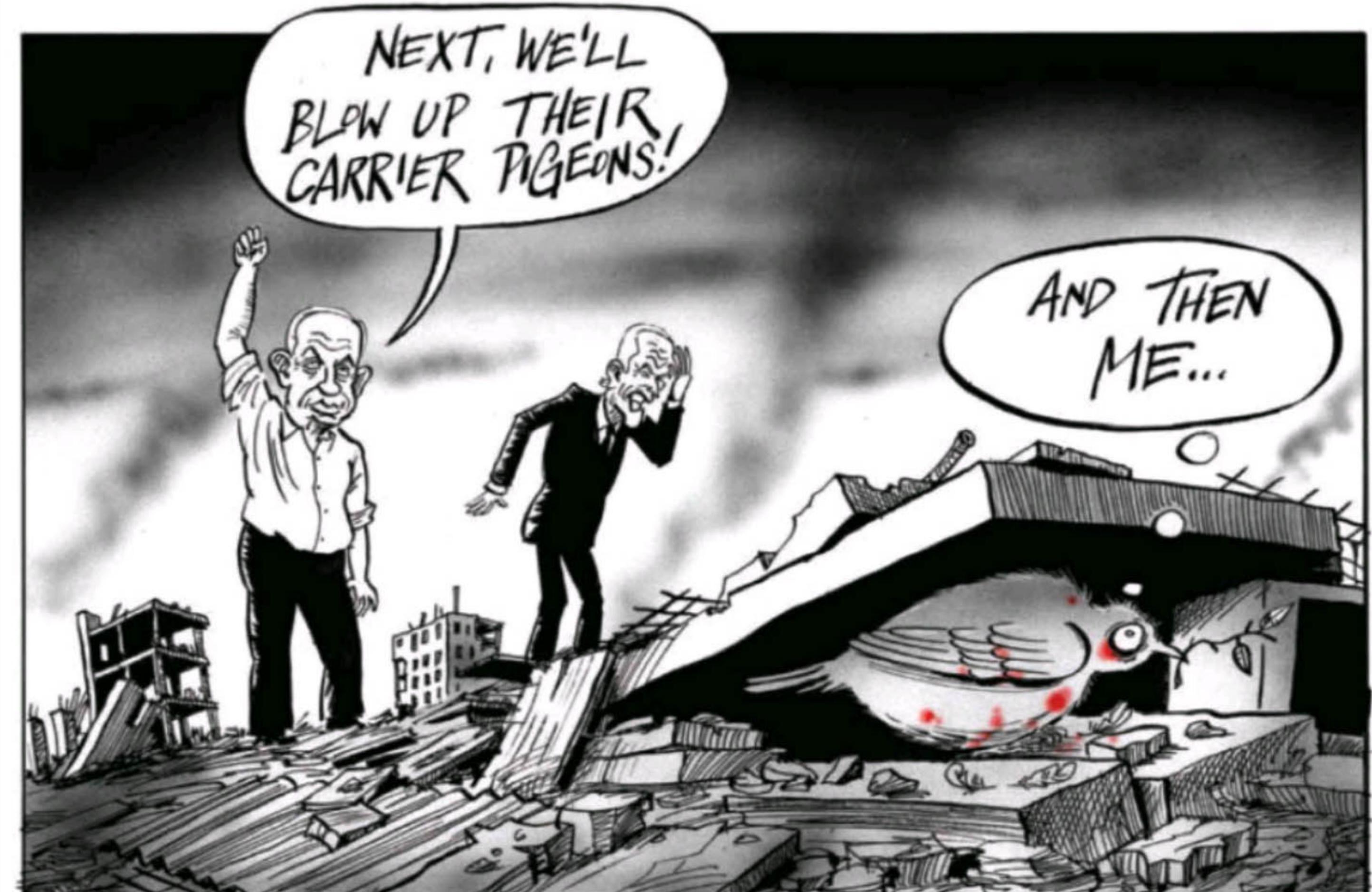
Amazon ordered its employees to return to the office five days a week, the toughest such edict yet among America's big tech firms. Staff had been required to turn up three days a week. An option of working anywhere for four months a year has also been scrapped. Andy Jassy, Amazon's chief executive, said the change was needed so that workers could "invent, collaborate and be connected". Employees in America will at least get their own offices back: Mr Jassy also scrapped hot-desking.

TikTok launched its appeal against the Biden administration's plan to ban it in America unless it separates from ByteDance, its Chinese parent

company. Lawyers for the video-sharing app told the appellate judges that the government was imposing an "extraordinary speech prohibition" on a single entity, which was unconstitutional. The government says ByteDance is a national-security threat. Both sides have asked for a decision by December 6th, so that the Supreme Court can hear the case before the ban comes into force on January 19th.

Meta banned RT (formerly Russia Today) from its platforms, after the American government accused the Russian broadcaster of trying to sway foreign politics. Two employees at state-backed RT have been charged with attempting to influence Americans through social media.

**Taking a bite in the Big Apple**  
Pret A Manger reported annual global sales above £1bn (\$1.3bn) for the first time. The purveyor of coffee, sandwiches and snacks has 690 shops, 480 of which are in Britain, its home country. But the Pret empire is spreading and international expansion is driving growth. The firm describes New York as the "overseas capital" for customers.



# The breakthrough AI needs

A race is on to push artificial intelligence beyond today's limits

**T**WO YEARS after ChatGPT took the world by storm, generative artificial intelligence seems to have hit a roadblock. The energy costs of building and using bigger models are spiralling, and breakthroughs are getting harder. Fortunately, researchers and entrepreneurs are racing for ways around the constraints. Their ingenuity will not just transform AI. It will determine which firms prevail, whether investors win, and which country holds sway over the technology.

Large language models have a keen appetite for electricity. The energy used to train OpenAI's GPT-4 model could have powered 50 American homes for a century. And as models get bigger, costs rise rapidly. By one estimate, today's biggest models cost \$100m to train; the next generation could cost \$1bn, and the following one \$10bn (see Business section). On top of this, asking a model to answer a query comes at a computational cost—anything from \$2,400 to \$223,000 to summarise the financial reports of the world's 58,000 public companies. In time such "inference" costs, when added up, can exceed the cost of training. If so, it is hard to see how generative AI could ever become economically viable.

This is frightening for investors, many of whom have bet big on AI. They have flocked to Nvidia, which designs the chips most commonly used for AI models. Its market capitalisation has risen by \$2.5trn over the past two years. Venture capitalists and others have ploughed nearly \$95bn into AI startups since the start of 2023. OpenAI, the maker of ChatGPT, is reportedly seeking a valuation of \$150bn, which would make it one of the biggest private tech firms in the world.

There is no need to panic. Plenty of other technologies have faced limits and gone on to prosper thanks to human ingenuity. The difficulty of getting people into space led to innovations that are now used on Earth, too. The oil-price shock in the 1970s encouraged energy efficiency and, in some countries, alternative means of generation, including nuclear. Three decades later, fracking made it possible to reach oil and gas reserves that had previously been uneconomical to extract. As a consequence, America now produces more oil than any other country.

Already, developments in AI are showing how constraints can stimulate creativity. As our Technology Quarterly this week sets out, companies are developing chips especially for the operations needed to run large language models. This specialisation means that they can run more efficiently than more general-purpose processors, such as Nvidia's. Alphabet, Amazon, Apple, Meta and Microsoft are all designing their own AI chips. More money has flowed into funding AI-chip startups in the first half of this year than in the past three combined.

Developers are also making changes to AI software. Bigger models that rely on the brute force of computational power are giving way to smaller and more specialised systems. OpenAI's newest model, o1, is designed to be better at reasoning, but not generating text. Other makers are employing less onerous calculations, so as to make more efficient use of chips. Through

clever approaches, such as using a mixture of models, each suited to a different type of problem, researchers have drastically cut down on processing time (see Science & technology section). All this will change how the industry operates.

Investors and governments have become used to the idea that, among tech companies, the incumbent has a natural advantage. For AI, that assumption can no longer be taken for granted. Today Nvidia sells four-fifths of the world's AI chips. But other more specialised rivals could well eat into its share. Already Google's AI processors are the third-most-used in data centres around the world.

OpenAI may have launched the pioneering large language model. But as resource constraints have struck, other big modelmakers such as Anthropic, Google and Meta are catching up. Although a gap between them and the second-tier models, such as France's Mistral, still exists, it may close. If the trend towards smaller and more specialised models continues, then the AI universe could contain a constellation of models, instead of just a few superstars.

This means that investors are in for a rocky ride. Their bets on today's leaders look less certain. Nvidia could lose ground to other chipmakers; OpenAI could be supplanted. The big tech firms are hoovering up talent, and many of them make the devices through which, they hope, consumers will reach their AI assistants. But competition among them is fierce. Few firms yet have a strategy for turning a profit from generative AI. Even if the industry does end up belonging to one winner, it is not clear who that will be.

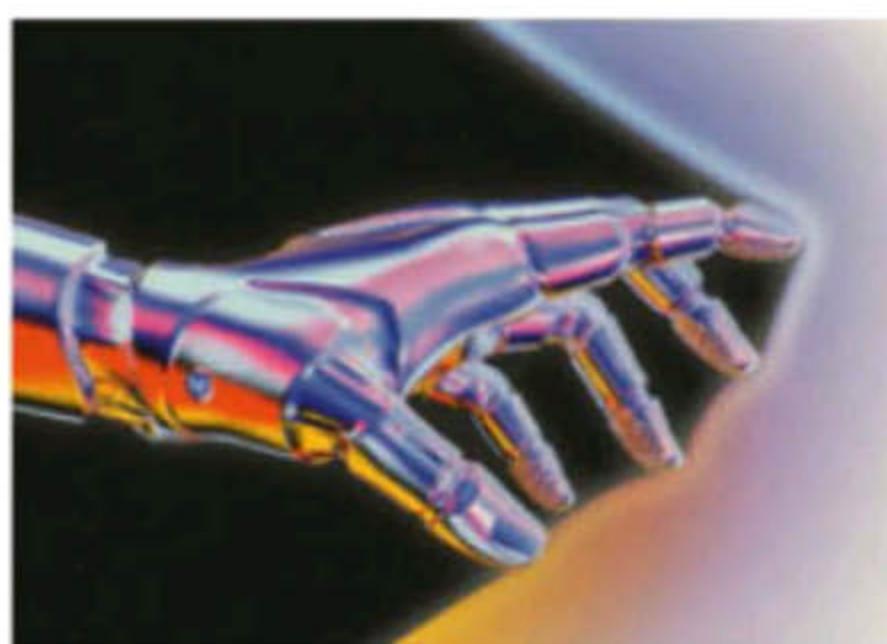
Governments, too, will need to change their thinking. Their fondness for industrial policy focuses on handouts. But progress in AI

is as much about having the right talent and a flourishing ecosystem as it is about amassing capital and computing power. Countries in Europe and the Middle East may find that the hard graft of cultivating ingenuity matters as much as buying in computer chips. America, by contrast, is blessed with chips, talent and enterprise. It has many of the world's best universities and, in San Francisco and Silicon Valley, an enviable and long-established cluster of talent.

## Chipped away

Yet America's attempt to restrain China is backfiring. Hoping to prevent a strategic rival from gaining the lead in a crucial technology, it has sought to restrict China's access to cutting-edge chips. By doing so it has unintentionally stimulated the growth of a research system in China that excels at working round constraints.

When ingenuity counts for more than brute force, a better way to ensure America's lead would be to attract and keep top researchers from elsewhere, for example through easier visa rules. The AI era is still in its infancy, and much remains uncertain. But the breakthroughs AI needs will come from giving ideas and talent the space to flourish at home, not trying to shut down rivals abroad. ■



## Economic growth

# How the poor stopped catching up

**Development in poor countries has stalled. To restart it, liberalise**

SINCE THE Industrial Revolution, rich countries have mostly grown faster than poor ones. The two decades after around 1995 were an astonishing exception. During this period gaps in GDP narrowed, extreme poverty plummeted and global public health and education improved vastly, with a big fall in malaria deaths and infant mortality and a rise in school enrolment. Globalisation's critics will tell you that capitalism's excesses and the global financial crisis should define this era. They are wrong. It was defined by its miracles.

Today, however, those miracles are a faint memory. As we report this week (see Finance & economics section), extreme poverty has barely fallen since 2015. Measures of global public health improved only slowly in the late 2010s, and then went into decline after the pandemic. Malaria has killed more than 600,000 people a year in the 2020s, reverting to the level of 2012. And since the mid-2010s there has been no more catch-up economic growth. Depending on where you draw the line between rich and poor countries, the worst-off have stopped growing faster than richer ones, or are even falling further behind. For the more than 700m people who are still in extreme poverty—and the 3bn who are merely poor—this is grim news.

To judge what has gone wrong, first ask what previously went right. In the poorest countries education and (especially) health have depended on donors writing big cheques. But even if aid has curbed disease, it has not unleashed sustainable growth. Likewise with pro-market technocrats in the IMF and the World Bank. Western institutions were most involved in Africa and Latin America, where growth has been patchy and has varied with commodities prices.

Critics of the “neoliberal era” conclude that globalisation therefore failed. However, the most successful liberalisations came from within countries, rather than in response to donors’ advice. In the 1990s global convergence was powered by a few big successes: China’s rapid growth after it opened up under Deng Xiaoping, a similar—albeit less spectacular—process in India after reforms dismantling the “licence Raj”, and the integration of countries in eastern Europe into the global market economy after the fall of communism. All that amounts to a powerful endorsement of capitalism.

Just as the rich world did not make convergence happen, it is not to blame for the stalling of development today. It is true that the West’s efforts are as flawed as ever. The IMF and World Bank are juggling promoting reform and development with fighting climate change, and are caught in the middle of the power struggle between America and China, which is making it fiendishly hard to restructure poor countries’ debts. Aid budgets have been squeezed, hurting global public-health campaigns, as Bill Gates argues in our online *By Invitation* column. Cash has been diverted from helping the poorest to other causes, such as greening power grids and helping refugees. Of what aid money remains, much is wasted rather than being spent after careful study of what works. The “Sustainable Development Goals”, by which the UN judges human progress,

are hopelessly sprawling and vague.

The biggest problem, though, is that home-grown reform has ground to a halt. With some notable exceptions, such as President Javier Milei’s efforts in Argentina, the world’s leaders are more interested in state control, industrial policy and protectionism than the examples of the 1990s—and it is no accident that such policies boost their own power. Indices of economic freedom have been broadly flat in sub-Saharan Africa since the mid-2010s and in South America since the turn of the century. Nigeria, where nearly a third of the population is extremely poor, still wastes a fortune on petrol subsidies; textile bosses in Bangladesh get special treatment at the expense of manufacturers who might otherwise create better jobs; and Pakistan’s inefficient state-backed mining, oil and gas conglomerates are allowed to stagger on.

Despite its past growth, a quarter of China’s population still lives on less than \$2,500 per year; its present economic slowdown, made worse by Xi Jinping’s centralisation and the censorship of economic data, is reducing their chances of a better life. Even India and Indonesia, which have successfully liberalised in the past but still contain many poor people, are now interfering with market forces to try to bring supply chains home. According to Global Trade Alert, a think-tank, the 2020s have seen five times as many harmful trade measures as liberalising ones.

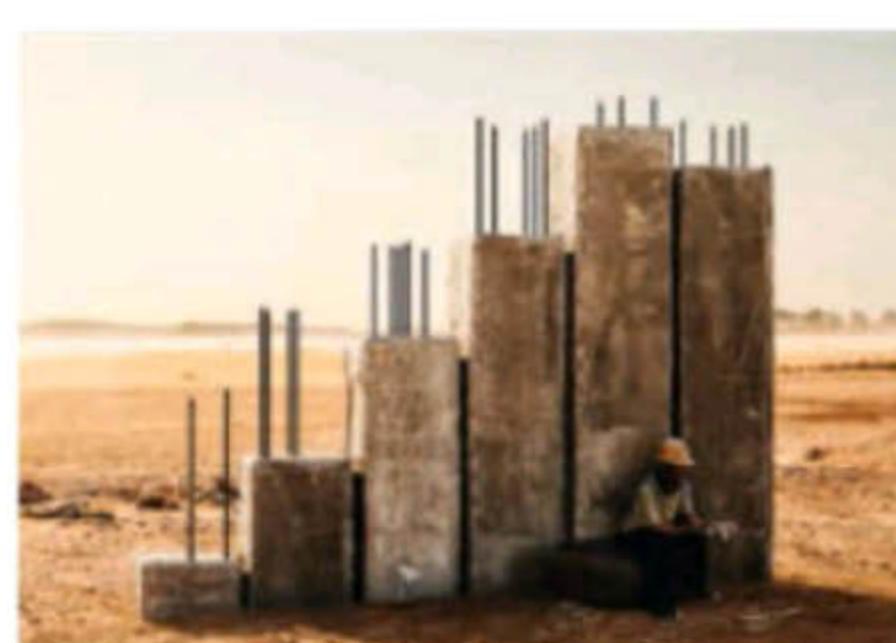
Many of the West’s interventions in the Global South failed, but in the era of catch-up, it did at least preach the virtues of free markets and free trade. These ideas spread because communism was proved to be backward in comparison with America’s prosperity and power. Today, though, America is increasingly

taken with interventionism, disdaining the old order and trying to replace it. Many countries instead look to the Chinese model of industrial policy and state-owned enterprises, drawing entirely the wrong lessons from the country’s growth.

As the world has turned towards intervention, so the chosen instrument for poor countries has become trade restrictions, as IMF research shows. This contains an uncomfortable echo of the failed development plans of the 1950s, built around freezing out imports rather than embracing global competition. Fans of industrial policy will point to East Asia’s “tiger economies” such as South Korea and Taiwan. Yet both embraced harsh global competition. And several African countries that tried to copy their industrial policies in the 1970s failed miserably.

## You don’t know what you’ve got till it’s gone

The world will pay for its failure to learn from history. Rich countries will cope, as they usually do. For the poorest people, however, growth can be the difference between a good life and penury. It should not be a surprise that development has stalled as governments have increasingly rejected the principles that powered a golden era. Nobody will suffer more as a result than the world’s poor. ■



Ukraine

# Unshackle the defenders

**Joe Biden should let Ukraine fire American missiles at military targets in Russia**

EVERY DAY, Vladimir Putin rains bombs and missiles on civilian targets in Ukraine, spreading terror and trying to shut down the power supply as winter approaches. Ukraine has proposed a proportionate, legal response to these illegal attacks. It would like to use Western missiles to hit military targets in Russia from which Mr Putin's forces are launching their barrage. So far, America has denied this reasonable request.

The West has been generous to Ukraine. Over the past two and a half years, it has given it over \$200bn in weapons and cash to defend itself from Russian aggression, with over \$100bn more in the pipeline. But time after time, donors have refused to supply kit that they later agreed was essential. First it was tanks, then missiles, then anti-missile batteries, then fighter jets. "They give us enough to survive, but not enough to win," one Ukrainian front-line commander complained to *The Economist* this summer.

Next week Volodymyr Zelensky, Ukraine's president, will meet Joe Biden, and will renew his plea to be allowed to hit military targets inside Russia. Britain and France are content to have their missiles, the Storm Shadow and the SCALP, used in this way. But that is not happening, apparently because the missiles rely on American technology to reach their targets, and America has, so far, exercised a veto. Germany shares President Biden's caution, and then some. It has not given Ukraine its own powerful Taurus missiles.

America may lift its veto on the use of European missiles, but that will not be enough. What Ukraine really wants is permission to fire American-supplied ATACMS at Russian targets. These have a longer range (up to 300km, against 250km for Storm Shadow and SCALP), and more of them are available. Yet Mr Biden says no. He should change his mind.

Various reasons are given for the veto. One is that the Russian planes that launch devastating "glide bombs" into Ukraine have been moved back out of ATACMS range. That is true; but there are plenty of other military targets, such as fuel and arms depots and command centres that Ukrainian drones struggle to hit. Lifting the restrictions would help Ukraine create a 300km-deep buffer zone on its border. America also says the missiles are in short supply. That is true of the European ones, but less so of the ATACMS.

Unfortunately, America is holding back out of a misplaced fear of escalation. Mr Putin has said that if Ukraine fires American missiles into Russia, it would be like NATO joining the

war, and has promised severe consequences. The threat is not so much that Mr Putin acts in Ukraine—Russia is already doing everything it can there short of using a nuclear weapon, and crossing that threshold would provoke outrage, including among its allies such as China. The threat is instead that Russia attacks Western interests elsewhere by, say, giving weapons to Iran or the Houthis. This

would be destabilising, but holding back would encourage Russian aggression in Europe—even as Mr Putin continued to wield the threat of stoking proliferation in the Middle East.

Mr Biden's caution rewards Mr Putin's recklessness. What is more, it rubs off on other faint-hearts, such as Olaf Scholz, Germany's chancellor, thus dividing NATO. Mr Putin sees that division, and concludes that the West is tired of war and keen to cut a deal that will be to his advantage. Peace talks may indeed begin next year, after America's election. The best way to raise morale in Ukraine and to strengthen Mr Zelensky's hand in any talks would be for the West to show that it is fully behind its ally. ■



Higher education

## Painful lessons

**Britain's government should let university tuition fees rise**

IN 2012 POLITICIANS in Britain burned lots of political capital by raising the cap on how much English universities can charge domestic undergraduates in tuition fees. Sir Nick Clegg, the deputy prime minister at the time, had previously pledged not to raise fees and never lived down the U-turn. This political folk memory helps explain why the Labour Party, which took power in July and has campaigned in the past to abolish tuition fees, will find it difficult to raise the cap again. That is nonetheless what it should do.

The financial strains on British universities are becoming hard to ignore. In the academic year just gone 40% of British universities ran deficits. The number is probably higher now (see Britain section). How to handle a failing university is no

longer an academic question. The effect of tighter immigration rules on numbers of foreign students, who pay higher fees than native ones, is one reason why the universities are under pressure. But the sinking value of tuition fees is another. The cap of £9,000 (\$11,880) that was put in place 12 years ago has been raised only once since then, and by a tiny amount, to £9,250. Inflation has eaten away at its value: it is now worth less than £6,500 in 2012 money.

Some argue that charging for higher education is wrong, and England should go back to the old days of free tuition, courtesy of the taxpayer. In fact, England's student-finance regime offers a lot to like. Britons with degrees earn 35% more than their peers who stop studying after secondary school. ►

Given these high private returns, it is fair that they should pay a big chunk of the cost of their education. Student-loan repayments do not end in bankruptcy: graduates in England start paying only when their annual income exceeds a threshold (currently £25,000 for this year's borrowers). The previous jump in tuition fees has not put off poorer students; and most graduates in a recent poll said their debts had not had a "negative impact" on their lives.

### From learners to earners

Every way of funding degrees has its flaws. Countries that pour a lot of public money into higher education generally limit how many students can go to university (as did England, until 2015). It is hard to argue that higher-earning graduates are the worthiest recipients of any new government spending. And relying on ever more foreign students to subsidise domestic ones is also not a sustainable solution. If fees for home students remain stuck, higher-paying foreigners will eventually start displacing them. Flows of foreign cash are volatile, and benefit universities in famous cities such as London more than others.

Also, voters like immigration even less than they like fees.

Those who would keep fees frozen point out that some students get poor value for money. A number pursue qualifications that are unlikely to boost their earnings; they may be better off with shorter courses or apprenticeships. But the choice is theirs and, besides, constraining fees for every student is not an answer to that problem. Britain's university regulator has been stepping up its policing of courses with high dropout rates and of those that lead too few graduates to good jobs. In 2017 the government required universities to meet minimum standards before taking advantage of the small increase in the fee cap. It could try something like that again.

Universities say that if fees had tracked inflation, the cap would now be more than £12,000. A sudden increase on that scale would be unwise. The reforms of 2012 provided universities with a very large bump in income, some of which they wasted. The cap was set at a high level in the vain expectation that some institutions might choose to charge less. But neither students nor the country are well served by allowing the real value of fees to fall for ever. Labour should let them rise. ■

### American politics

## After peak woke

The influence of a set of illiberal ideas is waning. That creates an opportunity

ONE OF THE early uses of the word was by Lead Belly, who sang about the Scottsboro boys, nine young African-Americans in Scottsboro, Alabama, who were wrongly accused in 1931 of raping two white women. They got an unfair trial; all nine later had their convictions overturned or were pardoned. In a recording in 1938, Lead Belly warns black Americans travelling through Alabama to stay "woke", lest they be accused of something similar. Even the most committed anti-woke warrior would grant that the man had a point.

But in the past decade, a form of wokeness has arisen on the illiberal left which is characterised by extreme pessimism about America and its capacity to make progress, especially on race. According to this view, all the country's problems are systemic or structural, and the solutions to them are illiberal, including censorship and positive discrimination by race. This wokeness defines people as members of groups in a rigid hierarchy of victims and oppressors. Like the Puritans of old, adherents focus less on workable ideas for reducing discrimination than on publicly rooting out sinful attitudes in themselves and others (especially others).

*The Economist* has analysed how influential these ideas are today by looking at public opinion, the media, publishing, higher education and the corporate world. Using a host of measures, we found that woke peaked in 2021-22 and has since receded (see Briefing). For example, polling by Gallup found that the share of people who worry a great deal about race relations climbed from 17% in 2014 to 48% in 2021, but has since fallen to 35%. Likewise, the term "white privilege" was used 2.5 times for every 1m words written by the *New York Times* in 2020. Last year it was used 0.4 times per 1m words. That timing is no coincidence. Many people assume that wokeness took off

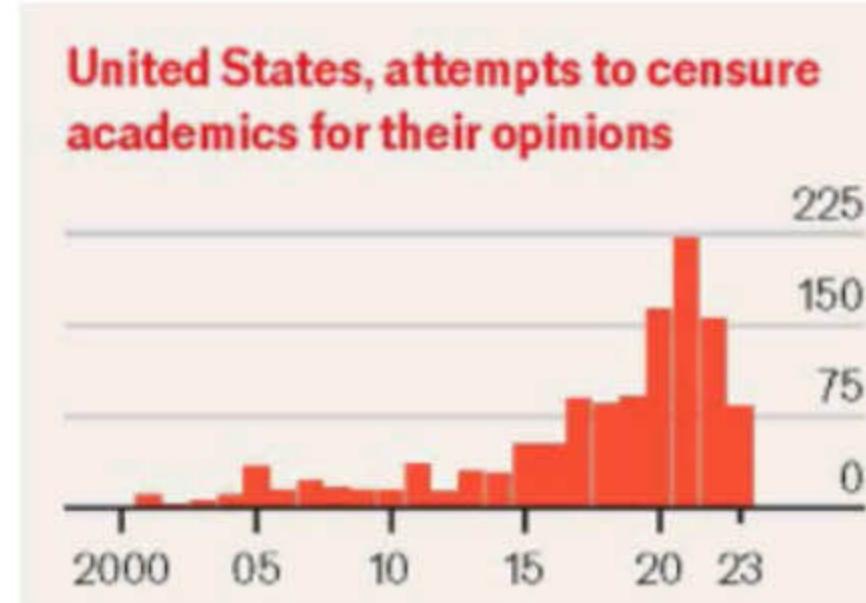
after the murder of George Floyd in 2020; in fact the inflection point was in 2015, as Donald Trump ran for president.

Mr Trump's victory had a profound effect on the American left. It strengthened those who said America is racist and sexist and undermined those who said that progress is possible and that persuasion beats cancellation. As those on the centre-left cowered for fear of being cancelled themselves, woke ideas spread from sociology departments to the rest of the university, and from there to company boardrooms. On campus, controversial speakers were prevented from addressing students. In corporate America managers were rewarded partly for hiring to meet targets based on diversity, equity and inclusion.

The backlash has been led by right-leaning activists and mainline liberals who disagree about many other things. And the Democratic Party has realised that woke ideas and policies are both unpopular with voters and electorally reckless in a party that relies on a multiracial coalition to win. Towards the end of her acceptance speech in Chicago, Kamala Harris talked about "the awesome responsibility that

comes with the greatest privilege on Earth—the privilege and pride of being an American". It would have been hard for a front-line Democrat to say that between 2016 and 2021.

The lesson is not that wokeness is over, still less that it achieved nothing good. The cycle of overreaction and counter-reaction can lead to progress. Companies still care about diversity; universities still disdain hateful rhetoric. But as the left and their critics on the right score points off each other, the fight increasingly feels stagey and artificial, like professional wrestling. The hope now is that race and sex will once again be discussed as questions of public policy, where compromise is possible, rather than of identity, where it is not. ■



## Letters

### Bitcoin mining and energy

You perpetuated common myths about bitcoin mining while neglecting the real story: bitcoin mining is a powerful new tool for supporting renewable-intensive grids ("Power hungry", August 31st). It is true that electricity grids are under increasing strain from manufacturing plants, electric vehicles and data centres, and it would be easy to think of bitcoin mining as just one more source of electrical demand.

But whereas data centres and the like will buy electricity regardless of the price, bitcoin mining is different. It operates only when power is cheap and abundant. Whenever power is scarce, and therefore expensive, it curtails its electricity usage in a matter of seconds.

In practice, this means that during severe weather events in Texas say, such as a heatwave, electricity prices spike, and bitcoin miners naturally turn their machines off. But when power is cheap, their machines remain on, providing a steady stream of revenue to energy producers. Having a reliable buyer of energy that does not add to peak demand is ideal for incentivising the building of renewable generation while still reliably delivering power to homeowners and hospitals.

Bitcoin miners also participate in demand-response programmes, allowing grid operators to control their power consumption to stabilise the grid. You characterised demand response as some kind of public gift to the bitcoin-mining industry. In fact, these programmes have been praised as a crucial part of managing a highly renewable system. The International Energy Agency, for example, says we must increase demand-response tenfold, or by 500 gigawatts, within this decade if we are to meet net-zero targets. Far from a giveaway, bitcoin miners participate in these demand-response programmes like any other company, bidding in an open market and driving prices down for consumers.

Moreover, the grid-stabilising behaviour of bitcoin miners puts them in direct competition with natural-gas "peaker" plants, which run only during peak demand. Both technologies help grid operators match fluctuating supply and demand in real-time.

The difference is that a system with more renewable generation and bitcoin miners is far less carbon-intensive than a system with less renewable generation and peaker plants. It is no surprise, then, that the industry lobbying Texas for more peaker-plant construction has also lobbied against its grid-balancing competition.

ROBERT F. KENNEDY JUNIOR  
*Washington, DC*

### Why we have OJ every day

Talk of orange-juice shortages in the face of strong global demand is ironic given the industry's roots ("The big squeeze", September 14th). The introduction of orange concentrate (or "chilled juice", its chosen euphemism) in the late 1940s was a response to a surplus of Florida citrus. According to Alissa Hamilton's book, "Squeezed", ballooning production renewed the imperative to persuade consumers to buy more oranges. Minute Maid, a concentrate producer, had no money to advertise and offered Bing Crosby cheap stock options in exchange for the crooner's services on the radio. The resulting marketing boom paved the way for orange juice to become a staple of the American breakfast.

YACOV ARNOPOLIN  
*New York*

### Preparing for old age

"The real test of Labour's ambition" (August 31st) gave a good summary of the need for reforming social care in Britain. However, the article suggested that it is "impossible" for people to plan for their future care costs "because no one knows how long they will need to be looked after". There are insurance solutions that can help provide protection against catastrophic care costs. These

LETTERS ARE WELCOME AND SHOULD BE ADDRESSED TO THE EDITOR AT:  
THE ECONOMIST, THE ADELPHI BUILDING, 1-11 JOHN ADAM STREET, LONDON WC2N 6HT  
EMAIL: LETTERS@ECONOMIST.COM. MORE LETTERS AVAILABLE AT: ECONOMIST.COM/LETTERS

include immediate-needs annuities (typically taken out as the insured life enters care) offered by companies such as Aviva, Legal & General, Just Group and National Friendly. There are also protection products, sold by firms such as National Friendly and Vitality.

Some people argue that social care should be the responsibility of the state and that it is better to allow individuals to pass on an inheritance than pay for their own care. However, the state's finances are constrained and those who can afford to pay for their care should do so.

The government's reforms of social-care policy should be clear about what the long-term position will be on the balance between the state, private provision and the wider family. This should enable the public to be made aware of their potential costs in later life, after any state support, and make provision for them.

TOM KENNY  
Chair of the Social Care Working Party  
Institute and Faculty of Actuaries  
*London*

### Let your Brits be country

Your article on the boom in country music in Britain mentioned how it has become popular in clubs ("What ho, y'all", August 31st). There are also several country-music festivals that draw big artists, two examples being Long Road and Country to Country, which plays across Belfast, Glasgow and London. It sold out the 20,000 capacity O2 Arena and has been running since 2013. Britain also has home-grown talent such as Ward Thomas and The Shires. The popularity of country music in Britain owes a huge amount to Bob Harris, a radio DJ with a passion for country.

LORENZ JORGENSEN  
*Saffron Walden, Essex*

Country music's subtle infiltration of Britain allows the fullest possible appreciation of the genre. Take, for example,

the old standby, "Drop Kick Me Jesus Through The Goal Posts of Life". Somewhere in country music the pathos of modern life is addressed: religiosity, booze, love gone bad, patriotism, feminism, fidelity, dead-end jobs and on and on. These are universal themes and you can get the message in three minutes or so. Anyway, welcome to the club and honk if you love Willy Nelson.

PAT FLEMING  
*Washington, DC*

### Man's best friend

Bartleby's thoughts on pets in the office (August 24th) reminded me of my experience at the OECD headquarters in Paris some 50 years ago. I insisted on bringing in my dog, Meatball, a hefty Briard. It wasn't long before Meatball became the favourite of just about everyone on the staff. Every morning he would make a tour of the building to collect the many treats that had been brought for him, then return to my office to curl up for a snooze. Our formal work environment soon relaxed to a remarkable degree, evidence that dogs in the workplace can indeed boost morale and productivity.

BENJAMIN COHEN  
Professor emeritus  
University of California at Santa Barbara

As a matter of fact, the office grind does not stray far from a dog's natural daily routine: hanging out with the pack and dozing most of the time.

ALEXANDER HILSBOS  
*Waltenschwil, Switzerland*

### Unpopular music

I read your article in remembrance of Arnold Schoenberg ("A maestro, due an encore", September 7th). Pierre Boulez once asked me, when he was about to conduct a new work by Elliott Carter, a modernist composer, if I knew how often contemporary compositions were performed? When I hesitated, he answered: "Twice. The first and the last time."

ALAN RIDING  
*Paris*

## Briefing Peak “woke”



## Back to sleep

WASHINGTON, DC

**By all sorts of measures, America is becoming less “woke”**

REGINA JACKSON and Saira Rao achieved a degree of fame at the height of the backlash in 2020 after police killed George Floyd, an unarmed black American accused of buying cigarettes with a counterfeit \$20 note. For a hefty fee, rich white women would hire the pair to help them confront unconscious biases at dinner parties that featured such ice-breakers as, “Raise your hand if you’re a racist.” Guests may often have broken down in tears when told that their claims to be colour-blind were simply another brick in the edifice of white supremacy, but there was lots of interest. The two women were featured in many news reports and made a film about their dinners, “Deconstructing Karen”, in which a guilt-stricken participant confesses, “I am a liberal white woman. We are absolutely the most dangerous women.”

The media scrum has since subsided. The last “Race2Dinner” event took place a year ago. The pair now host screenings of the film instead. The problem, says Ms Rao, is not just that they are fed up with having to “sit across from a white person to

tell them why they can’t use...the N-word”. It is also that public interest in matters of racial injustice has cooled. “The pulse of anti-racism, anti-colonialism, anti-imperialism, anti-genocide, is dead. There is no pulse,” Ms Rao laments.

### Woke me up

Republicans love to blame everything they consider wrong with America on an epidemic of “wokeness”, by which they tend to mean anything that smacks of virtue-signalling or political correctness. Thus a bridge over Baltimore harbour collapsed earlier this year not, as it might have seemed, because it was hit by a wayward cargo ship, but because one of the nearby port’s six commissioners is a black woman whose human-resources firm helps companies assess how diverse their workforces are, among other things—or so a Republican candidate for governor of Utah asserted. Donald Trump, when accepting the Republican nomination for president in July, blamed “woke” leadership for the failings of America’s armed forces. The party’s

official platform this year complains of “woke...government” spurring politically motivated prosecutions. The implication is that woke attitudes are proliferating, and that only Republicans can stem their rise.

In fact, discussion and espousal of woke views peaked in America in the early 2020s and have declined markedly since. *The Economist* has attempted to quantify the prominence of woke ideas in four domains: public opinion, the media, higher education and business. Almost everywhere we looked a similar trend emerged: wokeness grew sharply in 2015, as Donald Trump appeared on the political scene, continued to spread during the subsequent efflorescence of #MeToo and Black Lives Matter, peaked in 2021-22 and has been declining ever since (see charts on next page). The only exception is corporate wokeness, which took off only after Mr Floyd’s murder, but has also retreated in the past year or two.

The term woke was originally used on the left to describe people who are alert to racism. Later it came to encompass those ➤

► eager to fight any form of prejudice. By that definition, it is obviously a good thing. But Democrats seldom use the word any more, because it has become associated with the most strident activists, who tend to divide the world into victims and oppressors. This outlook elevates group identity over the individual sort and sees unequal outcomes for different groups as proof of systemic discrimination. That logic is then used to justify illiberal means to correct entrenched injustices, such as reverse discrimination and the policing of speech. It is this sort of "woke warrior" that Republicans love to lambast.

### Wide awake

Our analysis subsumes both the advocates and the denigrators of woke thinking, by looking at ideas and actions associated with this sort of activism, for good or for ill. It measures, for example, talk of "diversity, equity and inclusion" (DEI) in the corporate world, regardless of whether it is being invoked as a way to correct the under-representation of women and racial minorities or as an example of pious window-dressing. Some of the yardsticks we use apply only to the more doctrinaire form of woke activism, such as the number of drives to censure academics for views deemed offensive. Others capture only the more positive aspects of the movement, such as polling data on the proportion of Americans who worry about racial injustice. Either way, the results are consistent: America has passed "peak woke".

The simplest way to measure the spread of woke views is through polling. We examined responses over the past 25 years to polls conducted by Gallup, General Social Survey (GSS), Pew and YouGov. Woke opinions on racial discrimination began to grow around 2015 and peaked around 2021. In the most recent Gallup data, from earlier this year, 35% of people said they worried "a great deal" about race relations, down from a peak of 48% in 2021 but up from 17% in 2014. According to Pew, the share of Americans who agree that white people enjoy advantages in life that black people do not ("white privilege", in the jargon) peaked in 2020. In GSS's data the view that discrimination is the main reason for differences in outcomes between races peaked in 2021 and fell in the most recent version of the survey, in 2022. Some of the biggest leaps and subsequent declines in woke thinking have been among young people and those on the left.

Polling about sexual discrimination reveals a similar pattern, albeit with an earlier peak than concerns about race. The share of Americans who consider sexism a very or moderately big problem peaked at 70% in 2018, in the aftermath of #MeToo. The share believing that women face obstacles that make it hard to get ahead

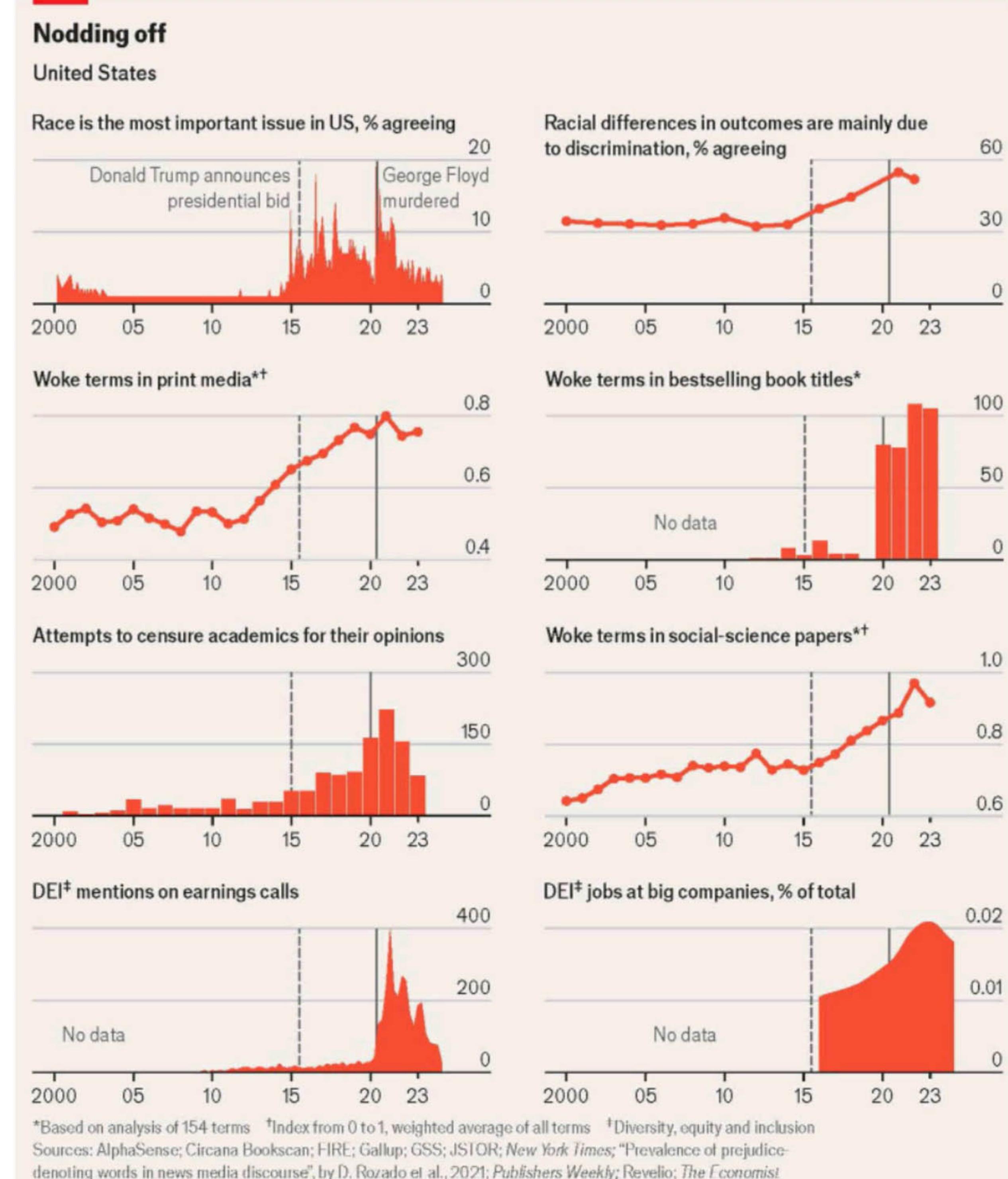
peaked in 2019, at 57%. Woke views on gender are also in decline. Pew finds that the share of people who believe someone can be a different sex from the one of their birth has fallen steadily since 2017, when it first asked the question. Opposition to trans students playing in sports teams that match their chosen gender rather than their biological sex has grown from 53% in 2022 to 61% in 2024, according to YouGov.

To corroborate the trend revealed by opinion polls, we measured how frequently the media have been using woke terms like "intersectionality", "microaggression", "oppression", "white privilege" and "transphobia". At our request, David Rozado, an academic based in New Zealand, counted the frequency of 154 of such words in six newspapers—the *Los Angeles Times*, *New York Times*, *New York Post*, *Wall Street Journal*, *Washington Post* and *Washington Times*—between 1970 and 2023. In all but the *Los Angeles Times*, the frequency of these terms peaked between 2019 and 2021, and has fallen since. Take the term "white privilege": in 2020 it featured roughly 2.5 times for every million words in the *New York*

*Times*, but by 2023 had fallen to just 0.4 mentions for every million words.

We found largely the same trend in television, by applying the same word-counting method to transcripts from ABC, MSNBC and Fox News from 2010 and 2023, and in books, using the titles of the 30 bestselling books each week between 2012 and the middle of this year. Mentions of woke words in television peaked in 2021. In popular books the peak came later, in 2022, with only a small drop in 2023 followed by a much greater fall so far in 2024.

In academia, which is often thought of as a hotbed of wokeism, the trend is much the same. Calls for academics to be disciplined for their views, as documented by the Foundation for Individual Rights and Expression, peaked in 2021 with a total of 222 reported incidents. (Many of these calls came from the right, not just from the left.) A similar database, compiled by the College Fix, a conservative student newspaper, finds 2020 was the peak in calls for scholars to be censored or cancelled. These findings also dovetail with polling data: the share of Americans who think ►



► that expressions of racist views should be restricted rose sharply between 2016 and 2021, reaching around 52%, and has since declined slightly, down to 49% in 2022.

Teaching and research also seem to be shifting away from wokery, at least somewhat. The use of our set of 154 woke terms began to rise sharply in 2015 in papers on the social sciences collected by JSTOR, a digital library of academic journals. By 2022 the incidence of "intersectional", "whiteness", "oppression" and the like were at their peak. At our request, Jacob Light, an economist at Stanford University, counted the frequency of woke words in a collection of course catalogues from American universities. Classes that invoked woke terms in their name or synopsis rose by around 20% between 2010 and 2022, but remained stable last year.

In part, academia's retreat from wokeness has been ordained by law. The Supreme Court banned race-based affirmative action in admissions last year. According to the *Chronicle of Higher Education*, 86 bills in 28 states have aimed to curb DEI initiatives in academia over the past year; 14 have become law. For example Alabama will from October 1st prohibit state-funded universities from having any DEI offices or programmes, from promoting "divisive concepts" about "race, colour, religion, sex, ethnicity or national origin" and from allowing transgender students to use the toilets of their choice.

Nine states ban academic institutions from demanding "diversity statements" from job applicants. Critics have assailed these personal meditations on the importance of inclusivity as ideological litmus tests. Earlier this year several prominent universities, including Harvard and the Massachusetts Institute of Technology, gave in to pressure from donors and alumni and dropped them. Others, such as the University of California, have faced lawsuits over their continuing use.

Wokeness is also in retreat in corporate America, even though it appeared there only relatively recently. Mentions of DEI in earnings calls shot up almost five-fold between the first and third quarters of 2020, in the aftermath of Mr Floyd's death. They peaked in the second quarter of 2021, by which point they were 14 times more common than in early 2020, according to data from AlphaSense, a market-research company. They have since begun to drop sharply again. In the most recent data, from the second quarter of 2024, mentions were only around three times higher than before Mr Floyd's death.

The share of new job listings that mention diversity continues to grow, however, as ever more firms add boilerplate about inclusivity at the bottom of ads. But the evidence also suggests that firms are less willing to put their money where their

mouth is, DEI-wise. The number of people employed in DEI has fallen in the past few years. According to Revelio, which tracks labour statistics at a group of big American firms, DEI roles as a share of overall employment doubled from the beginning of 2016 to the end of 2022 (to 0.02% of all employees, or around 12,600 roles). But in the most recent estimates, from July, these numbers were down by 11% from their peak (to 0.018% of employees, or 11,100 roles). According to Farent Advisers, a pay consultancy, the share of S&P 500 companies that tied bosses' remuneration to diversity targets peaked in 2022 (at 53%) and dropped in 2023 (to 48%).

The fall in corporate enthusiasm for DEI could have several causes. First, in any belt-tightening, support functions are the first to suffer cuts. This is how DEI consultants explain away the recent shrinkage of DEI departments at big tech firms such as Meta and Microsoft. Second, after the Supreme Court's ruling on affirmative action in education, companies are scared that they may be sued for any practices that could be construed as discriminating against certain groups. A third possibility is that firms are taking note of declining public enthusiasm for corporate social activism. Gallup detected a big drop between 2022 and 2023 in the share of Americans who like companies to take a stand on matters of public debate. Less than half, for instance, think businesses should speak out on racial issues or LGBT rights. Bud Light, a popular brand of beer, suffered a big drop in sales last year after a promotional collaboration with a transgender social-media star. Its parent company's shares have only recently recovered.

Asked why firms that two years ago were happy to talk up their DEI credentials were now ghosting *The Economist*, Johnny Taylor, from SHRM, an association for people working in human resources, says with a laugh, "Two years ago Budweiser was the number-one-selling beer in the country."

Other big brands including Disney, a media firm, and Target, a retailer, have also experienced backlashes for behaviour some customers considered too woke. Robby Starbuck, an activist who campaigns for firms with relatively conservative customers to abandon DEI, says he wants to "Make Corporate America Sane Again". Egged on by the likes of Elon Musk, a billionaire conspiracy theorist, he has won concessions and grovelling apologies from Coors, Ford, Harley Davidson, Jack Daniel's and John Deere. Mr Starbuck claims that whereas his first targets relented only after he posted castigating videos about them online, these days firms are beginning to drop DEI initiatives pre-emptively.

### The wake of woke

Although our analysis shows a clear subsidence in wokery, there are several reasons for caution. For one thing, although all our measures are below their peak, they remain well above the level of 2015 in almost every instance. What is more, in some respects, woke ideas may be less discussed simply because they have become broadly accepted. According to Gallup, 74% of Americans want businesses to promote diversity, whatever the troubles of DEI.

Over time, attitudes to wokeness will doubtless change again. It's easy to see how Mr Trump might prompt a revival in woke activism on the left if he wins the presidency again. By the same token, if Kamala Harris, the Democratic candidate, becomes president next year, she may spur a reaction among anti-woke activists. After all, some of the biggest differences in opinion between Democrats and Republicans concern social issues: 80% of likely Democratic voters believe the legacy of slavery still affects black people, for example, compared with only 27% of Mr Trump's supporters, according to Pew. There is also a chance that Gen Z, the most woke generation, retains this outlook as it ages, which would lead to a gradual increase in woke views among the broader population.

For now, however, advocates of woke thinking are in despair. Ms Jackson, from Race2Dinner, thinks things have got "much worse", particularly when looking at "what's going on with banning books, banning LGBTQ, banning trans folks, stopping DEI". She thinks Mr Trump has "given everybody permission to just be an asshole". Critics are exultant: Ruy Teixeira of the American Enterprise Institute, a think-tank, says, "I think people will one day look back on the 2015 to 2025 era as being a bit of a moment of madness." But even though Mr Teixeira thinks the woke wave has set social progress back, he does note that, over the long run, America has been reducing discrimination and improving opportunity for minorities of all sorts. That trend, he believes, is lasting. ■



## United States



Pennsylvania

### Keys to the keystone

HARRISBURG, PENNSYLVANIA

Buckets of money and vicious ad wars have left the race a virtual tie

ON JULY 21st Matt Roan, chair of the Cumberland County Democratic Committee, hosted a meeting with volunteers. The event took a turn when Mr Roan stopped to read a statement from Joe Biden announcing his departure from the presidential race. "There was this sort of sense of sadness—and then immediate hope," Mr Roan recalls in his office, which overlooks the Pennsylvania state capitol. The activist speaks highly of Mr Biden but acknowledged that "things were not looking good" at the time. The rise of Kamala Harris attracted a surge of volunteers to a county that favoured Donald Trump by around 18 points in 2016 but only 11 points in 2020. If such improvements hold there and in other areas like it, Ms Harris would probably win the state and the presidency.

Both campaigns see Pennsylvania as a fulcrum of the 2024 election, and for good reason. *The Economist's* forecast model suggests that the state—with its 19 elector-

al-college votes, the most of any swing state—is the tipping-point in 27% of the model's updated simulations, meaning it decides the election more often than any other state. Mr Trump wins only 7% of the time when he loses the Keystone State. Indeed, he narrowly won Pennsylvania in 2016, and then he lost by 80,000 votes out of nearly 7m cast in his unsuccessful re-election bid four years later.

No state has drawn more money. Of the

#### → ALSO IN THIS SECTION

- 24 Ryan Routh**
- 25 Eric Adams's friends**
- 25 Affirmative action and colleges**
- 26 Campaign calculus: The debate bump**
- 27 Never Trumpers**
- 28 Lexington: Culture and culture wars**

\$839.5m that the Harris campaign and allied organisations already have spent or committed to advertising, \$164.1m has gone to this state of 13m people. The less well-heeled Trump operation has directed \$135.7m of \$458.8m to Pennsylvania. Turn on the television, watch a YouTube video or listen to the radio inside Pennsylvania and it won't be long before spots for Ms Harris or Mr Trump begin to play.

The messaging war is a study in contrasts. Ms Harris seeks to define herself in uplifting ads while warning in others about Mr Trump's effect on the economy, reproductive rights and American democracy. As one of the most famous people in human history, Mr Trump doesn't spend time introducing himself to voters. His ads and rhetoric relentlessly seek to paint Ms Harris as an out-of-touch leftist responsible for inflation and migrant crime. Such fear campaigns have found success before in presidential elections, but J.J. Abbott, a Pennsylvania Democratic strategist, argues that "there may be some limitations on how much these dark, brutal ads on those issues may work" this time, citing similar unsuccessful efforts mounted by Republicans in recent statewide races.

Mr Trump has also drawn attention to Ms Harris's past opposition to natural-gas fracking, an important industry in western Pennsylvania, which she now supports. ►

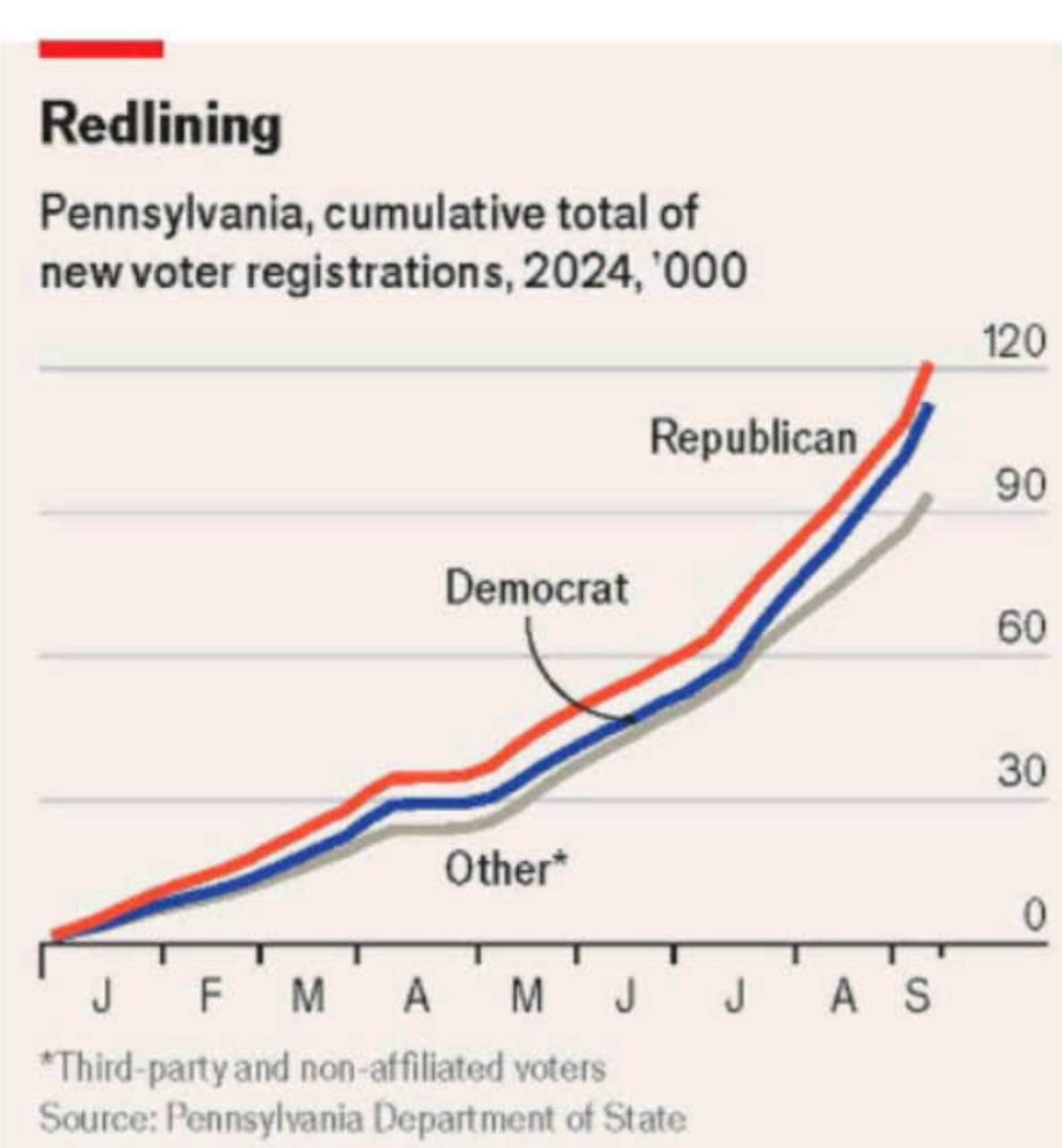
The issue may be top of mind in those energy-producing regions but elsewhere voters often express indifference. "It is not a slam dunk for any politician...to think that Pennsylvania is monolithically in support of further energy exploration," says Stephen Bloom, vice-president of the Commonwealth Foundation, a centre-right think-tank. "No one has ever said the word fracking to me" while campaigning, says Stella Sexton, vice-chair of the Lancaster County Democratic Committee. She says she hears more about the cost of living and reproductive rights.

For many years a blue state that also elected moderate Republicans, Pennsylvania voted about three points to the right of the country in 2016 and 2020. Since 2008, the percentage of voters registered as Democrats has declined while the share of Republicans has grown. Republican registrations outpaced Democratic ones this year until Ms Harris entered the race (see charts). Democrats argue that some of the Republican gains have been offset by a rise in left-leaning independents.

Harris supporters are particularly proud of their ground game. The campaign has over 350 staffers across 50 offices in Pennsylvania, 16 of which are located in rural areas that Mr Trump won by double digits four years ago. The idea is to chip away at support in heavily Republican areas even when Ms Harris doesn't have a chance to win outright. "They're play-acting at trying to do better in the rural counties," argues Mark Harris, a Republican strategist. "This will once again be an extraordinarily divided election between densely populated suburbs versus exurban and rural communities."

Republican efforts appear more scattered, with a constellation of groups working on turnout efforts. Postal voting is a priority. In 2020 Mr Trump actively discouraged mail-in voting but has since shifted his rhetoric, albeit inconsistently, in the hope of cutting down the Democrats' advantage.

If Mr Trump wins Pennsylvania, it will



show that he put together a coalition of low-propensity white working-class voters and religious voters, says Ryan Shafik, a Republican strategist, and would probably also have attracted "a good amount of newer minority voters". Ms Harris will have to reassemble Mr Biden's coalition built on strength among urban and minority voters, as well as continuing to make inroads into the state's suburbs. Her current lead in Pennsylvania, according to a polling average maintained by FiveThirtyEight, a data-journalism outfit, is less than two percentage points. For all the money pouring in, the race remains a virtual tie. ■

#### Political violence

## Assassin and author

LOS ANGELES

Ryan Routh's self-published memoir offers some clues as to his motives

RYAN WESLEY ROUTH was prepared for a stakeout. The lanky 58-year-old from Hawaii waited behind the fence of Donald Trump's golf course in West Palm Beach, Florida, for 12 hours, according to mobile-phone records. He had packed a bag of food, a camera, a semi-automatic rifle and a scope. A Secret Service agent spotted Mr Routh's gun and opened fire before he could attempt to shoot the former president, who was playing an unscheduled round. The agency says Mr Routh did not have sight of Mr Trump, but the apparent assassination attempt was the second in just over two months.

Mr Routh has been charged with two violations of federal gun laws and he could serve up to 20 years in prison. He already has a criminal record, including a conviction in North Carolina in 2002 for possessing a machine gun. His motive for wanting to kill Mr Trump remains unclear. But unlike Thomas Matthew Crooks, who was

killed while attempting to gun down Mr Trump at a rally in Pennsylvania in July, Mr Routh's biography and opinions can be divined from the public record. Social-media profiles and a self-published e-book (available for \$2.99 online) paint a picture of a man with changeable political opinions, hatred for Mr Trump, a predilection for violence and profound naivety.

Mr Routh's book, "Ukraine's Unwinnable War", was published in 2023 following what he describes as a five-month stint in the country. After claiming that he failed to join the International Legion, a branch of the Ukrainian army filled with foreign soldiers (the legion denies any association), he says he tried to recruit fighters to help wage war against Russia. The book's rambling subtitle—"The Fatal Flaw of Democracy, World Abandonment and the Global Citizen: Taiwan, Afghanistan, North Korea and the End of Humanity"—offers a sense of its broad scope and incoherent prose. The 291-page text is something between a diary and a political treatise.

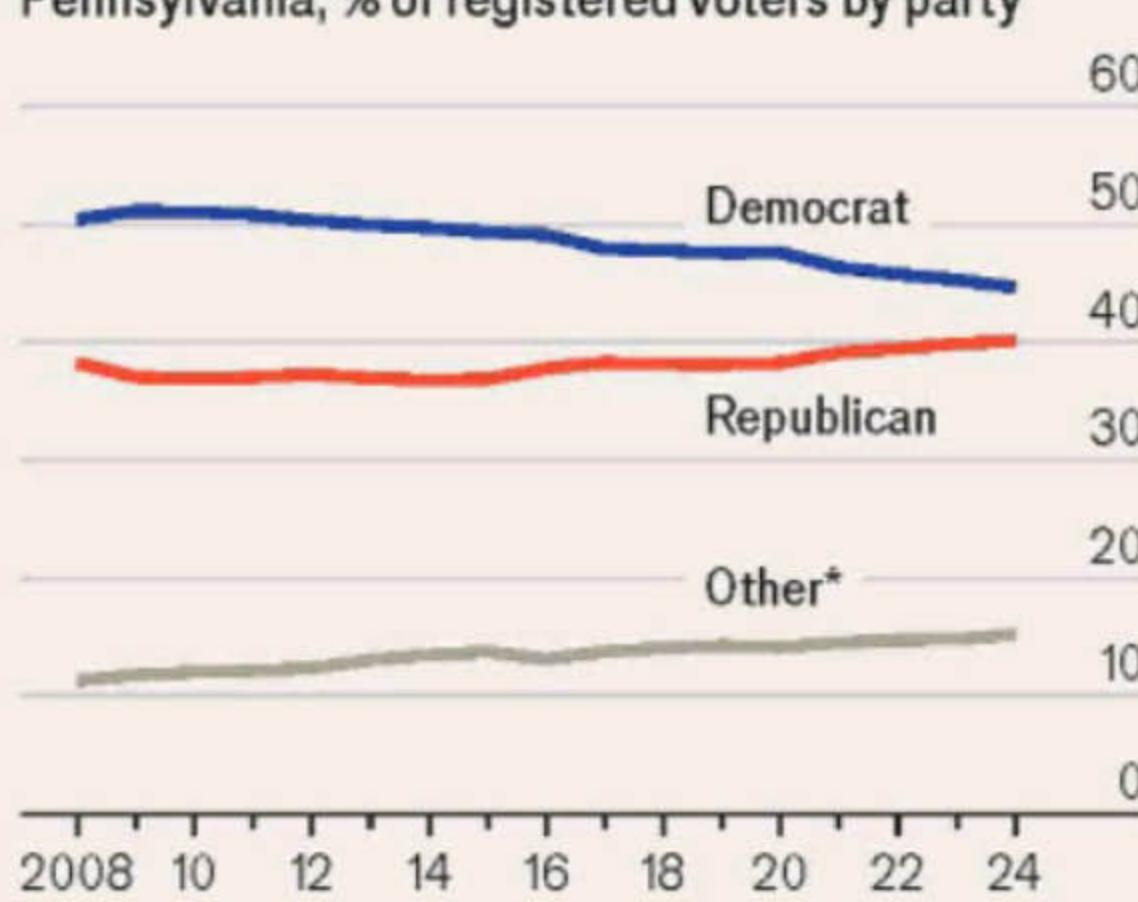
Mr Routh admits in the book that he voted for Mr Trump in 2016. He suggests that he was "fooled" by the "idiot" former president, and felt let down by his foreign-policy blunders, including pulling America out of the Iran nuclear deal, which was brokered by President Barack Obama in 2015. It is on Iran's behalf that Mr Routh apologises for voting for Mr Trump, and he offers the country a bloody solution that now looks like foreshadowing. "I am man enough to say that I misjudged and made a terrible mistake and Iran I apologise," he writes. "You are free to assassinate Trump as well as me for that error in judgement ... No one here in the US seems to have the balls to put natural selection to work or even unnatural selection."

Mr Routh seems to have abandoned his support for Mr Trump at some point during his first term in office. Posts on X suggest that in 2020 he backed the short-lived presidential campaign of Tulsi Gabbard, a Democratic congresswoman, and that he hoped Nikki Haley and Vivek Ramaswamy might team up to defeat Mr Trump in the Republican primary earlier this year. He commends President Joe Biden for his support for Ukraine, though not without calling him "frail" and criticising him for the disastrous withdrawal from Afghanistan. He never mentions Kamala Harris, as the book was written before she became the Democratic presidential nominee. But he does suggest that "we must get to a place where every leader is always a woman so that we can avoid this testosterone driven insanity and macho bullshit."

While much of Mr Routh's derision seems reserved for Mr Trump, his book reveals a man disillusioned by politics more broadly and unencumbered by his own contradictions. He condemns the storm-

#### Blue fall

Pennsylvania, % of registered voters by party



ing of the Capitol on January 6th 2021 but then advocates for Mr Trump's assassination and mulls whether Democrats and Republicans are destined to "slaughter the entire opposing party". He offers to be "kidnapped by North Korea...to show them one by one that Americans are not the enemy". There is a revealing reference to "Homage to Catalonia", George Orwell's memoir about his time on the front lines of the Spanish civil war. Mr Routh seems to fancy himself a latter-day Orwell, wanting to fight for freedom in Ukraine only to feel ineffective in the end.

In 1995 Ted Kaczynski, the "Unabomber", advocated a revolution against industrial society in a 35,000-word manifesto. His bombs targeted people he believed to be complicit in the advancement of technology. Mr Routh may have similarly hoped that shooting Mr Trump could force a reckoning. At the end of his book, he writes that he did not expect to make it out of 2023 alive. "I am certain likewise that my end will go unnoticed...but I will dream and imagine that perhaps it would spark motivation in at least one person to take up arms and fight against the hatred that ended me." In crafting his dangerous message to others, he may have emboldened himself. "If you want to be one of those action heroes in the movies", he wrote, "now is your time to shine." ■

## New York

# The Adams families

NEW YORK

**The list of people around the mayor who are under investigation keeps growing**

ERIC ADAMS, New York City's mayor, likes to talk about his devotion to the job: "The goal is stay focused, no distractions, and grind for New Yorkers." Yet the distractions keep coming.

The list of people being investigated by federal agents includes two deputy mayors, the schools chancellor and a former police commissioner, who resigned on September 12th. The list of federal agencies poking around includes the Justice Department, the FBI and the IRS. The city's own Department of Investigation is busy too. No indictments have come down, and no one has been accused or charged with any wrongdoing, but as federal agents raid the homes and scoop up the phones of top officials, questions are multiplying about some of the people Mr Adams has chosen to help him manage America's biggest city. The investigations are not related to one another, but the same cannot be said of all those caught up in them.



**Mayor culpa**

Federal investigators have taken the phones of three brothers close to the mayor. David Banks, the schools chancellor, had his phone seized at the home he shares with his fiancée Sheena Wright, the first deputy mayor. Her phone was also taken. She says she is "co-operating fully with any investigation" and that she is "confident that I have done nothing wrong". Mr Banks said he is co-operating with investigators and is not the target of their inquiry. His brother Philip is deputy mayor for public safety. His phone was also seized in early September. According to press reports the third brother, Terence, who runs a government-relations firm, is also under scrutiny. His lawyer says: "We have been assured by the government that Mr Banks is not a target of this investigation." The brothers deny any wrongdoing.

Another separate investigation involves another set of brothers. Edward Caban, the former police commissioner, resigned a week after his phone was seized as part of a federal investigation, reportedly into the consulting business run by his brother James. Both men have denied any wrongdoing. James's lawyer says his work as a liaison between the NYPD and a private company is "perfectly legal". Edward said he was prompted to resign "for the good of the city" because the investigation was "a distraction" for the department.

It does not end there. Timothy Pearson, an adviser to the mayor, also had a phone seized this month as part of a federal probe. The mayor is under pressure to fire Mr Pearson, who allegedly assaulted security guards at a migrant shelter and also faces sexual-harassment lawsuits. Mr Pearson's lawyer has said he denies the allegations in all the suits. The FBI searched the home of another senior staffer in February. Last year the FBI looked into donations

made to Mr Adams's 2021 mayoral campaign. At issue was whether any campaign money came from foreign donors, which would be illegal. His top campaign fundraiser later resigned, and the investigation appears to be continuing.

Mr Adams's own mobile devices were seized by federal agents in November 2023. The mayor has repeatedly said he has done nothing wrong. When the police commissioner resigned, Mr Adams told New Yorkers he was "as surprised as you to learn of these inquiries". He went on to say, "I spent more than 20 years in law enforcement, and so, every member of the administration knows my expectations that we must follow the law."

But Mr Adams also brags about his loyalty to his team and says he himself is "perfectly imperfect". His friendships with the Banks and Caban families go back decades. Mr Adams worked with the fathers of both sets of brothers when he was a police officer, and Mr Pearson was once his own commanding officer. "City government is a family affair", says John Kaehny of Reinvent Albany, a good-government group. "The mayor's responsibilities are to the people who elected him, not the people he has employed the longest," says Susan Lerner of Common Cause, a government watchdog. That is not always the impression Mr Adams has given. ■

## College admissions

# Admit it

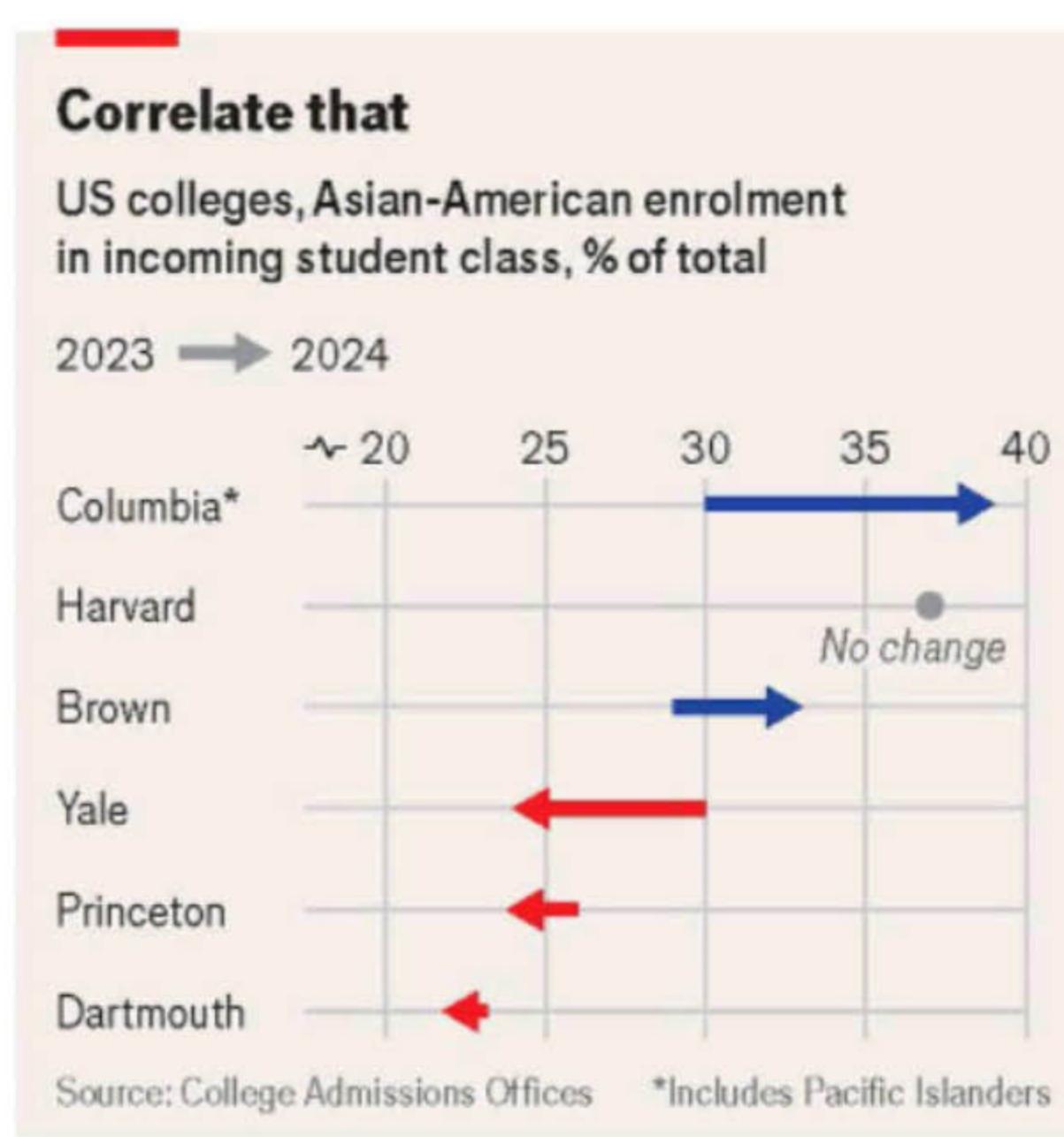
WASHINGTON, DC

**What has been the effect of the Supreme Court's ban on affirmative action?**

IN JUNE 2023 the Supreme Court banned race-conscious admissions at American universities. Many supporters of the practice feared that black and Hispanic enrolment at the nation's most selective colleges would plunge, too, when members of the class of 2028 arrived on campus.

So when some colleges released data this month showing a decrease in black and Hispanic enrolment, many were quick to blame the Supreme Court. Harvard University, Amherst College and the University of Virginia reported decreases in black enrolment from last year. Brown University and Massachusetts Institute of Technology (MIT) showed declines in enrolment of both black and Hispanic students. But assuming that these dips can be blamed solely on the ban would be a mistake.

Public universities in America are obliged to disclose demographic data but many have yet to do so for the new academic year. Private universities do not have



to publish numbers, but many do so anyway. The picture so far is mixed. Yale, Tufts and the University of Virginia reported slightly higher enrolment among Hispanic students compared with last year. Dartmouth College, Princeton University, and Yale University reported decreases in Asian-American student enrolment—the group that the Supreme Court decision was supposed to help (see chart).

College presidents continue to value diversity, but must operate within the constraints of the court's ruling. Yet so many other factors have affected college applications that isolating the court's impact is hard. "I'm a neuroscientist by training, and when you are doing an experiment, you never tinker with two or three factors at the same time, right?" says Joanne Berger-Sweeney, the president of Trinity College, a liberal-arts university in Connecticut.

Those factors include the botched roll-out of the Free Application for Federal Student Aid, or FAFSA, says Angel Pérez, who heads the National Association for College Admission Counselling. (FAFSA is a form that families must complete to qualify for financial aid.) They include laws passed by some Republican state legislatures, which took things a step further than the Supreme Court did by passing laws banning diversity, equity and inclusion initiatives altogether. Meanwhile, some colleges made admissions tests, such as the SAT, mandatory after a brief hiatus during the pandemic. Black and Hispanic students tend to perform worse on these tests, and so could have been put off by them.

Finally, with race no longer mattering in admissions, some students chose not to report theirs. It is possible that some of the reported losses among black and Hispanic students may actually be hidden in the "unknown" racial category. Some private colleges have stopped collecting race data altogether, says Bryan Cook of the Urban Institute, a think-tank. "If you don't collect the racial data of your applicant pool, you can't be accused of using race in your admissions process."

## Campaign calculus: post-debate bounce

### Now you see it

#### The impact of Kamala Harris's debate win is showing in the polls

LIKE BIRD-WATCHERS with binoculars, observers of America's presidential race have had their eyes trained on the opinion polls to see whether they can spot a post-debate bounce for either candidate. Now they can. According to *The Economist's* poll tracker, Kamala Harris's nationwide lead over Donald Trump has widened to 4.5 percentage points, from 3.8 points on September 10th, the day of their debate. A 0.7-point improvement is small but potentially significant, and gives Ms Harris her biggest lead yet in our tracker (see chart).

Contrary to Mr Trump's claims, Ms Harris clearly won the debate. Several surveys have confirmed what CNN's flash poll suggested on the night: that a large majority of Americans thought Ms Harris bested Mr Trump, who repeatedly waded into the traps his rival laid for him and came across as angry and rambling. A YouGov poll reported that 55% of debate-watchers thought Ms Harris won, against 25% for Mr Trump; ABC's scored it 58% to 36% for Ms Harris. A good night for the Democrat was capped by an endorsement from Taylor Swift.

The Harris campaign got an immediate financial boost, reporting that it raised fully \$47m in the 24 hours after the debate. Will a debate victory have a real impact on the race? History suggests presidential jousts rarely make a difference. But President Joe Biden's catastrophic performance against Mr Trump on June 27th was a game-changer, and this time the novelty of Ms Harris's candidacy meant that Americans were paying attention: some 67m of them tuned in, 16m more than watched the Trump-Biden showdown. It takes a while for new polls to show whether the debate moved the needle on polling averages. The needle has now budged.

The true picture may be even rosier for Ms Harris than aggregated scores suggest, since her bounce is still held down by pre-debate polling. Some of the latest surveys are striking. Morning Consult shows Ms Harris leading nationwide among likely voters by six points, compared with three before the debate; *The Economist/YouGov* shows Ms Harris improving by four points while Mr Trump remains steady. Of 12 fully pre- and post-polls, Ms Harris has

improved her share by 1.2 points on average and Mr Trump has worsened by 0.3 points, so the margin has moved by 1.5 points in Ms Harris's direction.

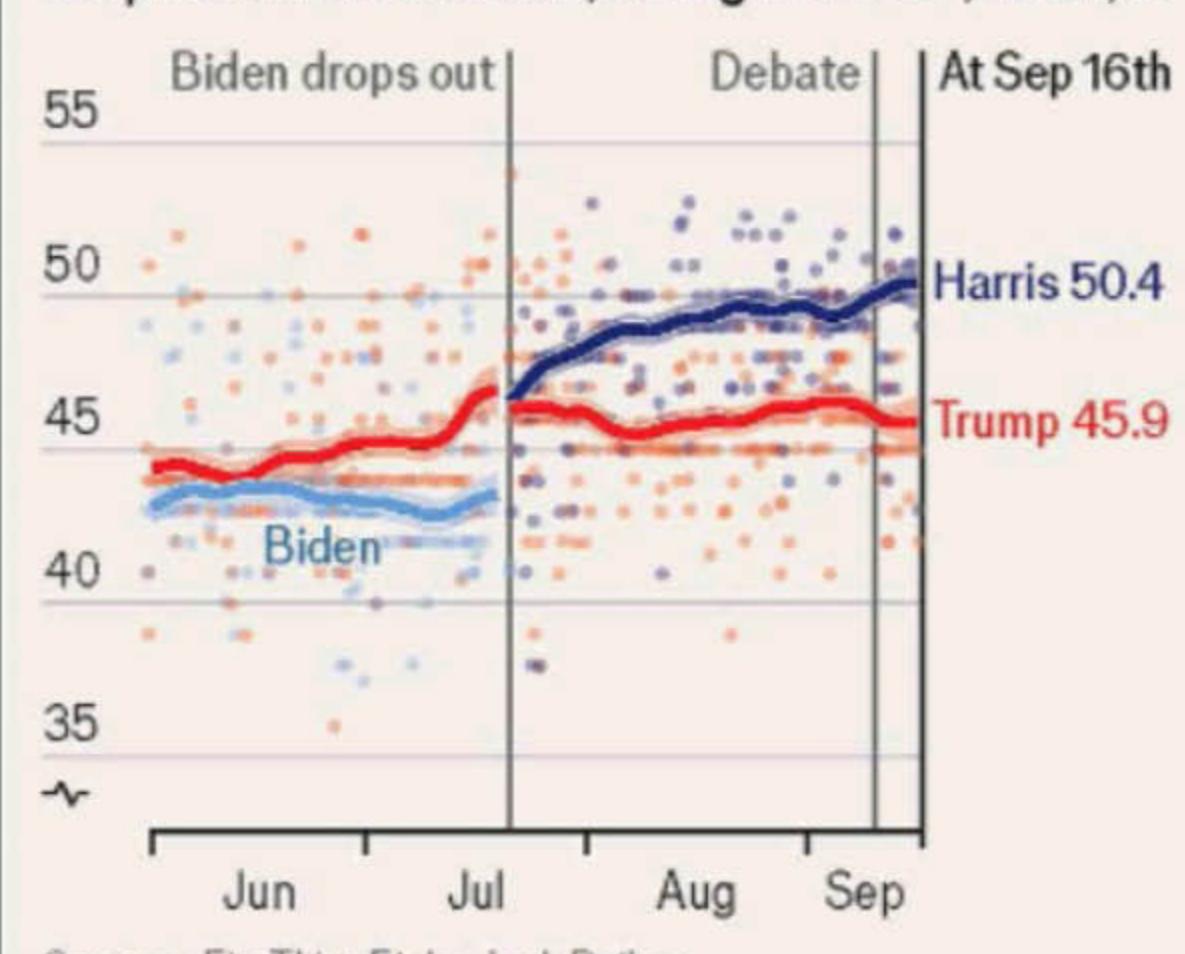
Voters' views of Ms Harris have kept improving. Before Mr Biden dropped out her net-favourability rating was a dismal minus 17 points. This week, according to FiveThirtyEight's poll aggregator, positive views of her equalled negative ones for the first time since mid-2021 (Mr Trump is at minus ten).

The good post-debate news for Ms Harris comes with two caveats, however. One is that it is not the popular vote that determines who wins, but the electoral college, where the outcome will hinge on a handful of swing states. State-level polling since the debate is still scarce and the results so far have been more mixed. The race remains extremely close. Even so, overall the polling shifts have been enough to nudge our election-forecast model a few notches in Ms Harris's favour. The model now gives her a 57% chance of winning (her highest yet), against 43% for Mr Trump, compared with a 53-47 edge on September 10th. Broadly speaking, whereas before the debate the model pointed to a toss-up, now it gives Ms Harris a nearly three-in-five chance of victory.

The second caveat is that a lot could still change. The latest polls were conducted before the apparent assassination attempt on Mr Trump in Florida on September 15th. Since June the contest has been full of big surprises. They surely won't be the last.

#### After-effect

US presidential election, voting intention, 2024, %



## Dissident Republicans

# Rebels with a cause

ATLANTA

## The never-Trump movement has leaders, but will it have followers?

**G**EOFF DUNCAN knew “The Beast” from the inside. Ahead of the 2020 election he rode in the president’s aptly named limousine whenever Donald Trump came to Atlanta. But when Mr Trump claimed that Georgia’s election was rigged, Mr Duncan, then the state’s lieutenant-governor, rebutted him. Death threats soon arrived from Trump loyalists. Mr Duncan chose not to run for re-election after watching the former president “hijack the conservative agenda” in the Georgia legislature and “sidetrack multiple sessions” by infecting lawmakers with his baseless vote-fraud obsessions.

In August Mr Duncan joined a chorus of Republican politicians campaigning against Mr Trump when he endorsed Kamala Harris on stage at the Democratic National Convention. “It was like the first day getting traded from the Yankees to the Red Sox,” he says of sitting in the green room waiting for his debut. Since then Liz Cheney, once the third-most powerful Republican in the House, and her father, former vice-president Dick Cheney, have said that they, too, will vote for Ms Harris.

Yet the never-Trump movement of anti-Trump conservatives is not quite what it was. Four years ago it contributed to Joe Biden’s victory as thousands of Americans who voted for Mr Trump in 2016 abandoned him. They were encouraged to do so by an array of generals, press officers and administration officials who had worked under Mr Trump during his presidency. Democratic mega-donors financed groups like the Lincoln Project, a conservative PAC, to run ads warning fellow right-wingers of Mr Trump’s con-man proclivities and fondness for authoritarianism.

This time around the movement’s influence appears more muted. Mr Trump unleashed a campaign of vengeance against Republicans who voted to impeach him. A Trump-backed candidate crushed Ms Cheney by 37 points in a Republican primary in 2022. When Mitt Romney announced last year that he would not run again, the movement lost its legs in the Senate. The question in 2024 is whether its leaders’ voices will matter in battleground states.

They are certainly going to try. This cycle Republican Voters Against Trump is planning to spend \$40m to air testimonials in swing states from former-MAGA voters, which would be a four-fold increase from 2020. The Lincoln Project is targeting two

voter blocs it hopes will flip. One is “Red Dawn conservatives” (named after a cold-war film in which the Russians invade America), baby-boomers who came of age politically during Ronald Reagan’s presidency and are uncomfortable with Mr Trump’s cosiness with Russia. The other is “Dobbs dads”, conservative millennials struggling to justify abortion bans to their daughters. The activists reckon that hearing from more people like Mr Duncan will create a “permission structure” for voters to quietly leave the top of the ticket blank or cast a ballot for Ms Harris.

### “Cowardice” over Kamala

However, the never-Trump movement is divided over whether it should explicitly endorse Ms Harris. Stephen Hayes, co-founder of the *Dispatch*, a centre-right online news outlet, is adamant that journalists in his orbit should be warning Americans of the threat of Mr Trump without resorting to “partisan boosterism” by backing the Democratic nominee. Pat Toomey, a former senator from Pennsylvania and self-described “never-again-Trumper”, says that he will vote for neither candidate, mostly out of disdain for Ms Harris’s economic policies. “The outcome is very likely binary, but that doesn’t mean my choice is necessarily binary,” he explains.

Sarah Longwell, who runs Republican Voters Against Trump and publishes the

*Bulwark*, another news outlet, calls that “the kind of cowardice I have seen play out over and over again in the Republican Party”. If never-Trumpers believe Mr Trump is a singular threat to democracy, she thinks they should work not just to deprive him of votes but to give Ms Harris more.

Never-Trump has become “a movement of leaders without followers”, says Charlie Sykes, a former conservative talk-show host and author of “How the Right Lost Its Mind”. Weekly *Economist*/YouGov polls show that since 2016 the percentage of Republicans who plan to vote for Mr Trump rose from roughly 80% to 90%. When it comes to swing voters, more importantly, the share of Republican-leaning independents who plan to back him has nudged slightly upwards since April, but overall has barely budged since 2020. Why?

The Republican traditionalists most aligned with never-Trumpers probably already crossed partisan lines. Eight years into Trumpism those who remain in the Grand Old Party may be less influenced by its elite old-timers. And, says Kyle Kondik of the Centre for Politics at the University of Virginia, persuadable voters tend to be the ones paying the least attention.

Sitting in his backyard in Forsyth County, Georgia’s wealthiest, Mr Duncan contemplates his future. He hopes his Georgia colleagues will admit to backing the wrong guy if Mr Trump loses again. On the other hand, “If this whole Republican thing just implodes on itself maybe there’s a place for me over there,” he says, referring to the Democratic Party. In October he will go on the road with Ms Harris.

But campaigning comes with risks. Two weeks ago the town sheriff called and told Mr Duncan not to go home one evening. Someone called in claiming there was a sniper waiting on his rooftop. ■

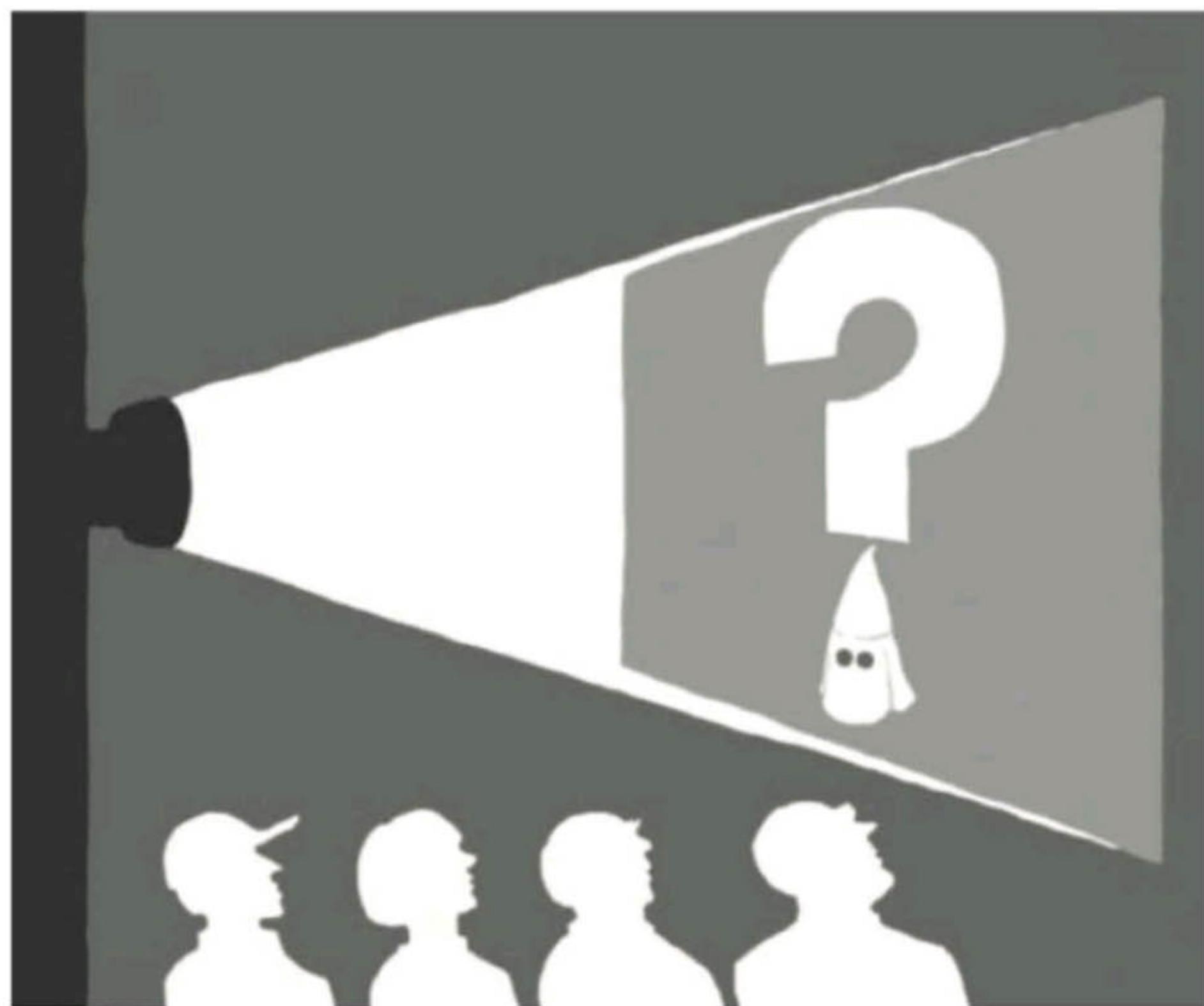


Mr Duncan goes to Chicago

## LEXINGTON

### *Talking white supremacy*

*How the right is taking culture war to culture itself*



THE WOMAN has a confession to make. Over an elegant dinner, she admits to her companions that sometimes when she is out with her husband and he is "really loud" she shushes him. A normal exchange within a marriage, one might think. But she is white and he is black. Her impulse, she worries, is "probably my white supremacy talking".

The scene appears in the new mockumentary "Am I Racist?" by Matt Walsh. A conservative podcaster and film-maker, Mr Walsh wants, he has said, to expose "the so-called-anti-racist hustle" of the diversity, equity and inclusion movement. Among the interviews and gags in the film—some outrageous or funny, others silly—this moment registers as poignant, an unsettling glimpse into a couple's life: "white supremacy" appears to be harming a marriage that seems to be proof of racial progress. Is that because the reality of white supremacy has penetrated so deeply into the woman's subconscious mind that it warps her behaviour? Or because the idea of white supremacy has penetrated so deeply into her conscious mind that she must forever second-guess how she speaks with her husband?

The movie dismisses the first question and resoundingly answers "yes" to versions of the second. It luxuriates in the paradoxes of some anti-racist activists, who while purporting to want to overcome racism can also treat it as immutable. "America is racist to its bones," one consultant tells Mr Walsh. Clad in tweed and be-wigged with a man bun, he pretended to be a solemn white leftist and paid thousands of dollars in fees to beguile anti-racist experts into embarrassing, extreme assertions and acts on-camera.

"Republicans are Nazis," declares one of the two moderators of the dinner, at which they schooled the white women in their racism (see Briefing). America, she says, "is not worth saving. This country is a piece of shit." A loud crash startles her as Mr Walsh, a masked waiter, drops a stack of plates. He then leads the women in a toast. "Just raise a glass if you're racist," he says, and they do.

Mr Walsh contrasts the anger, not to say nihilism, of the activists, which he sees as fomenting racism, with the hopeful, accepting views of some just plain folks. "Why would you want to forget they're black?" growls a white man in a biker bar, after Mr Walsh,

in his earnest DEI persona, tries to explain what he has learned. "You should embrace them being black." In another scene, a black woman tells Mr Walsh, "We didn't see colours, baby, because we grew up together and there was a lot of love."

Those dissonant yet harmonious messages might warrant a hearing on the right now more than on the left, as Springfield, Ohio, quakes beneath fact-free claims by the Republican presidential ticket that Haitian immigrants are eating pets. Indeed, the movie seems countercyclical. As *The Economist* reports this week, concerns over such matters as "white privilege" peaked three years ago, after the protests against the police killing of George Floyd.

Yet "Am I Racist?" is finding a sizeable audience. Released on September 13th, it was fourth at the box office in its first weekend, bringing in \$4.5m and beating out a new action movie, "The Killer's Game". Lexington saw the film in Times Square, the very belly of the blue beast; the small theatre was filled with a youngish audience, mostly but not only mostly white. Critics panned "The Killer's Game". By contrast, "Am I Racist?" has not been reviewed by a mainstream publication, though it has received a 99% audience rating on the fan site Rotten Tomatoes. Predictably, silence from left-of-centre publications has sharpened interest from the right. Elon Musk has tweeted in solidarity.

The film is the first wide theatrical release from the Daily Wire, a conservative media company. It adds a new dimension to the parallel right-wing cultural universe encompassing everything from rap music to fashion. "We say often on the right that politics is downstream of culture, but we're afraid to actually make culture—we just like to critique it all day," Jeremy Boreing, a founder of the Daily Wire, said at the premiere. "The Daily Wire is making culture." Maybe, as the film-makers hope, the movie will attract and amuse people disinclined at first to agree with its messages. More likely this cultural parallelism will lead to more mockery and caricature on both sides, uncomplicated, like the polarisation of the news media, by much engagement or debate.

Mr Boreing praised Mr Walsh for "using the left's own playbook against them", deploying "tricks" devised by Sacha Baron Cohen, whose mockumentaries embarrassed prominent conservatives among others. The genre is largely lost on Lexington; laughing at the manipulation and humiliation of the unwitting, however annoying they may be, can leave an unpleasant taste.

#### White gullibility

Like Mr Baron Cohen, Mr Walsh is a quick-witted impostor; unlike him, he is a soothingly mild one. His most sensational trick ensnares Robin DiAngelo, the author of "White Fragility", a best-seller. Though she is clearly uneasy he prompts her to take cash from her wallet to give to his producer, who is black, as reparations. Subsequently learning she was fooled, Ms DiAngelo said she donated Mr Walsh's fee of \$15,000 to the NAACP Defence Fund. Of Mr Walsh and his allies, she said, "They will not prevail in their efforts to stop the work for racial justice."

But what has become of that work? The left is due for a reckoning over the reckoning on race. The protesters have moved on, the book sales have dried up, the DEI departments are emptying, and the elite white grovelling and self-flagellation recorded by Mr Walsh have been, on the left, politely memory-holed. Yet a movement concerned with structural injustice has achieved little structural change, whether to policing or the black-white wealth gap. Was it all, in the end, just a performance? ■

## The Americas



**The Amazon**

### Rainforest rewards

MÄE DO RIO AND MARACAÇUMÉ

Entrepreneurs are betting big on carbon markets in the Amazon

A TRACTOR WITH a subsoiler loosens the earth and carves out deep holes. A dozen men follow, dropping tree seedlings into them. This industrious scene in a deforested part of the Amazon is more reminiscent of the paper-and-pulp industry than the voluntary carbon market, in which companies buy carbon credits to offset their greenhouse-gas emissions. Brazil can be to carbon removal what Saudi Arabia was to carbon production, claims Peter Fernandez of Mombak, the company that runs the project. "And I want Mombak to be the Saudi Aramco of that," he says.

This is big talk for a market with a serious reputation problem. In 2023 the volume of credits traded on the voluntary carbon market was less than half that in 2022; and the market's value shrank from \$1.9bn to \$723m (see chart on next page). Corporate buyers have been put off by scandals: some project developers claimed credits for protecting forests that were not

at risk of being cut down.

Yet in Brazil optimists like Mr Fernandez abound. Rather than protecting standing forest, as many carbon-credit projects do, they are focusing on large-scale reforestation. A ten-hour drive from Mombak's farm, re.green, another Brazilian firm, is planting trees on 8,500 hectares (21,000 acres) of degraded pastureland. In May Microsoft, which plans to be carbon negative by 2030, signed a deal to buy 3m tonnes of carbon credits over 15 years from re.green for an undisclosed price (the company has a similar agreement with Mombak). Google is expected to announce a deal with Mombak at the end of this month, its first foray into reforestation credits.

→ ALSO IN THIS SECTION

---

**30 Brazil's greedy Congress**

---

**31 Justin Trudeau's troubles**

Believers say there are two reasons to bet on the market. First, most of the world's big listed companies now have targets to reduce their emissions, as shareholders and regulators press them to become greener. Heavy industry, airlines and energy-hungry technology firms cannot fully cut their emissions, so to achieve net zero they will need to pay to remove carbon dioxide from the atmosphere.

Second, many governments are regulating emissions more aggressively. The World Bank tallies 75 carbon-pricing schemes around the world, covering an estimated 24% of global emissions, up from 7% a decade ago. Although the voluntary market is separate from the compliance market, the two do sometimes dovetail. California's cap-and-trade system allows participants to use some credits issued on the voluntary market.

Only 2bn tonnes of carbon dioxide per year are being removed from the atmosphere by human-led efforts, mostly through reforestation. In order to limit global warming to 1.5°C above pre-industrial levels, the rate of extraction needs to rise to between 5bn and 10bn tonnes per year by 2050, researchers at the University of Oxford estimate. At 10bn tonnes, the size of the carbon-removal market would be between \$300bn and \$1.2trn, according to McKinsey, a consultancy.

Carbon-dioxide removal can be done through natural methods—such as planting trees or restoring wetlands—or tech-based ones, such as direct air capture and storage (DACS), in which machines claw carbon dioxide from the air. Tech-based projects are less prone to scammers. They are designed to put carbon dioxide away indefinitely, for example by storing it underground, whereas forests can be burned or cut down. However, they are expensive. To sequester a tonne of carbon dioxide using DACS costs around \$1,000, compared with \$10-40 by planting trees.

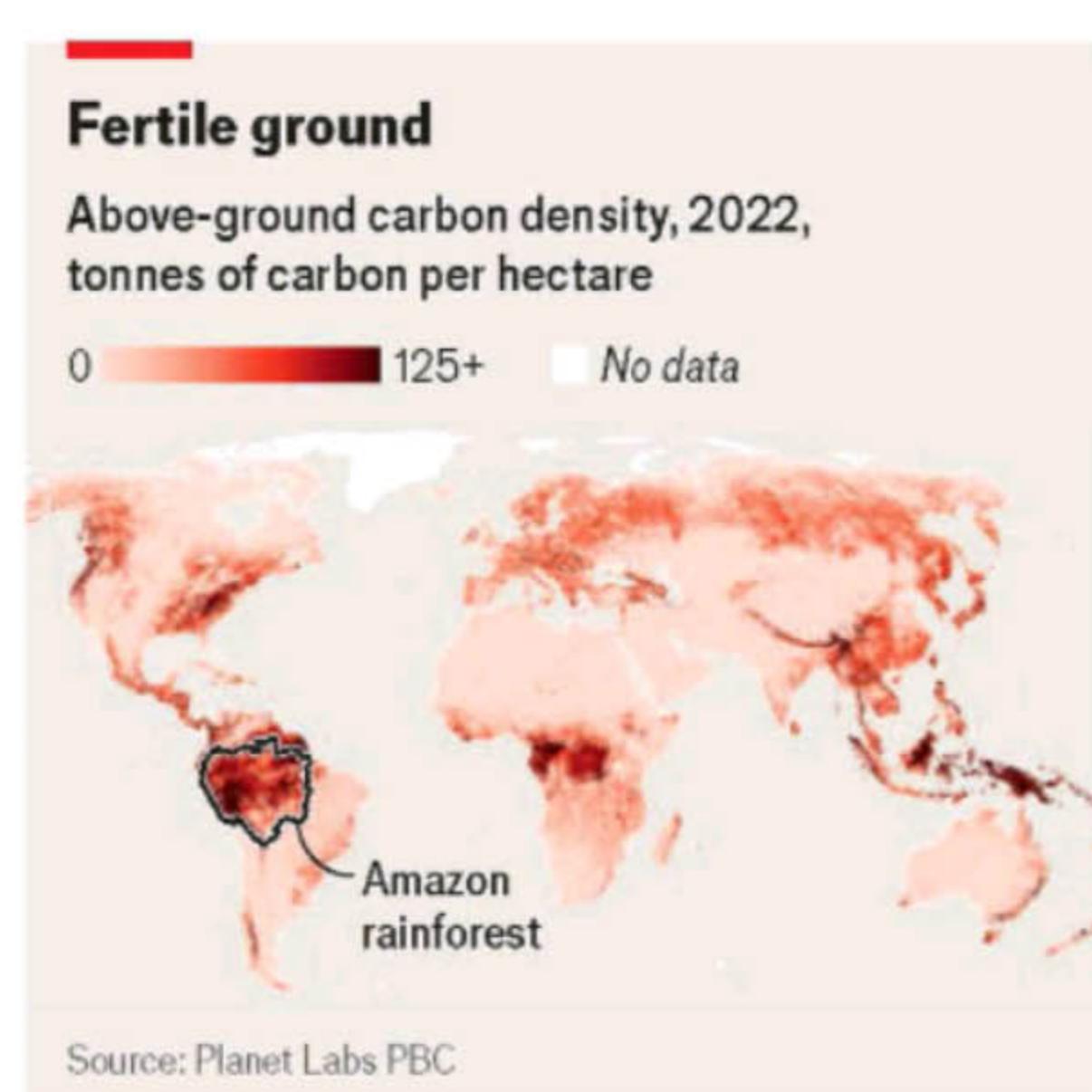
This makes reforestation, and Brazil, attractive in the short term. Brazil is home to vast tracts of degraded land and its tropical climate favours quick tree growth. Mombak and re.green's projects are on former cattle ranches whose owners sold their land when it became unproductive. Others may be tempted to follow suit. Assuming a carbon credit price of \$30 in 2030—a price already being used or exceeded in high-quality reforestation deals today—it would become more financially attractive to swap cattle-raising for reforestation on roughly half of Brazil's pastureland, according to calculations by McKinsey.

### Rebuilding Earth's lungs

All told, restored Brazilian forests could account for 15% of the world's potential for carbon removal through reforestation (the only other country that could plausibly match this is Indonesia). Brazil—currently the world's sixth-largest emitter of greenhouse gases—could be the only large country to become carbon negative.

There is excitement in Brazil. The national development bank thinks that the country could lease 2.5m hectares of public land to reforestation companies, generating a huge number of carbon credits (their value would depend on the market). Brazil's Congress is discussing a law that would create an emissions-trading system.

Developments beyond Brazil also offer reasons for hope. It is becoming easier to tell good credits from junk. Since 2020 rat-



ing agencies have popped up to evaluate projects. Rival credit issuers are challenging Verra, the dominant one. Insurance firms have emerged to protect buyers against events like wildfires.

Yet formidable challenges remain. The greatest is finding land to buy. Land-grabbers in Brazil often forge titles in cahoots with local authorities, and many private owners lack deeds. It will take re.green years to carry out due diligence on the nearly 2,000 farms it is considering buying. To scale up reforestation, industrial seed production and sapling nurseries producing Amazonian trees are needed.

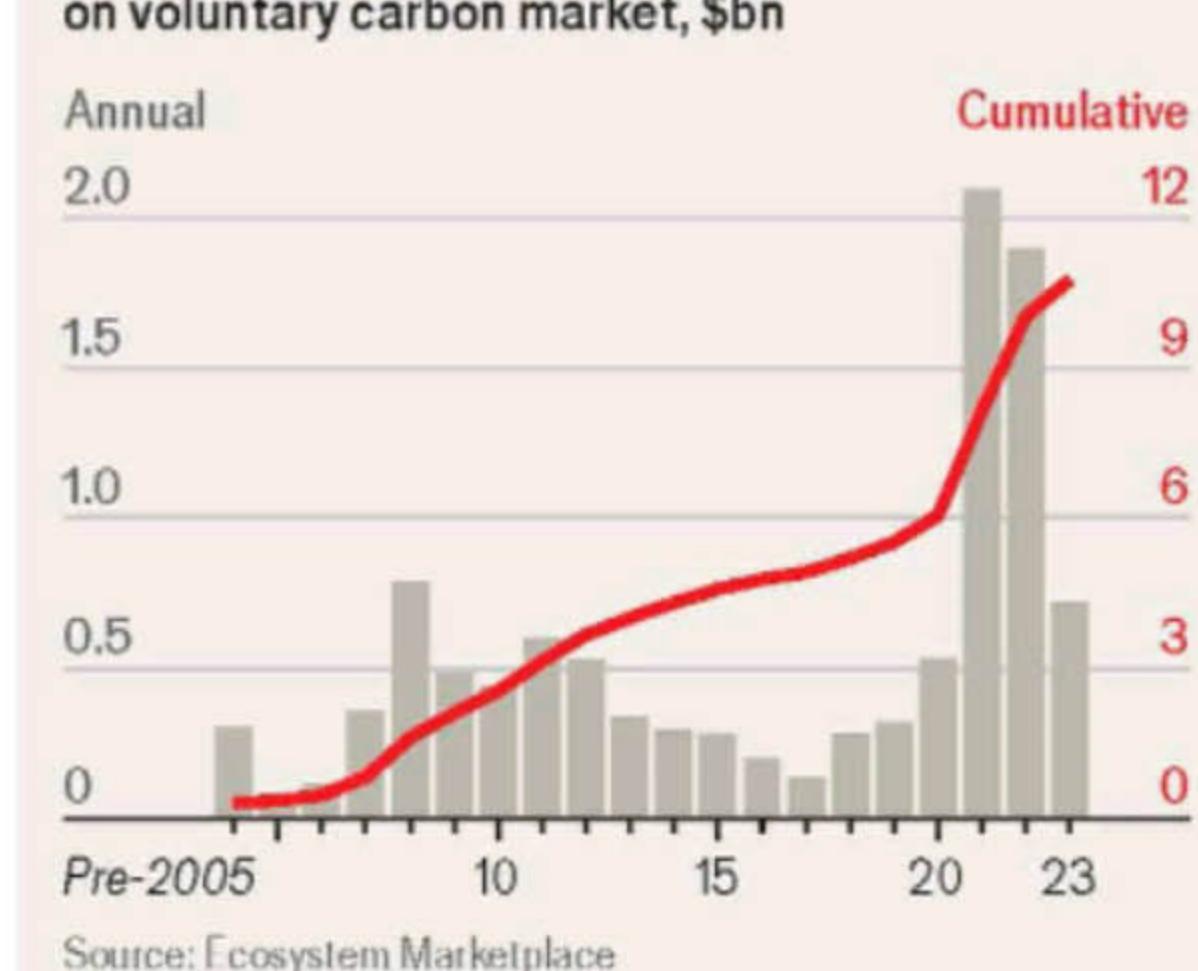
A trillion-dollar market is unlikely to emerge without a lot more transparency. Most decisions on pricing remain confidential. Rating agencies publish overall scores for projects but often charge hefty fees for the underlying data. That is fine for the likes of Microsoft, which enjoys monopsony power in carbon removal. The firm, which has bought credits to remove at least 5m tonnes of carbon dioxide, has a department dedicated to finding projects. Smaller companies, by contrast, will struggle to do the same.

Doubts also linger about how to measure sequestration. Many credit issuers use methodologies based on temperate forests in Scandinavia and California, which capture less carbon than tropical jungles. Some companies are beginning to use satellite imagery and lidar-laser scans that build three-dimensional images to estimate carbon stocks. But such sophisticated tools are not yet widespread.

Market-watchers are waiting for one law that could rev up the industry. Since the Paris agreement on climate change in 2015, countries have been negotiating rules for an integrated global carbon market to allow them to buy credits from one another to offset their emissions—possibly including from the voluntary carbon market. The last and most complicated part of the agreement to be hashed out is how to avoid double-counting offsets. If that ever gets done, restoring the Amazon will be good for business and for the world. ■

### Changing climate

Global value of carbon credits traded on voluntary carbon market, \$bn



### Brazilian politics

## Who's in charge?

SÃO PAULO

Pork-barrel politics in Congress is reaching new depths

PRESIDENT LUIZ INÁCIO LULA DA SILVA is exasperated. "In no other country in the world has Congress kidnapped part of the budget" as has happened in Brazil, he fumed in August. He has a point. In the past decade Brazil's Congress has become one of the most powerful in the world by giving itself ever greater control of the country's federal budget. The Supreme Court and Lula, as the president is universally known, are trying to curb legislators' extravaganza of pork-barrel spending, which fosters corruption and imperils the country's fiscal targets. In response, Congress is threatening a power grab.

At stake are billions of reais of federal spending. Since Brazil's constitution was adopted in 1988, Congress has had the power to participate in the drafting of the annual budget. Most of the money is taken up by mandatory spending on things such as public salaries and pensions. The remaining 11%, which represented 226bn reais (\$41bn) last year, is discretionary. Lawmakers are allowed to present amendments to discretionary spending for projects in their constituencies such as new roads or schools. Today such "earmarks" make up 24% of discretionary spending, up from less than 2% in 2015.

These powers are an anomaly. Among the 38 countries of the OECD, a club of mostly rich countries, 20 do not allow their legislatures to co-draft the budget, according to Marcos Mendes of Insper, a university in São Paulo. In those that do, earmarks generally do not account for more than 1% of discretionary spending. The United States, which caps them at 1%, has strict rules against legislators or their families benefiting financially from them.

The purpose of earmarks was partly to make governing easier. In Brazil's most recent election, in 2022, 23 parties won seats in Congress. Presidents used to have the power to decide which earmarks to approve, and would use them to reward allies who helped them pass laws.

But offers of pork shrank in the 2010s, thanks to a string of presidents who had poor relations with Congress and a crippling recession. In 2015 Congress amended the constitution to force the president to allocate at least 1.2% of the government's annual net revenues to earmarks. In 2019 the then-president Jair Bolsonaro let lawmakers run amok to win their protection as impeachment motions piled up against

him. Legislators made it obligatory for the government to allocate an additional 2% of its annual net revenues for “collective earmarks”, which are proposed by congressional committees or caucuses.

When Congress began to give itself increasingly obscure budget powers, the Supreme Court struck them down. But legislators have found creative fixes. In 2019 they established a new type of grant, colloquially named Pix amendments after a popular instant-payments system. These allow deputies to send money to their constituencies without specifying what the funds will be used for. Beatriz Rey of POPVOX, a think-tank in the United States, calls them “a blank cheque for corruption”.

According to Transparency International, a watchdog, of the 8bn reais that were approved in Pix grants last year, less than 1% included information about the projects they would fund. The destination of some earmarks may be dodgy. In March Chiquinho Brazão, a legislator from Rio de Janeiro, was arrested as part of investigations into the murder of a political rival in 2018. During their enquiries federal police found evidence suggesting that Mr Brazão and a clique of allies had diverted millions of reais in earmarks via a charity. Federal police have requested a probe be opened. (Mr Brazão denies any wrongdoing.)

All this is altering the balance of power. Since the president has lost the ability to approve earmarks, the costs of being in the opposition have declined. Congress is becoming bolshier and increasingly challenging presidential vetoes. Earlier this month legislators forced through a law—that Lula had vetoed—to further defer the introduction of payroll taxes for a raft of industries. Such moves will make it harder for the government to control spending, just as investors fret about Brazil’s debt and deficits.

On August 16th Brazil’s Supreme Court suspended Pix grants, citing the lack of transparency, and called a meeting between Congress and the executive. The two sides agreed that the executive should be obliged to set aside an unspecified amount of money to fund Pix grants, but that these should “respect criteria of transparency and traceability”. The details have yet to be hashed out.

Congress was infuriated by the Supreme Court’s decision. The day after the court’s ruling, the speaker of the lower house, Arthur Lira, proposed a bill that would amend the constitution to allow Congress to overturn some decisions made by the court. Due to term limits, Mr Lira cannot be re-elected as house speaker in a vote next February. Early indications suggest that his successor could be a machine politician just as keen to protect Congress’s new powers. Lula’s job is not about to get any easier. ■

## Canadian politics

# On the ropes

OTTAWA

### The loss of a safe seat piles pressure on Justin Trudeau to step down

**A**DD A POLITICAL beast to Canada’s endangered species list: Justin Trudeau’s Liberal party. On September 16th the prime minister’s party lost a by-election in his hometown of Montreal, an area that it had represented almost uninterruptedly since the second world war. That was the second supposedly impregnable Liberal fortress to fall in just three months, following the loss of a seat in Toronto in June. The message is unmistakable. Voters are horribly disenchanted with Mr Trudeau and the Liberals. The consequence is less clear: whether Mr Trudeau will resign.

Mr Trudeau himself is the main target of voters’ bile. He has won three successive general-election victories since 2015, but his popularity has been waning for over a year. In part voters have simply grown tired of the longest-serving leader in the G7. But many see him as ignoring their concerns, including over a housing crisis, inflation that exceeded 8% at the tail end of the pandemic, and levels of immigration. Urban constituents who should be strong supporters of the Liberals are telling their MPs that they’ve had enough of the prime minister. “I didn’t hear it from two, three people. I heard it from dozens and dozens of people,” says Alexandra Mendès, a Liberal MP. “He’s no longer the right leader.”

The Liberals are almost certain to lose at the next general election, which must take place by October 2025, though not to Bloc Québécois, the regional separatist

party that narrowly won the seat in Montreal. A recent poll suggested just 26% of Canadians would vote for Mr Trudeau compared to 45% of voters who would back his Conservative rival, Pierre Poilievre. (Quebec, home to Montreal, is the only area where the Conservatives do not have a lead in the polls.) Since winning the leadership of his party in 2022, Mr Poilievre has done a good job of appealing to voters by talking about their woes.

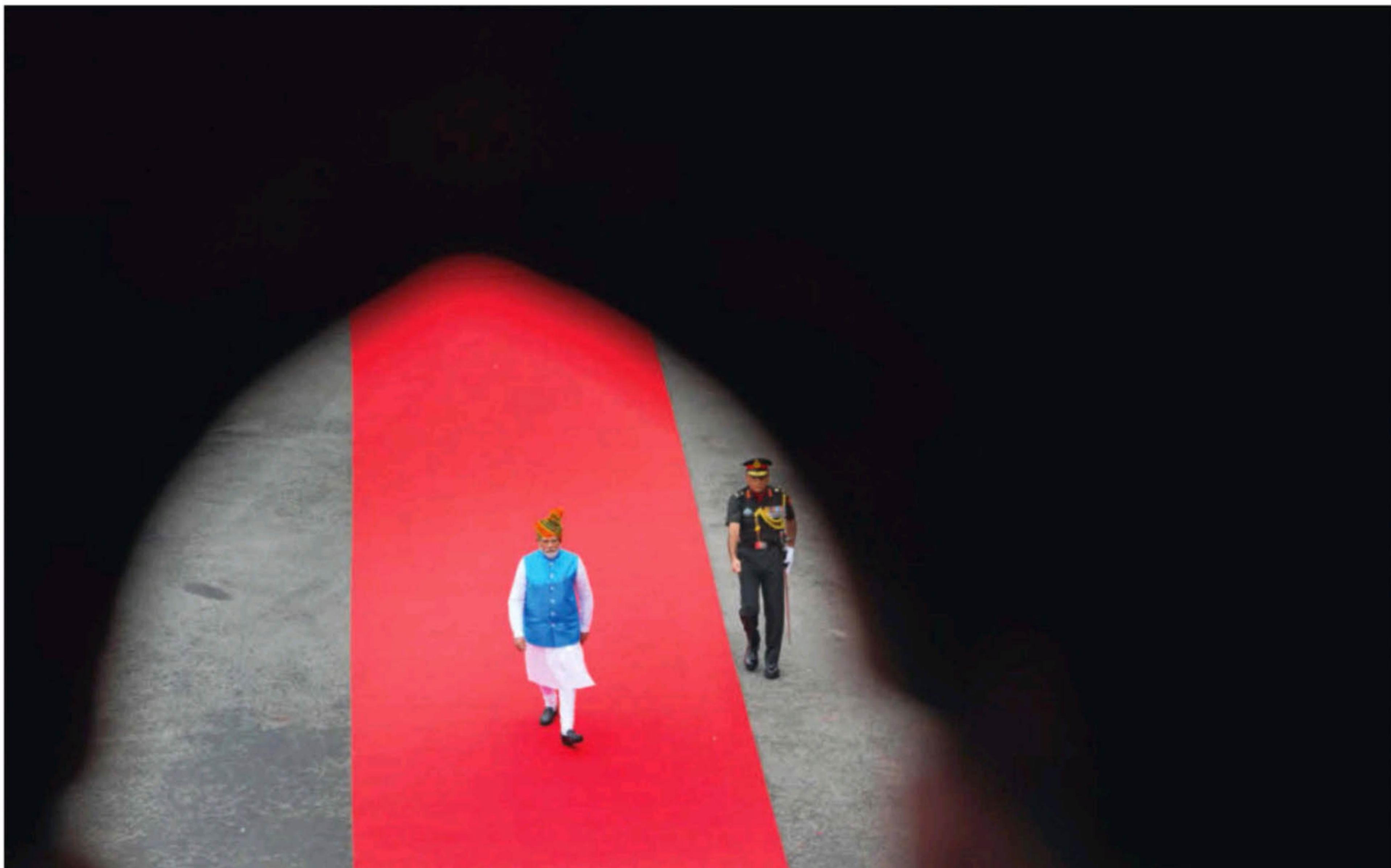
The first Liberal by-election loss in June caused some lawmakers, who realise their fate is linked to an unpopular leader, to call for Mr Trudeau to step aside; more may now follow. But Mr Trudeau will be hard to dislodge. Prior to the vote in Montreal he said he would lead his party into a general election whatever the by-election result. Canada’s Liberals are one of the most successful political parties in the Western world. A Liberal prime minister has been in power in Canada for 92 of the past 128 years. But it was Mr Trudeau who single-handedly resuscitated it from irrelevancy a decade ago. Others interested in leading the party, including Mark Carney, a former governor of the Bank of England, are loth to openly knife him.

Economic issues are not the only ones bedevilling the Liberal party. It is wracked by bitter divisions over the war in Gaza. They were laid bare during the Montreal by-election, when dozens of campaign workers quit in the middle of the election effort, criticising the prime minister for not condemning Israel strongly enough. A Liberal leadership campaign would almost certainly be dominated by a destructive debate about the conflict in the Middle East. The day after the result Mr Trudeau again vowed to stay on in the job, and to “work harder”. But restless lawmakers stoked by angry voters may soon take the matter out of his hands. ■



Out in the cold

## Asia



**Indian politics**

## Modified Modi

DELHI

**India's strongman is 100 days into his third term. It's not smooth sailing**

FOR MANY Indians, the general election result in June was a stunning repudiation of Narendra Modi, India's prime minister. But to hear him speak of it, that isn't the case. He insists that, despite the loss of his party's parliamentary majority, which has forced him to rely on coalition partners, the vote was for "continuity". He has barely changed his cabinet since cobbling together a government. He has doubled down on pledges to turn India into a developed country by 2047, the centenary of its independence. And his Bharatiya Janata Party (BJP) is campaigning for imminent regional elections on a familiar platform of development and Hindu nationalism.

The new government also claims to have completed a plan for its first 100 days that Mr Modi and his ministers started to compile as soon as campaigning started. Mr Modi ordered all ministries to report their progress, details of which were pub-

lished on September 17th, the 100th day of his third term and also his birthday. They included approving infrastructure projects worth \$39bn, expanding an affordable-housing programme and launching a new national pension scheme.

On the surface, Modi 3.0 may look much like his first two terms. Dig deeper, however, and a change becomes apparent. Mr Modi's new government has, in fact, withdrawn a series of politically important initiatives under pressure from an emboldened opposition and from pressure groups.

### → ALSO IN THIS SECTION

**34 Policing the Pacific Ocean**

**35 The Taliban crack down further**

**36 A boom in private tutoring**

**37 Banyan: Geopolitical gaslighting**

India's courts have been showing their mettle, too, challenging the government or the BJP in a number of high-profile cases. And, even within his own political camp, Mr Modi is facing demands to adjust his leadership style, as well as some policies.

Further hazards loom. The BJP faces bruising contests in all five regional elections due in the next six months. One in Jammu & Kashmir, starting on September 18th, is the first since Mr Modi scrapped the Muslim-majority region's semi-autonomous status in 2019. The BJP may struggle to retain control of Haryana, which votes on October 5th, and Maharashtra, where a November poll is likely. The opposition, meanwhile, is likely to hold on to Jharkhand and Delhi in elections due by January and February, respectively.

To Mr Modi's supporters, his recent record demonstrates sound leadership. They say he has learned from the election result and is willing to consult more broadly, even as he advances his reform agenda. He is still popular, they add, and deserves credit as the first Indian politician to win three consecutive terms as prime minister since Jawaharlal Nehru in the 1950s and 1960s. Besides, the BJP controls many more seats in parliament than the Congress party, its main national rival, did while leading coalition governments from 2004 to 2014. ➤

► But can Mr Modi really turn from strongman to consensus-builder? He has never had to share power before. While campaigning he suggested he could be of divine birth and sidelined many political allies. This led to some unusually public criticism from the Rashtriya Swayamsevak Sangh (RSS), the Hindu-nationalist organisation from which the BJP grew. And even if he makes the transition, a more collaborative approach might force him to scrap some promised reforms and offer some expensive handouts.

#### The compromise candidate?

Mr Modi may yet master consultative government, ultimately leading to better policymaking, says Rahul Verma of the Centre for Policy Research, a think-tank in Delhi. But results will be slower. And early signs suggest he has yet to adjust fully: he could, for example, have consulted more broadly on the recently withdrawn initiatives before putting them forward. Failure to adapt, meanwhile, could lead to further electoral losses and even a challenge to Mr Modi's leadership from within.

One of the government's first climb-downs came in early August, when it referred new legislation on Muslim charitable endowments to a joint parliamentary committee. That was remarkable because Mr Modi rammed most laws through parliament in the past decade. Opposition and Muslim leaders denounced the bill as a curb on religious freedom. More tellingly, one of Mr Modi's key coalition partners also backed referral to the committee.

Soon after that came a U-turn on a broadcasting-services bill. The government published one draft in November, aiming to tighten regulation of digital and other media. A beefed-up version was then circulated among stakeholders in July but suddenly recalled in mid-August following objections from many. They feared it would stifle social-media platforms such as YouTube, now widely used by Mr Modi's critics. A new draft may not appear for two years, people involved say.

Then, on August 20th, the government withdrew an advertisement inviting people from outside the civil service to apply for senior bureaucratic posts. The advertisement was part of a Modi initiative to bring expertise into government. But it, too, caused an outcry as no posts were reserved for lower Hindu castes and other minorities, as is usually the case under an affirmative-action scheme. The episode sparked fresh calls for a national caste census (the opposition had pledged one while campaigning for the general election). The BJP has long opposed such an exercise but may be preparing another U-turn: the RSS voiced support for a caste census for the first time on September 2nd.

That may appease some lower-caste

voters but it could alienate upper-caste Hindus, many of whom are BJP stalwarts. If a caste census is conducted, its results could undermine BJP claims about improved social mobility. And such policy reversals come at the expense of Mr Modi's public image as a muscular, infallible leader. "We have finished Modi psychologically," Rahul Gandhi, the leader of the opposition, said on September 4th. "I sit in front of him in parliament and I know his confidence is gone."

Another boost for the opposition came on September 13th when the Supreme Court granted bail to Arvind Kejriwal, the chief minister of Delhi and leader of an opposition party. That will allow him to contest the Delhi election more aggressively. It is also the court's latest move to rein in investigative agencies that have targeted several opposition leaders. Mr Kejriwal was arrested in March on corruption charges that he says are politically motivated. Since his release, he has resigned as Delhi's chief minister and called for its election to be brought forward to November.

Although India's courts are still susceptible to government pressure, the Supreme Court has been more assertive in other politically charged cases, too. In July it blocked three BJP-ruled states from requiring shops and eateries on a Hindu pilgrimage route to display their owners' names (a policy clearly aimed at Muslim owners). In September the court also warned state governments against demolishing the property of those accused of crimes before they are convicted. Such demolitions often target Muslims in BJP-ruled states.

#### From 100 days to five years

As for Mr Modi's 100-day plan, he has hit many of his targets. But he had to adjust several parts. One omission was a proposal to privatise at least two state-owned companies. That apparently faced opposition from some coalition members. He also added new details, including a review of a scheme to recruit soldiers for fixed four-year terms. That scheme was designed to lower pension costs, which absorb more than a fifth of military spending. But it was hated by recruits, who were previously hired for at least 15 years with a full pension. Another of Mr Modi's coalition partners demanded a review.

None of this spells disaster for Mr Modi. It is early days, and he has scored some important wins, quickly winding up government-forming talks with coalition partners and then tweaking his budget to allocate more money to job creation. India is still the world's fastest-growing major economy: on September 3rd the World Bank upgraded its GDP forecast for this financial year from 6.6% to 7%. Still, Modi 3.0 clearly needs more than continuity. It demands compromise, too. ■

#### Protecting the Pacific Ocean

## Not waving but plodding

SYDNEY

**Australia's Pacific police are competing with China's**

A SMALL TEAM of Chinese police has been stationed in Honiara, the Solomon Islands' capital, since 2022, when the two countries signed a security agreement that shocked America and its allies. The cops train local officers in riot control and shooting, and give their families lessons in kung fu. Since their arrival, China's law-and-order footprint in the Pacific region has grown. Last year it sent police advisers to Vanuatu, north-east of Australia. In February officials in Kiribati, a neighbour of Hawaii, said that Chinese police were now embedded with its forces. China's attempts to establish police stations abroad were part of "transnational repression efforts", said an American official.

As well as deploying police, China hosts Pacific officers for training and is showering cash-strapped forces with equipment. Those advances have caused jitters in Australia, which has long been what Anthony Albanese, its prime minister, calls the "security partner of choice" for Pacific nations. His Labor government is having to spend lavishly to remain the region's go-to power. It scored a much-needed win on August 28th, when Pacific leaders unanimously endorsed a plan for Australia to beef up regional policing.

Australia will build several new training centres for Pacific police, including one in Brisbane, and finance a multinational unit of Pacific officers to be deployed during ri-



Too close for comfort

► ots or natural disasters. The details are being thrashed out, but Australia has allocated A\$400m (\$270m) over five years to the “Pacific Policing Initiative”. This is in addition to A\$1.4bn over four years promised last year for Pacific “peace and security”.

The security needs of island states are glaring. Their vast Pacific Ocean, covering an area bigger than every continent combined, is by one estimate the world’s largest unpoliced space. Illegal fishing boats pillage its rich stocks of tuna. Drug-trafficking is growing. Criminals use the Pacific as a transit route for methamphetamine and cocaine headed from the Americas to Australia and New Zealand. Gangs are putting down roots in Fiji and Tonga, fuelling local crime and addiction. Rather than cracking down, some police are cashing in.

But big powers are also lavishing attention on police because most Pacific countries do not have armies. China’s interests in policing co-operation are political as well as strategic, argues Graeme Smith of the Australian National University in Canberra. Chinese officers are expected to protect or control Chinese diaspora communities, he says. (A big settler community in the Solomons has been targeted in past riots.) China may also hope to gain influence over national-security decisions.

Against that backdrop, Australia’s new policing deal is a strategic win. “It was an explicit endorsement of Australia’s role as the main security provider for Pacific island countries,” says Mihai Sora, a former diplomat now working for the Lowy Institute, a think-tank in Sydney. But Australia has had to tread carefully. Unsurprisingly, Pacific countries do not want to be treated like pawns or bullied by their neighbours. They are concerned about the militarisation of their islands. Regional policing plans should be “framed to fit our purposes”, warned Charlot Salwai, Vanuatu’s prime minister, last month. For his part, Mr Albanese was at pains to stress that the plan was being “led by” Pacific police.

Australia has had some other wins. In April Mr Albanese’s government managed to fend off, for now, the possibility of Papua New Guinea signing a sweeping security agreement with China, after it also promised A\$200m to the country. And Fiji has ejected Chinese officers formerly embedded with its police.

Even so, China still has more to offer. When it failed to push through a regional security deal with Pacific countries in 2022 it seemed it might have overplayed its hand. But on September 11th it hosted several Pacific ministers for a forum on policing, and opened a facility for training Pacific police forces in Fuzhou. China’s “strategy of picking countries off one by one...seems to be working”, says Mr Sora. As in other areas, many Pacific nations see the benefits of playing both sides. ■



### Afghanistan

## No country for women’s rights

### The situation is getting grimmer for women under the Taliban

**L**AST MONTH the Taliban published a new consolidated code of religious laws. It has left Afghan women reeling, with many now searching for ways to leave. It also has implications for the Taliban’s quest for legitimacy and relations with the world. Three years after America’s withdrawal from the country, the situation in Afghanistan looks worse than ever.

Even before the announcement in late August, women were banned from attending secondary schools, universities, parks and female-only spaces such as beauty salons. They were not allowed to work in most professions. Now they are banned from raising their voices or reciting the Koran in public. They are prohibited from looking at any man other than their relatives, and have to cover their faces fully.

Nasiba (not her real name), a 28-year-old midwife in Badghis, in the north-west of the country, says that after three years under the Taliban she feels “a sense of hopelessness, loneliness”. When she leaves the house, she does so “with fear, shaking, that someone might say something to me or stop me”. Some women have reacted to the latest announcement by reducing how much they go out; others ensure they are never alone outside. Amina, a widow in Kabul, the capital, locks her daughter and son inside. Her children eat once a day, if at all: “If there’s food they eat, if not they wait.”

The new religious code is a “pivotal moment”, says Richard Bennett, the UN spe-

cial rapporteur on human rights in Afghanistan, who is barred from the country by the Taliban. He wants “gender apartheid” to be considered a crime against humanity. Activists want the Taliban to be tried at the International Criminal Court (Afghanistan has signed up to the Rome statute). That seems unlikely. Outrage in the West has been muted, not least as many are distracted by the wars in Ukraine and Gaza.

Suhail Shaheen, the Taliban’s choice to be permanent representative to the United Nations, says the new code was introduced to “limit” the powers of the morality police, who have become more present in the country. Mr Shaheen insists that the law banning women from speaking outside had been “misinterpreted”. He says that the Taliban has issued thousands of licences for women interpreters. The ban applied to women singing at large gatherings of men, he claims. He adds that women can study midwifery or go to a religious school.

That is of little comfort to many women. Nasiba says that she has started to think about leaving the country, mostly for the sake of her ten-year-old daughter but also of her five-year-old son, who admires the Taliban. “He sees [the Taliban] at the shopping centre, he sees their rangers and wants to take a photo...maybe he’ll become a Talib,” she says, with a grim laugh. “When there’s no education...no computer classes, or English, just religious education, what else is he going to become?” ■

## Education

## Cramming culture

DELHI AND SINGAPORE

## Private tutoring is booming across poorer parts of Asia

**T**HE MORAL of the story is clear in “12th Fail”, a recent Bollywood hit about a poor farm boy, Manoj, bent on passing India’s ruthless police exam. Persevere and be richly rewarded, it suggests. Yet for a film about education and meritocracy, the portrayal of Indian schools is dismal: teacher-abetted cheating is rife at Manoj’s local school. Where he ultimately finds success, and love, is not at school, but at a jam-packed tutoring centre in Delhi.

Private tutoring is well known as an East Asian phenomenon. Apart from in China, most students in East Asia get it: 72% in Hong Kong; 79% at South Korea’s *hagwons*; 52% of lower-secondary schoolers, Japan’s main test-crammers, in the country’s *juku*. In China, where 38% of students (and 45% in cities) took private tutoring before a 2021 clampdown, many centres have simply gone underground. These businesses, whatever their flaws, exist alongside education systems that are highly effective and well-funded.

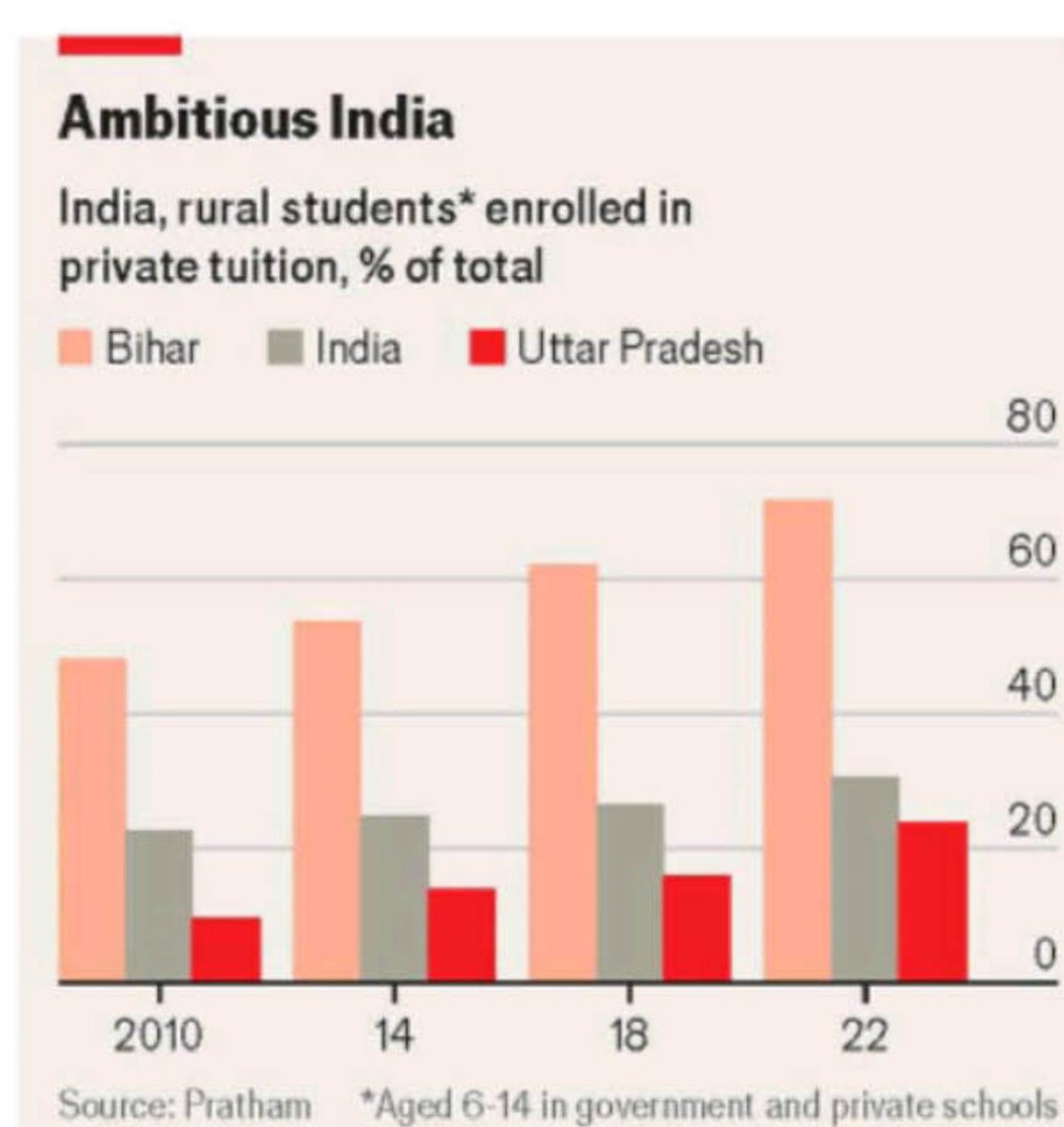
## The hard way

But now private tutoring is on the rise in poorer parts of Asia. The scale is huge. Although the data are scattered and shoddy, we have tried to estimate tutoring’s prevalence in South and South-East Asia, excluding Singapore, where the education system more closely resembles those in East Asia. From Pakistan to Indonesia, we reckon that roughly 258m children get private tuition.

The biggest market is in India. Fully 31% of rural Indian schoolchildren under 15 now get private tutoring, up from 23% in 2010; in some poorer states, three in four do (see chart). Tax revenue from Indian tutoring centres has more than doubled since 2019. But even removing India from the mix still leaves a tutoring tally of 131m children, by our estimate.

The first reason for the growth is gaps left by formal education systems. In poorer parts of Asia, the state often struggles to provide good schools. In this century, as primary education has neared universality, the share of children enrolled in secondary school rose by 24 points in South Asia and by 16 percentage points in the rest of Asia, according to the World Bank. Yet over the same period, government education spending as a share of GDP has stagnated or fallen across much of the region.

In many places this has led to cuts to



teachers’ salaries and textbooks. In Cambodia, one of Asia’s poorest countries, an estimated 82% of students take private tutoring, mostly from their own low-paid teachers seeking a salary top-up. Schools end up less equipped to deliver results, and the worst fall apart. Yet many Asian systems sort children through high-stakes exams. So parents turn to tutors.

A second factor is heightened social competition, driven by a growing middle class and a greater demand for a limited number of university places. Urbanisation also plays a role: children in cities are likelier to get private tutoring than rural ones, thanks to the greater supply of tutors and

better internet access. In India, where cities have added 200m residents in 20 years, many newly urbanised parents think that buying their children tutoring will help them get a professional-class job. In Delhi, Mohammad Shahzad, a supervisor at a generator manufacturer, pays 2,800 rupees (\$33) a month to have his two daughters tutored, a 30% addition to the usual school fees. His daughters’ teachers are competent, but Mr Shahzad feels that tutoring, despite its expense, is worth it. “It’s like having one meal: you survive, but with two or three, you’re healthier,” he says.

The final factor is an arms-race dynamic. Private tutoring is an anxiety industry: if your neighbour’s children get private tutoring and yours don’t, they risk falling behind. This holds whether tutoring demand originates from the pressures of a rigorous schooling system or the desire to flee a failing one. The availability of online tutoring, supercharged by the pandemic, has made it easier to get in on that arms race.

Even so, research measuring the effectiveness of tutoring has produced mixed results, says Mark Bray, an expert on Asian private tutoring. Partly this is because of its enormous diversity. One study in rural India found that students who had private tuition got higher reading and maths scores than those who did not, on a par with an extra year of school. But other research, in Sri Lanka and China, finds little or no effect on results.

## Another brick in the wall

The costs of private tutoring can be large. Studies show some children in private tutoring sleep less well. The stresses extend to parents’ wallets. Umesh Sharma, a chauffeur in Delhi, spends 1,200 rupees a month to have his two sons tutored: 4% of the city’s average monthly income and ►



Expensive, but worth it?

► about as much as their school fees. In other parts of India, it is worse. In West Bengal nearly half of all education spending, public and private, goes on coaching.

One big worry is that in some places private tutoring is eroding public education. In Nepal and Cambodia, school-teachers withhold parts of the curriculum for their own paid tutoring after school. The incentive is clear: in Cambodia, low-paid teachers who offered tutoring doubled their salaries. In Bihar, India's poorest

state, a recent survey by JJSS, an NGO, found that dozens of dilapidated government schools had almost entirely outsourced their educational functions to private centres. Government schools have been reduced to "merely providing a mid-day meal and arranging examinations".

What to do? South Korea spent four decades trying and failing to suppress private tutoring, before such efforts were ruled unconstitutional in 2000. Similarly interventionist approaches, like China's rash crack-

down, succeed only in driving tutoring underground. Some governments are relaxed: the education ministry in Thailand says that "the state must begin with an assumption that private tutoring does not reduce social welfare." Others are experimenting. In response to a recent string of suicides, this year India's education ministry introduced rules banning bigger coaching centres from enrolling students aged younger than 16. Private tuition is here to stay. But it could be managed more effectively. ■

## BANYAN

### *Geopolitical gaslighting*

*The private sector won't save America's Indo-Pacific policy*

America wants South-East Asians to know that it is the region's best friend. In summits, white papers, speeches and private asides since coming to office in 2021, officials of the Biden administration have told them that America, not China, is the top source of foreign direct investment into the region. It is Uncle Sam who is going to make them rich.

Their audience could be forgiven for feeling gaslit. The most visible investments in these countries in recent years have come from China, not America. It is China that is building new high-speed trains, ports and public buildings, in a bid to win favour in the region. So why the empty boast?

America's pitch to South-East Asia is part of a creative effort by President Joe Biden's administration to compete for economic influence without offering Asian countries new access to American markets. To do this, it has sought to emphasise investment rather than trade, and to highlight the American private sector's part in the region's economic growth since the second world war.

There is some truth in what American officials say. America has built up at least twice as large a stock of investment as China has in South-East Asia, the heart of geopolitical competition in the continent. But the bulk of these investments arrived decades ago. A new report from the Lowy Institute, a think-tank in Sydney, shows that over the past decade China invested \$218bn in the region. America invested only \$156bn.

It is the marginal dollar that matters to local business leaders, and to politicians keeping an eye out for their next ribbon-cutting opportunity. The goodwill and influence that investment confers must fade as decades pass. The

prospect of future returns is more potent—and here China has the advantage.

In an earlier era, America might have hoped to compete on quality, if not quantity. America invested in projects that moved Asian industries up the value chain, such as advanced manufacturing and semiconductors. Mr Biden often talks about America as a provider of high-quality investment. The contrast with China, whose investments once focused on things like garments, is implicit.

But China now competes on quality, too. Firms from both countries are investing in data centres to power the boom in artificial intelligence. Of the two, only China is bringing South-East Asian firms into its electric-vehicle supply chain. Only China is investing in processing critical minerals in South-East Asia which will go into batteries to power those vehicles.

That is not to say that American firms cannot still play a helpful role in reducing Chinese influence. Where an investment makes sense, they can provide an alternative to Chinese financing. Competition between the two can lead to better terms

for borrowers. The problem is that American firms are rarely interested in investing in these projects, which they regard as riskier.

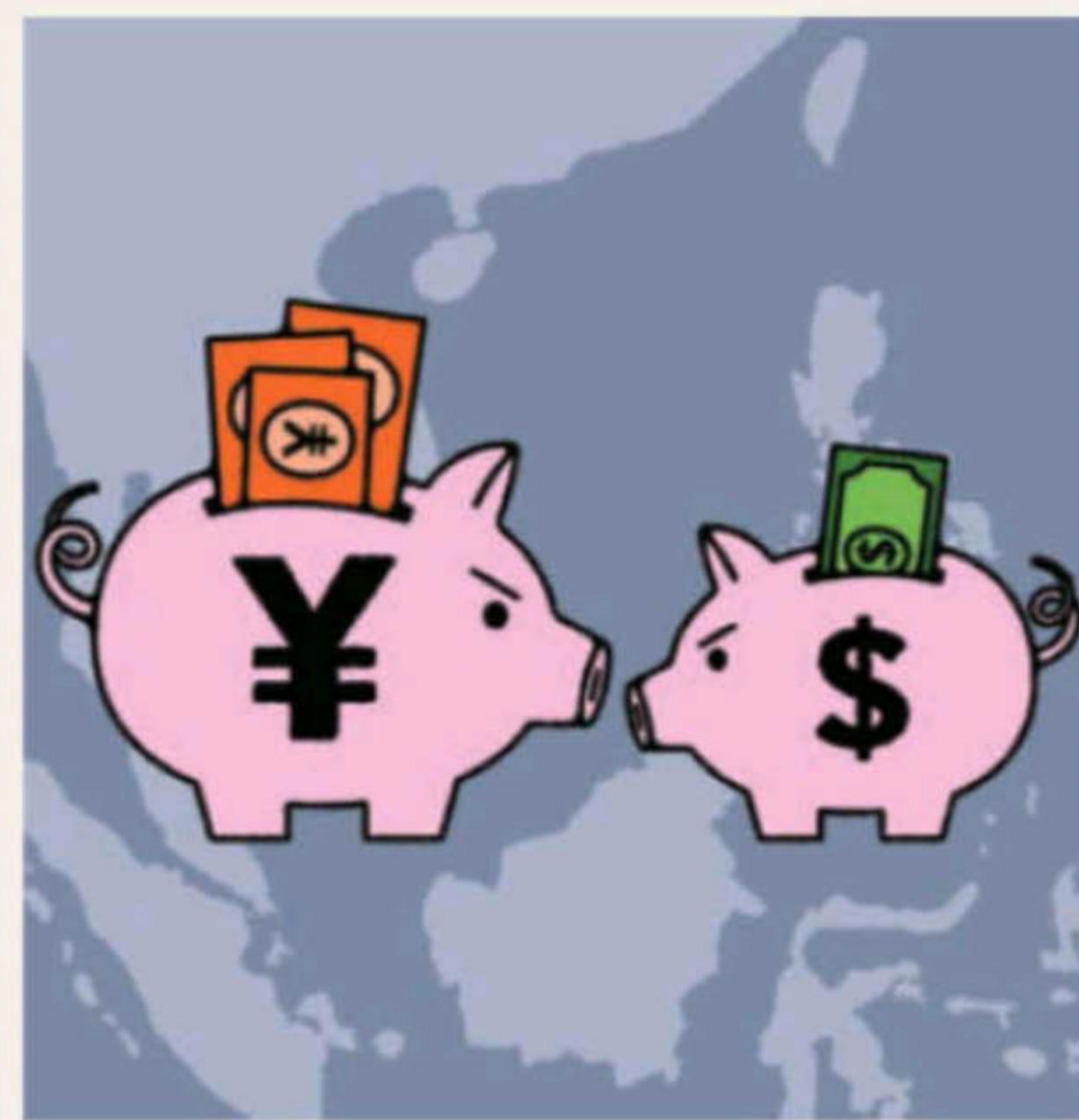
Nor can America simply tell its firms to invest in unprofitable projects in South-East Asia, as China can. Asian countries know that private-sector investment is not directed by bureaucrats in Washington, so they don't worry that they will get less if they fall out of favour.

Chinese investment, however, can be won or lost over geopolitics. Aides to Joko Widodo, Indonesia's president, say that he has been reluctant to criticise China over its actions in the South China Sea or Xinjiang for fear of losing its backing for his infrastructure splurge.

In sum, private-sector investment will not preserve declining American economic influence in Asia. America has no clear advantage on quantity or quality. And it cannot convert capital into political capital in the way that China can.

What would work better? Mr Biden, like Donald Trump before him, has said no to the Trans-Pacific Partnership, a trade deal signed by Barack Obama. Mr Trump attacked it in 2016 as a bad deal, and Democrats fear that it sank Hillary Clinton's bid for the presidency. Kamala Harris, too, has long been sceptical of such deals. But only its offer of greater access to the world's largest market offers any prospect of reversing the ebb of American influence in the region.

In the meantime, American officials will keep trying to benefit from nostalgia for investments past. This is no great offence; they are working with what they have. The only real harm would be if they began to believe it themselves. That would delay their own much-needed reckoning of America's declining economic influence in Asia.



## China



**Raising the retirement age (1)**

### Sunset delayed

After much hesitation, China is raising its strikingly low retirement age. The public is angry

CHINA'S LEADER, Xi Jinping, boasts that his political system has a matchless ability to get difficult things done. "For anything that benefits the party and the people," he has said, "we must act boldly and decisively." Yet it was not until September 13th, after years of indecision, that China announced the first raising of its retirement age since the 1950s. From among the world's lowest, it will begin to creep closer to rich-world norms.

Having seen the unhappy reaction to similar changes elsewhere, Mr Xi may have had reason to hesitate. Turmoil in the West is normally something that China's propagandists exploit. But huge protests in France last year against a higher pension age triggered anxious and angry comments in China over the government's repeated mutterings about doing something similar. "The common people are cursing behind closed doors," wrote one user of

Weibo, a social-media platform, referring to the contrast between public anger in France and its furtive form in China.

When China at last bit the bullet and published its own timetable, it did so with little fanfare. State-run television mentioned the move below several other headlines on its main evening news. Viewers had to wait more than 35 minutes (and sit through nearly 20 minutes telling of Mr Xi's activities) for just a bare outline. The retirement age for female blue-collar workers will rise from an astonishingly low 50 to 55, for female white-collar workers from 55

→ ALSO IN THIS SECTION

---

**39 Child-care challenges**

---

**40 Prisoner diplomacy**

---

**40 A typhoon hits Shanghai**

to 58, and for men from 60 to 63. These changes will begin in January 2025 and be phased in over 15 years. For men and female white-collar workers, the pension age will rise by a month every four months. For blue-collar women it will rise by a month every two months.

The evening news did not bother with a follow-up report. But Chinese netizens were very much bothered by the government's actions. Posts with the hashtag "reform to delay the statutory retirement age" have garnered more than 870m views and over 240,000 comments on Weibo. Censors have been swift to move in. More than 5,100 of these comments were posted below an early report by Xinhua, the government's main news agency. Try reading these now; fewer than 30 remain, none of them disapproving.

But anger abounds among comments still visible on less-filtered accounts. "Capitalist exploitation has reached the common people. Brilliant!" wrote one in a typical thread. "So, who was the People's Congress representing?" asked another, referring to the country's rubber-stamp legislature that suddenly approved the reform without public consultation. A third weighed in: "Corrupt officials would love to work for ever." And another: "If this continues, society will descend into chaos." ➤

► That is unlikely. Surveillance is so intense and the police so determined to crush unrest that even if there are demonstrations, they are almost sure to be small and far from the country's most politically sensitive locations. It would be hard to imagine China tolerating the kind of protests that erupted in Russian cities in 2018 over pension-age reform.

China paid attention to those events, including the concessions made by Russia's ruler, Vladimir Putin. Russia's original plan was to raise the retirement age for women from 55 to 63. Mr Putin revised that to 60, though he stuck to 65 for men (up from 60). It had long been expected that when China made its own move, it would announce gradual steps towards 65 for men and women. This would be just over the average in the OECD, a club of mostly rich countries, which in 2022 was 64.4 for men and 63.6 for women. In the end, China settled on a plan that will see men required to work until they are 63, though they may go on until 66 if they choose. Women will enjoy similar flexibility.

So why, if China is so capable of preventing protests, did it not act earlier? After all, it faces a demographic crunch and looming pension-fund crisis no less fearsome than those of other countries that have raised their retirement ages. Life expectancy has risen from 35 when the Communist Party seized power in 1949 to 77 today, less than three years below the OECD average. People over 60 already make up more than a fifth of the population. By 2035 that ratio will be closer to a third (see chart). The working-age population—from which pension contributions are drawn—is falling. Some experts have said that without any change, the state's pension fund, on which most retired people rely (private pensions have yet to take off), would have run out of money by 2035.

Concerns raised by critics of reform may have resonated among policymakers. In many households, the retired play a crucial role in providing child care. Keep them at work longer, a common argument goes,

and young people will be even less inclined to have babies (see next story).

Another oft-heard objection to reform is that forcing people to work longer will make it harder for young people to get jobs. Youth unemployment in China is eye-wateringly high. It reached 21.3% among urban residents in June 2023. The government then spent months rejigging its calculations and came up with a somewhat less embarrassing rate. In July it was 17.1%. But this argument against raising the retirement age holds less water: making people work for longer could encourage them to consume more, which could boost the economy and create jobs.

For every person who is anxious about

youth unemployment there is someone who frets that raising the retirement age will cause the same problem among the elderly. Age discrimination is rampant in China. Working longer may be fine for people in secure jobs, such as in the civil service or state-owned firms. But in the private sector people worry they will be forced out before they reach retirement age because they are considered too old. On social media, commenters seethe about state employees for another reason, too: their pensions are much higher.

Amid this debate a huge part of the population is often ignored. More than half of China's citizens have a rural *hukou*, or household registration, including most ►

### Raising the retirement age (2)

## The trade-off

### Having workers toil for longer may lead to other challenges

**C**HINA'S PENSIONS are underfunded and its population is getting older. So the government's recent decision to raise the retirement age for state pensions seemed overdue (see previous story). But it may create other problems, most notably in the field of child care. And these challenges may lead young people to have fewer babies, exacerbating the country's demographic crisis.

According to state media, under 8% of Chinese toddlers are enrolled in nurseries. Most families rely on grandparents to care for them. That is true in cities, where nearly 80% of households are thought to do so. And it is also the case in rural areas. Parents from the countryside often work far from home, leaving their children behind. Walk around some villages and all you will see are the elderly and the young.

So raising the retirement age risks creating a child-care deficit, which may affect the decisions of young women. China's fertility rate, or the number of children that each woman is expected to have, is 1.1. That is among the lowest in the world and well below the 2.1 needed to keep the population stable. In a study published last year, Jing Zhang of Erasmus University in Rotterdam found that women who lean on grannies for care are four times more likely to have a second child than women who do not.

Many women face a choice between starting a family or continuing their careers. Chinese women are increasingly choosing the latter. But the availability of grandparent-provided child care might



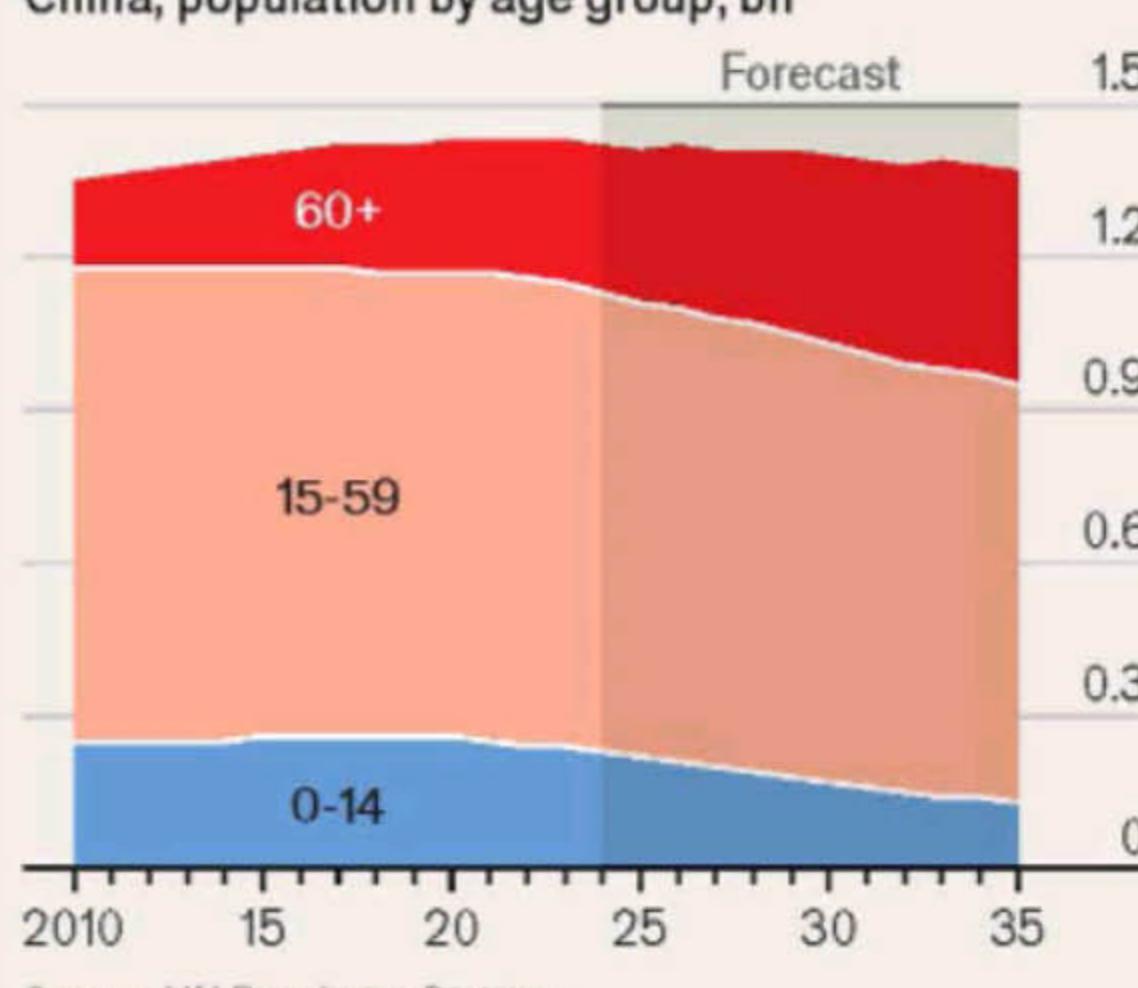
You can find your way home, right?

mean that women need not choose. Research published in 2019 showed that access to such care increased the labour-force participation of mothers with young children in cities by around 40%.

Another area likely to be affected by the higher retirement age is care of the elderly. It is common for Chinese women in their 50s to look after the old as well as the young. On social media some commenters wonder how society will cope with all this change. He Lin-shan, a popular poster on Douyin, China's version of TikTok, asked: "If women can't retire, will the policy experts take care of their families for them?"

### Growing old

China, population by age group, bn



► of the 300m or so people who have moved from the countryside to work in cities. Many are only entitled to a pension that is a tiny fraction of the amount given to those registered as urbanites. It is about 200 yuan (\$28) per month on average.

No change to this has been announced. The pensionable age for many rural *hukou*-holders will remain at 60. One user of Weibo pointed out a reason for the silence. "If pensions were distributed evenly across the entire population, including farmers, I bet everyone's pension would be less than it is now," he wrote. (By "everyone", he meant "urban people".) Mr Xi's calls for "common prosperity" do not, it seems, imply equality for farmers and migrants. ■

#### Diplomacy

## Prisoner or hostage?

#### China frees an American pastor after 18 years in jail

**D**AVID LIN had been trying to help an underground Christian group build a church in Beijing when he was detained by the Chinese government in 2006. The ruling Communist Party does not look kindly on spiritual activities it does not control. So Mr Lin, an American pastor, was charged with contract fraud, a common pretext for jailing religious leaders. As expected, he was convicted and condemned to life in prison. Though his sentence was later reduced, he was not due to be released until 2029.

Yet on September 15th the American State Department announced that Mr Lin, 68, had been freed and was heading home. The move came after much diplomacy. President Joe Biden raised the issue of detained Americans in China during a meeting with his Chinese counterpart, Xi Jinping, in November. So did Antony Blinken, America's secretary of state, in talks with China's chief diplomat, Wang Yi, in July. When Jake Sullivan, America's national security adviser, visited Beijing last month, he is thought to have pressed Mr Lin's case.

The pastor was "wrongfully detained" by China, says the State Department, using a designation that may imply he was being held in order to influence American policy. Two other American prisoners still fit that bill, according to the department. A businessman from Texas called Mark Swindan has been held since 2012 on drug-related charges. Kai Li, another businessman, from New York, was detained in 2016 and later convicted of espionage. Both men deny the charges against them.

In total there are more than 200 Amer-

icans under various forms of "coercive measures" in China, according to estimates from the Dui Hua Foundation, an American NGO that lobbies on their behalf. Some of these people are in prison. Others have been hit with "exit bans", meaning they are allowed to travel within China, but cannot leave. The most unfortunate among this group only discover they have been banned from exiting China upon trying to check in at the airport.

China denies engaging in hostage diplomacy. But it likes to have an "inventory" of foreign prisoners it can use when negotiating with other countries, says Peter Humphrey, a China analyst. These detainees come in handy when China wants to get back its own citizens who are locked up abroad, or when it tries to retrieve people who have fled for various reasons, such as officials hoping to avoid corruption probes. China has signed prisoner-transfer agreements with several countries.

Mr Humphrey, who is British, spent 23 months in a Chinese prison between 2013 and 2015 for allegedly violating laws protecting personal data (he denies this). But it was a more high-profile case, in 2018, that put China's detention policies in the spotlight. In December of that year two Canadians—Michael Kovrig, a former diplomat, and Michael Spavor, a businessman—were taken into custody and later charged with spying. This seemed to be in retaliation for the detention in Canada of a Chinese businesswoman, Meng Wanzhou,

*Chaguan*, our China column, has been suspended. Our goal is to reinstate it when we have a new columnist resident in Beijing.

on suspicion of violating sanctions against Iran. The Justice Department in Washington had sought her arrest so that she could be extradited to America.

The "two Michaels", as the Canadians became known, spent more than 1,000 days in prison. Both men were released in 2021, at the same time as Ms Meng. "So hostage diplomacy ended with a cold-war-style prisoner exchange, with the skies between China and Canada serving as the frontier bridge," we wrote back then. On the next two episodes of our "Drum Tower" podcast, Mr Kovrig shares the story of his detention for the first time.

The release of Mr Lin has been celebrated by American officials. But the State Department continues to warn Americans to reconsider travel to China because of the "risk of wrongful detentions" and the "arbitrary enforcement of local laws". China calls this unreasonable. It is desperate to attract tourists and foreign investors to boost its sluggish economy, so it wants the travel warning to go away.

There have been hints recently that America might tone down its language. Perhaps the homecoming of Mr Lin will lead to action. His release is a rare bit of good news from the world of Sino-American diplomacy. ■



#### A typhoon batters China's largest city

Shanghai was hit by Typhoon Bebinca on September 16th. Hundreds of thousands of residents were evacuated in what state media called the strongest storm to rip through the financial hub in 75 years. Fierce winds uprooted trees and toppled billboards. The weather also disrupted the three-day mid-autumn festival. Officials had hoped to see a big increase in consumption during the holiday. Faced with a sluggish economy, the government is encouraging people to spend more. But Shanghai's residents were stuck inside during much of the festival. Even elsewhere, consumer demand has been soggy.

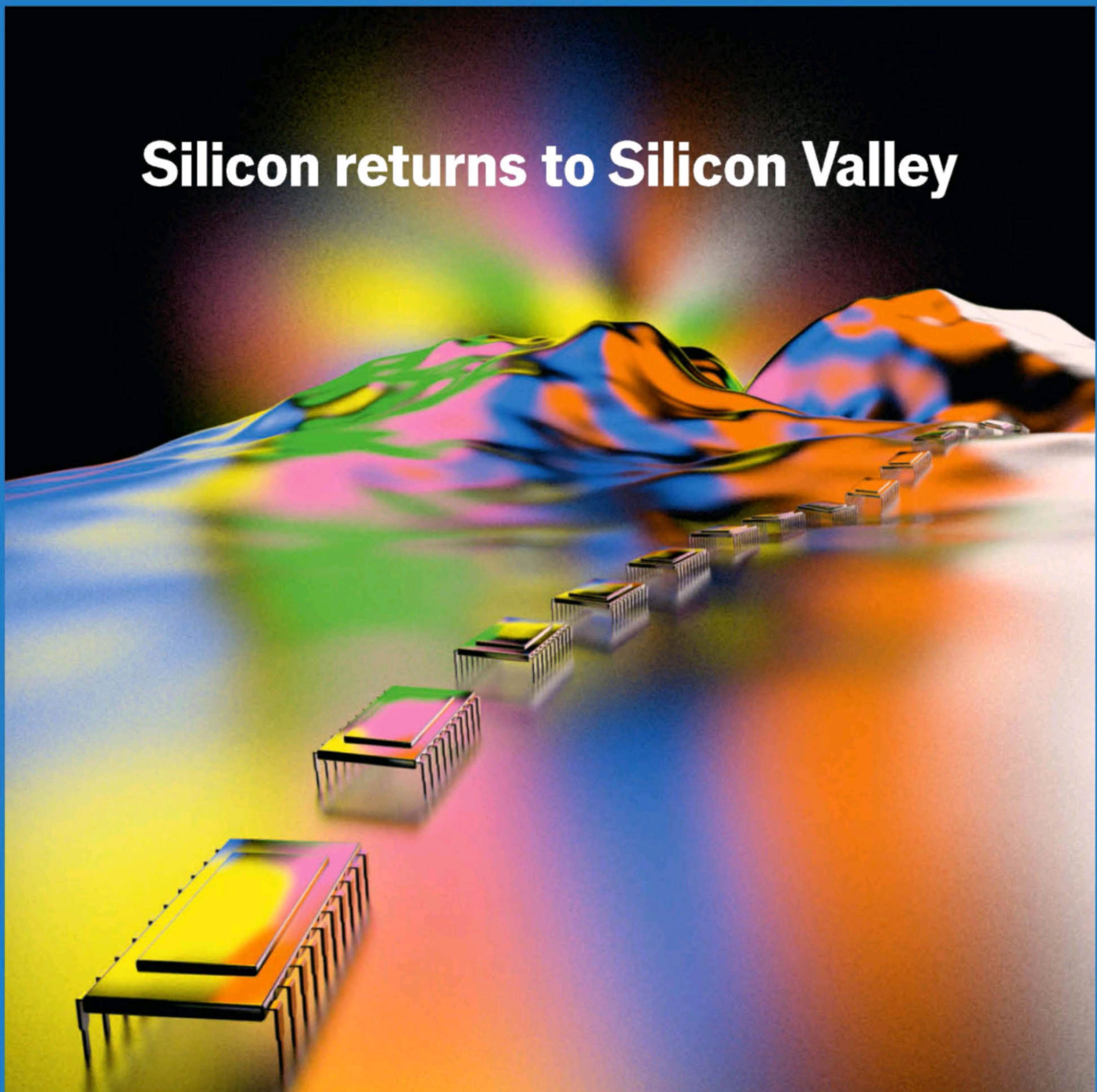
# TECHNOLOGY QUARTERLY

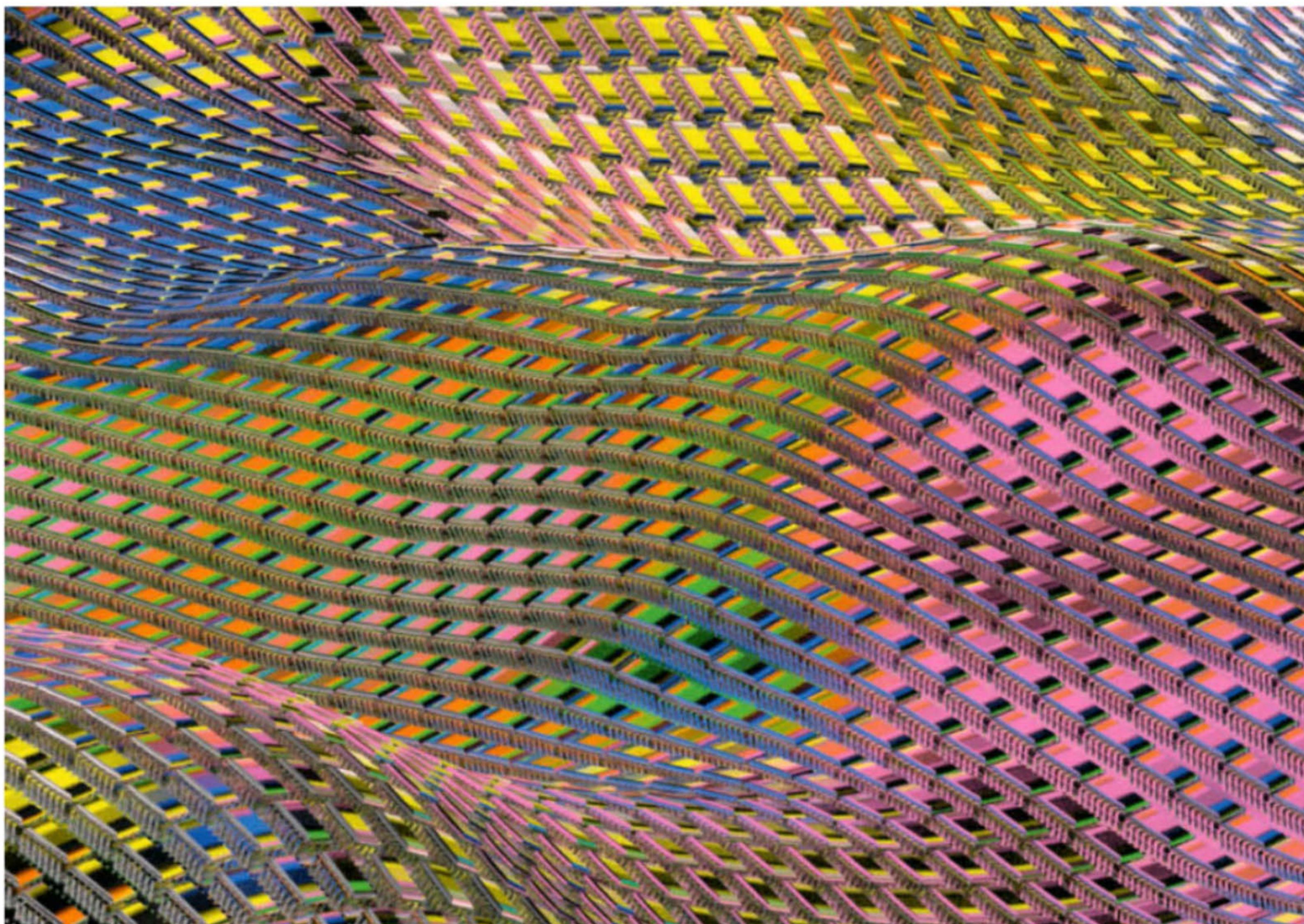
*Chipmaking*

→ SEPTEMBER 21ST 2024

- 3 The chips are up
- 5 Shrinking the transistors
- 7 Node names
- 8 The problem of packaging
- 10 Chip design
- 12 Beyond digital computing
- 14 Relentless innovation

## Silicon returns to Silicon Valley





## Chipmaking

# Putting the silicon back in the valley

**AI has returned chipmaking to the heart of computer technology, says Shailesh Chitnis**

A CENTURY AGO, 391 San Antonio Road in Mountain View, California, was the site of an apricot-packing shed. Today it is just one of the many low-rise office blocks on busy roads that house Silicon Valley's tech startups and wannabe billionaires. In front of it, though, stand three large and peculiar sculptures, two-legged and three-legged forms that bring to mind water towers. They are giant versions of two diodes and a transistor, components of electronic circuitry. In 1956, 391 San Antonio Road became the home to the Shockley Semiconductor Laboratory, a startup devoted to the idea of making such components entirely out of silicon. It is the birthplace of Silicon Valley.

The firm, founded by William Shockley, a co-inventor of the transistor, was a commercial flop. The embrace of silicon was not. In 1957 eight of Mr Shockley's employees, whom he dubbed the "traitorous eight", defected to start Fairchild Semiconductor less than two kilometres away. Among them were Gordon Moore and Robert Noyce, future co-founders of Intel,

a chipmaking giant, and Eugene Kleiner, co-founder of Kleiner Perkins, a ground-breaking venture-capital firm. Most of the storied tech companies in Silicon Valley can trace their roots, directly or indirectly, back to those early Fairchild employees.

Before semiconductor components were invented, computers were room-size machines that used fragile and finicky vacuum tubes. Semiconductors, solid materials in which the flow of electrical current can be controlled, offered components that were more sturdy, more versatile and smaller. And when such components were made mostly from silicon, it became possible to make a whole raft of them on a single piece of the stuff. Tiny transistors, diodes and the like on silicon "chips" could be wired together into "integrated circuits" designed to store or process data.

In 1965 Moore, while still at Fairchild, noted that the number of transistors that could be put into an integrated circuit at a given cost doubled every year (he later relaxed the doubling time to every two years). His observation, codified as "Moore's law", mattered. Chips produced in 1971 had 200 transistors per square millimetre. In 2023 the MI300, a processor built by AMD, an American semiconductor firm, crammed 150m transistors into the same area. The smaller the transistors got, the faster they could switch on and off. The MI300's components are thousands of times faster than their predecessors were 50 years ago.

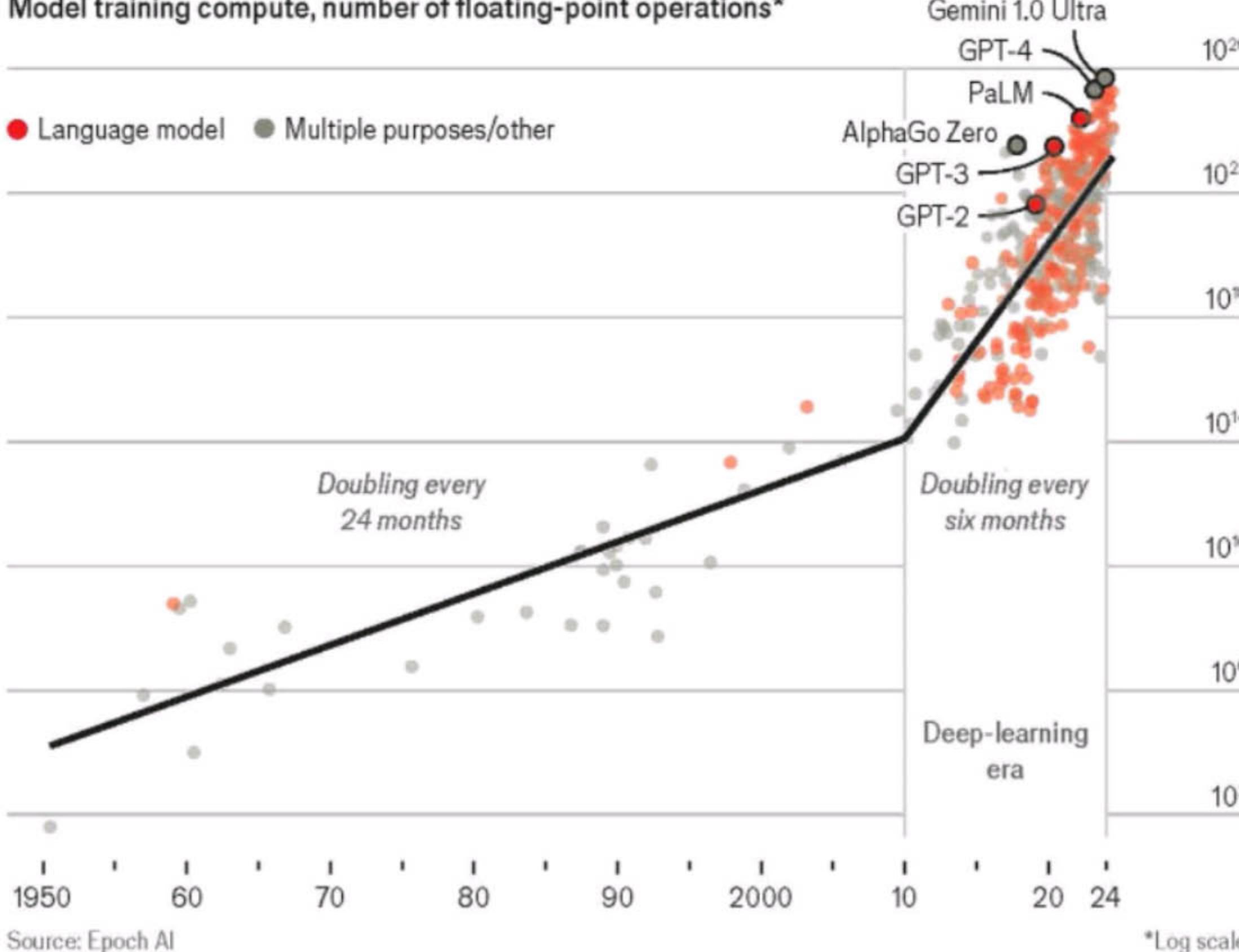
All major breakthroughs in computing, from personal computers and the internet to smartphones and artificial intelligence (AI), can be traced to transistors getting smaller, faster and more affordable. The transistor's progress has driven technology's progress.

For a while, the technological centrality of silicon chips was mirrored by the importance of the businesses that made them. In the 1970s IBM, which made ►►

### Re-doubling their efforts

Model training compute, number of floating-point operations\*

● Language model ● Multiple purposes/other



Source: Epoch AI

► chips, the computers that used them and the software that ran on them, was a giant beyond compare. In the 1980s Microsoft proved that a company selling only software could be even more attractive. But Intel, which made the chips on which Microsoft's software ran, was a huge force in its own right. Before the dot-com bust of 2000 Intel was the sixth-biggest company in the world by market capitalisation.

After the bust, though, the "Web 2.0" services offered by firms like Google and Meta took centre stage, with the semiconductors on which their platforms were built increasingly commodified. To describe the dynamic underlying the growth of big tech, it was software, not silicon, that Marc Andreessen, a venture capitalist, credited in 2011 with "eating the world".

The boom in AI has changed that; its progress depends on immense computational power. Before 2010 the amount of computing needed to train leading AI systems grew roughly in line with Moore's law, doubling every 20 months. Since then it has doubled every six months (see chart 1). That means there is ever more demand for ever more powerful chips. Nvidia, an American company which specialises in chips of a sort peculiarly well suited to the needs of the large language models (LLMs) that dominate AI, is now the third-most valuable company in the world. Since late 2023 the MSCI index of chipmaking firms has outperformed its index of software firms by a wide margin for the first time in over a decade (see chart 2).

As AI makes chipmaking important again, companies with AI ambitions are getting into the game themselves. The driver is not just training, but subsequent use (also called "inference"). Answering queries with LLMs, though not as demanding as training them in the first place, is still a big computational task, and one that needs to be undertaken billions of times a day. Because bespoke circuits can do this more efficiently than the general-purpose ones sold by most semiconductor providers, some companies running LLMs are choosing to design chips just for this purpose. Apple, Amazon, Microsoft and Meta have all in-

vested in building their own custom AI chips; there are more processors designed by Google and used in data centres than by any other company but Nvidia and Intel. Seven of the ten most valuable firms in the world are now in the chipmaking business.

The sophistication of a chip depends mostly on how small its features are; currently the cutting edge is defined as having "process node" measurements of less than seven-billionths of a metre (seven nanometres, or 7nm—see box on later page for a pinch of salt with which to take this). That is where the AI action is centred. But over 90% of semiconductor manufacturing capacity works with process nodes of 7nm or more. These chips are less technologically challenging, but more widespread, found in everything from televisions and refrigerators to cars and machine tools.

In 2021, at the height of the covid-19 pandemic, an acute shortage of such chips disrupted production across various industries, including electronics and cars. The industry's pursuit of efficiency had seen it become globally distributed, with different regions specialising in different bits of the chain: chip design in America; chipmaking gear in Europe and Japan; the fabs where that gear is used in Taiwan and South Korea; the packaging of the chips and their assembly into devices in China and Malaysia. When the pandemic disrupted these supply chains, governments took note.

In August 2022 the American government dangled a \$50bn package of subsidies and tax credits to lure chip manufacturing back to America. Other regions have followed suit, with the EU, Japan and South Korea promising almost \$94bn in handouts. Things have been made more complicated by America's attempts to cut off China's access to cutting-edge chips and the tools with which they are made by means of export bans. China has responded to those bans by restricting exports of two materials vital for chipmaking.

But the chipmakers' biggest worries are not industrial policy or national rivalries. They are technological. For five decades, shrinking transistors boosted performance without increasing energy consumption. Now, as chips get denser and AI models bigger, energy use is soaring. To maintain exponential gains in performance, chipmakers need new ideas. Some, like tighter integration between hardware and software, are incremental. Others are radical: rethinking silicon or ditching digital processing for other techniques. This Technology Quarterly will show how such advances can keep the exponential engine humming. ■

### The chips are up

MSCI world stockmarket indices, January 1st 2010=100



Source: LSEG Workspace

\*And equipment

<sup>†</sup>To September 11th

**Transistors**

# Shrink to fit

**The semiconductor industry faces up to its most formidable technical challenge yet**

INSIDE A STERILE, cavernous building in the Dutch city of Eindhoven, the latest monster dreamed up by ASML, a maker of chipmaking gear, is quietly humming away. Weighing 150 tonnes and the size of a double-decker bus, the tool offers humans the latest way to do something they have been doing since the ice age—writing on stone, otherwise known as lithography. The stone here is silicon; the writing is done with light.

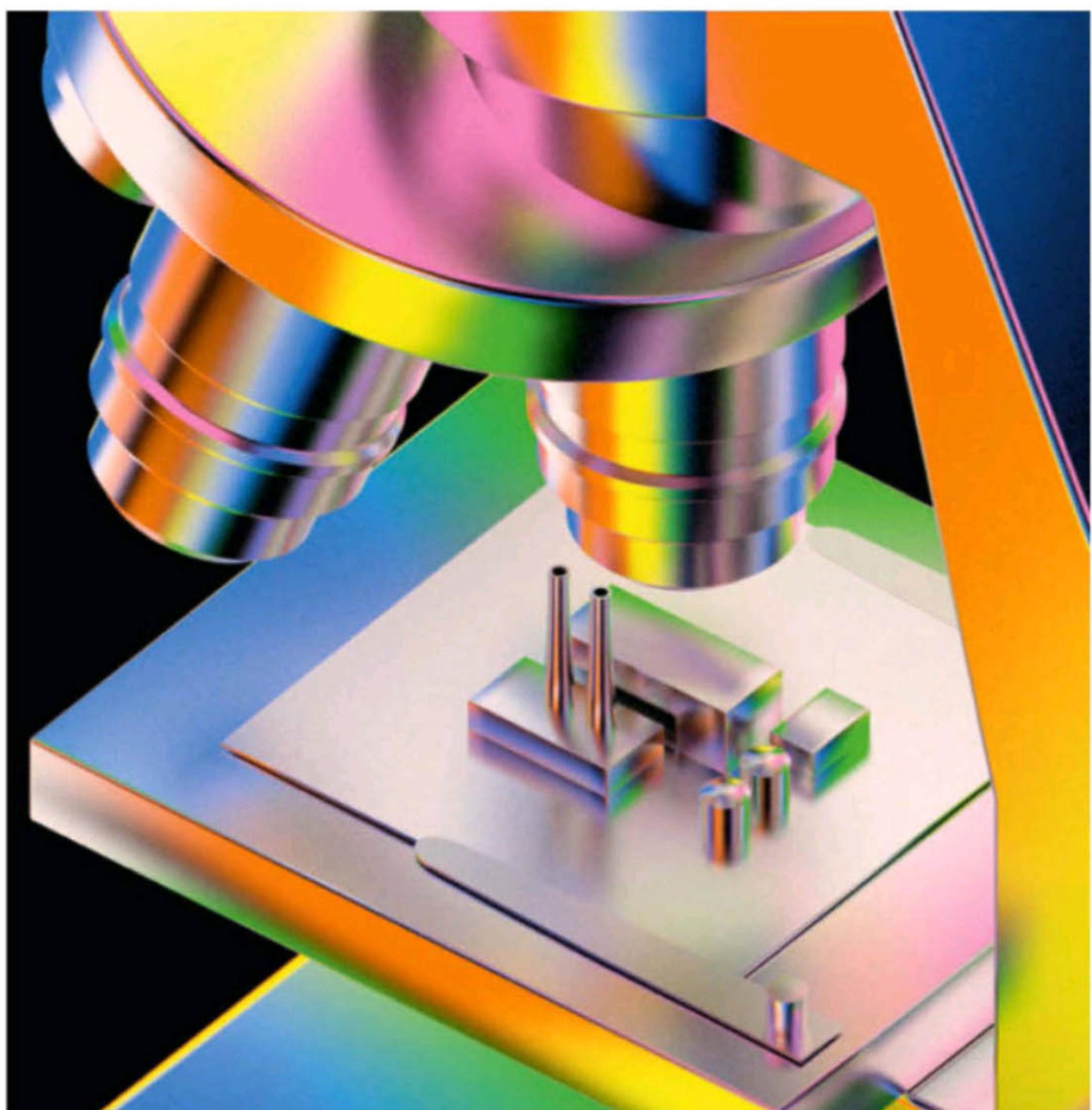
The machine fires 50,000 droplets of tin into a vacuum chamber every second. A laser heats each drop to 220,000°C, 40 times hotter than the surface of the Sun. This transforms droplets into plasma that emits light of extremely short wavelength (extreme ultraviolet, or EUV). The narrow beam of light is reflected, using a series of mirrors that are smooth down to tens of picometres (trillionths of a metre) to hit a mask that contains blueprints of the chip's circuits.

The EUV rays bounce from the mask and project the design onto a silicon wafer coated with a thin layer of sensitive material called photoresist. The wafer is moved very precisely so that the pattern can be printed again, and again; a wafer can be used to make hundreds of chips. Typically, the exposed photoresist (hit by the light) is washed off, creating a 'stencil' on the silicon wafer. Subsequent machines etch away material, implant ions or deposit metals onto the 'stencil' to create a layer of the chip. A new layer of photoresist is then added, a new pattern projected onto it, and a new layer of etching takes place. A modern chip can require dozens of such layers of printing.

The latest EUV lithography machines from ASML cost more than \$350m each. They thus highlight a dynamic of the semiconductor industry: as transistors, the main type of electronic component found in chips, have become smaller, the tools and factories to make them have become bigger and pricier. Brian Potter of the Institute for Progress, an American think-tank, estimates that in the late 1960s a semiconductor fabrication plant (or fab) cost about \$31m in today's money to build and equip. The newest fabs that TSMC, a Taiwanese giant, is building in Arizona, will cost \$20bn each.

**Itsy bitsy teeny weeny**

The transistors these fabs now make by the trillion are switches. Each one has terminals called the source and the drain that are separated by a channel of silicon. A third terminal, called the gate, sits atop this channel and regulates the flow of current between the source and drain. When voltage is applied to the gate, current flows from the source to the drain. Without voltage, the current stops. These on and off states correspond to the 1s and 0s of binary notation.



However magical a computer program may be, the hardware it runs on is, at heart, a set of such switches turning on and off according to the way they are tied together by circuitry. Simple circuits called logic gates combine transistors to offer the basic functions of binary logic: AND, in which the output is 1 if both inputs are 1; OR, in which the output is 1 if any input is one; and NOT, in which a 1 becomes a zero (or vice versa). Such logic gates can be combined to form more complex circuits, and these circuits in turn can be combined to form powerful processing chips.

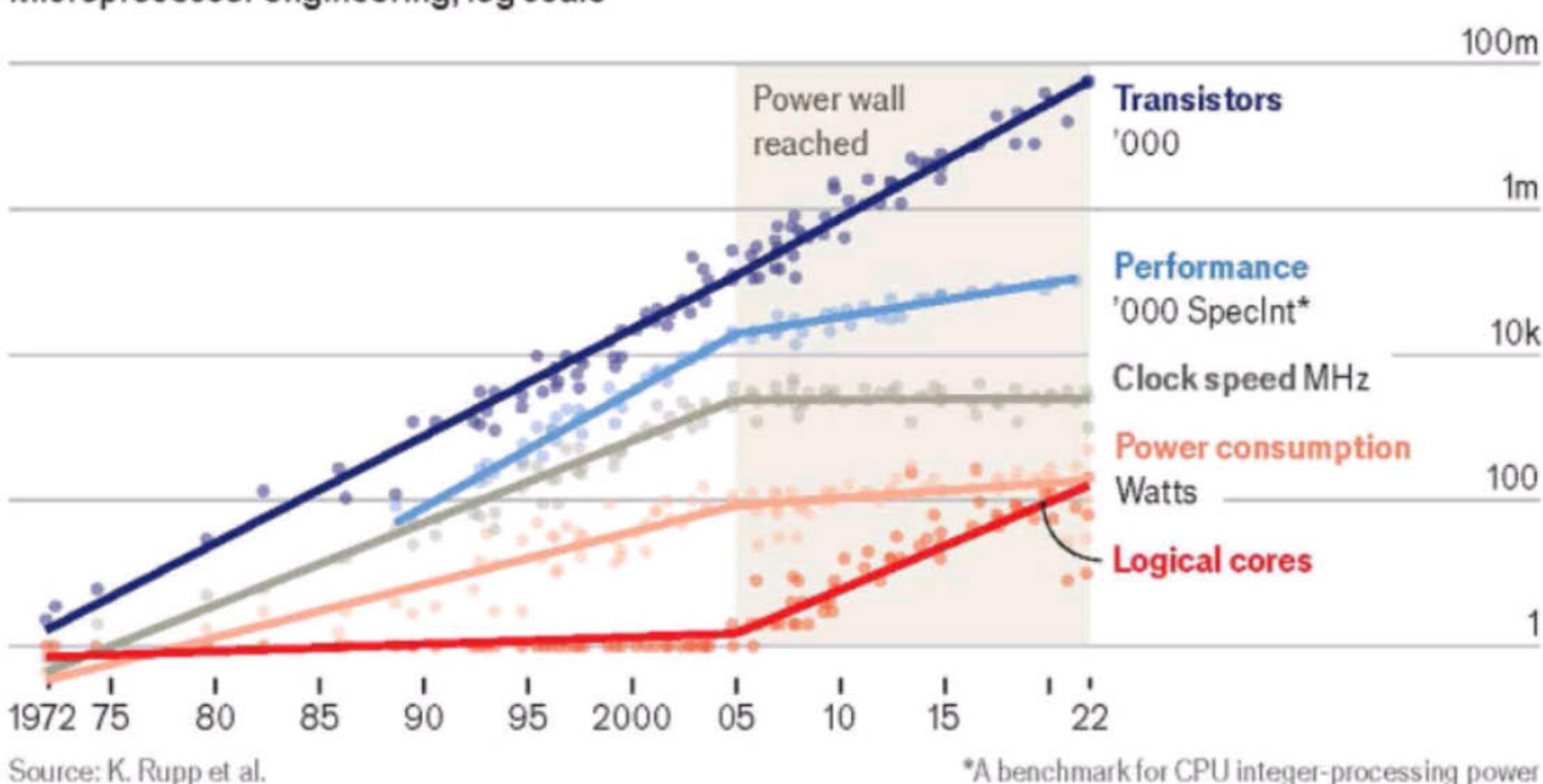
Gordon Moore's original observation, in 1965, was that as the making of chips got better, the transistors got smaller, which meant you could make more for less. In 1974 Robert Dennard, an engineer at IBM, noted that smaller transistors did not just lower unit costs, they also offered better performance. As the distance between source and drain shrinks, the speed of the switch increases, and the energy it uses decreases. "Dennard scaling", as the observation is known, amplifies the amount of good that Moore's law does.

In 1970 the gate length, a proxy for the distance between the source and drain, was ten microns (ten millionths of a metre, or 10,000nm). By the early 2000s this was down to 90nm. At this level, quantum effects cause current to flow between the two terminals even when the transistor is off. This leakage current increases the power used and causes the chip to heat up.

For chipmakers that was an early indication that their long, sort-of-free ride was ending (see chart). Transistors could still be made smaller but the leakage current placed a limit on how low a chip's voltage could be reduced. This in turn meant that the chip's power could not be reduced as before. This "power wall" marked the end of Dennard scaling—transistor sizes shrank, but chip speeds no longer got quicker ➤

## Hitting the power wall

Microprocessor engineering, log scale



► and their power consumption was now an issue. To keep improving performance, designers started arranging logic gates and other elements of their chips in multiple, connected processing units, or "cores". With multiple cores, a processor can run many applications simultaneously or run a single application faster by splitting it into parallel streams.

This allowed performance to keep climbing even though the speed at which the switches worked was no longer increasing. But it did not solve the problem that the power used by each transistor was no longer falling. As the transistor count continued to rise, chip designers shut down parts of the chip, known as dark silicon, to prevent waste heat from melting it.

Getting around the problem of leakage current meant abandoning the old structure for transistors, in which the conducting channel sat flush to the surface of the chip and the controlling gate sat on top of it. In 2011 Intel introduced a design in which the channel stood proud, like a fin above water, and passed through the gate, not below it (see diagram). This allowed the gate to exert greater control over the channel, even when off. These "finFETs" allowed chipmakers to continue shrinking their transistors. The new transistors leaked less current and consumed about half as much power as the previous generation. Most leading-edge processes now have two or three fins per

transistor to boost speed. FinFETs allowed the gate length to shrink further, to around 16nm. But only so many fins can be placed side by side.

To shrink the gate length further, the next step is to lift the channel off the surface of the chip altogether, so that the gate surrounds it on all sides. Samsung, a South Korean giant, was the first to build such transistors, called "gate all around" (GAA), in its latest chips. Intel and TSMC are expected to follow soon. IMEC, a chip-research organisation in Belgium, expects GAA to take the industry to the end of this decade, at which point gate lengths will approach the smallest feature size that can be etched with existing techniques.

Beyond this point the only way to increase transistor density is to redesign chips so that some of the transistors which used to sit side by side are instead stack one atop the other. Going three-dimensional allows chipmakers to pack in more gates than the horizontal approach. Intel, for example, says that by stacking transistors it can build the simplest kind of logic gate, an inverter, in half the space usually needed.

Even with stacked transistors, the need to squeeze persists. Once a transistor's gate length approaches 10nm, the thickness of the silicon channel along which the current passes through the gate needs to be less than 4nm, making leakage issues even more pronounced. The industry's answer to this is to replace silicon with materials available in sheets of almost no thickness at all. Circuits made of materials just a few nanometres thick—the width of a few atoms—could allow chipmakers to shrink transistors without concern about current leaking through when they are off.

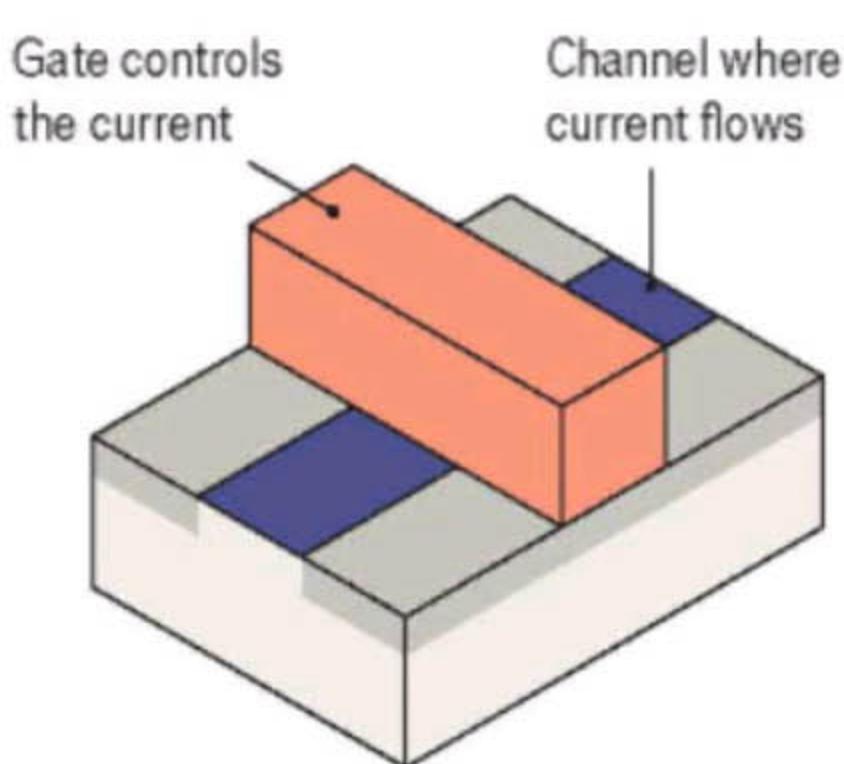
## Thinning out

Among the two-dimensional (2D) contenders to replace silicon are materials called transition metal dichalcogenides (TMDs) which can be prepared in layers just three atoms thick. Of the hundreds of TMD semiconductors that could replace silicon, three look most promising—molybdenum disulfide, tungsten disulfide and tungsten diselenide.

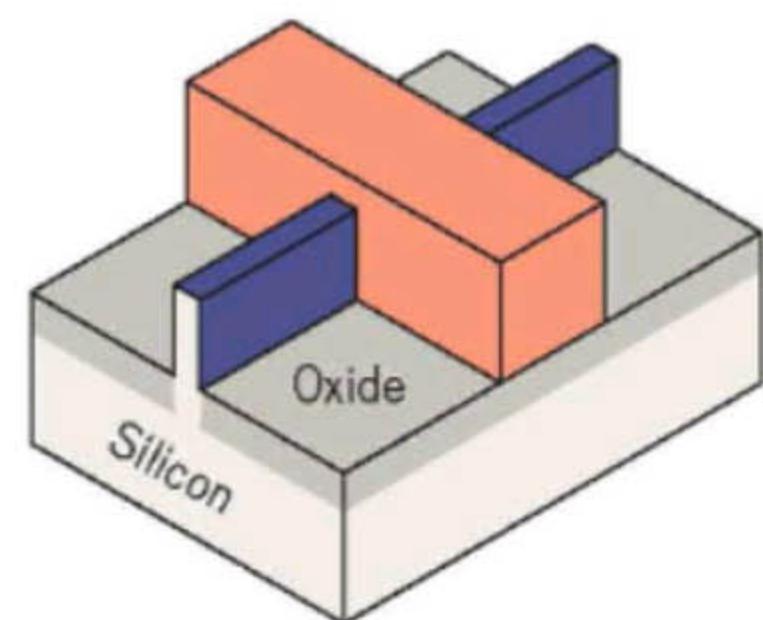
But such 2D materials have difficulties to overcome before they can challenge silicon. The first is that the thinness of the materials makes them hard to connect with metal wiring. Another is reliably fabricating chips using these materials across a 300mm wafer, the standard size for chip fabrication. Also, chip de-

## Narrow is the gate

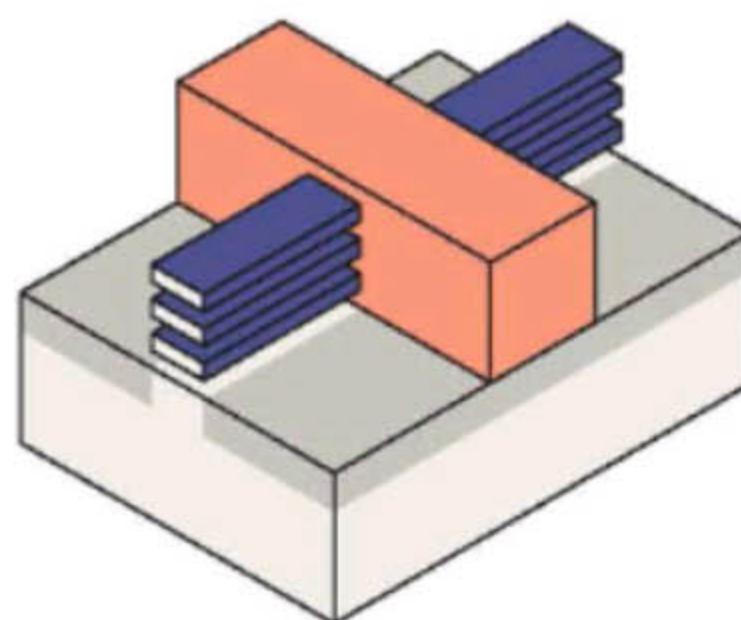
Planar transistor, pre-2011



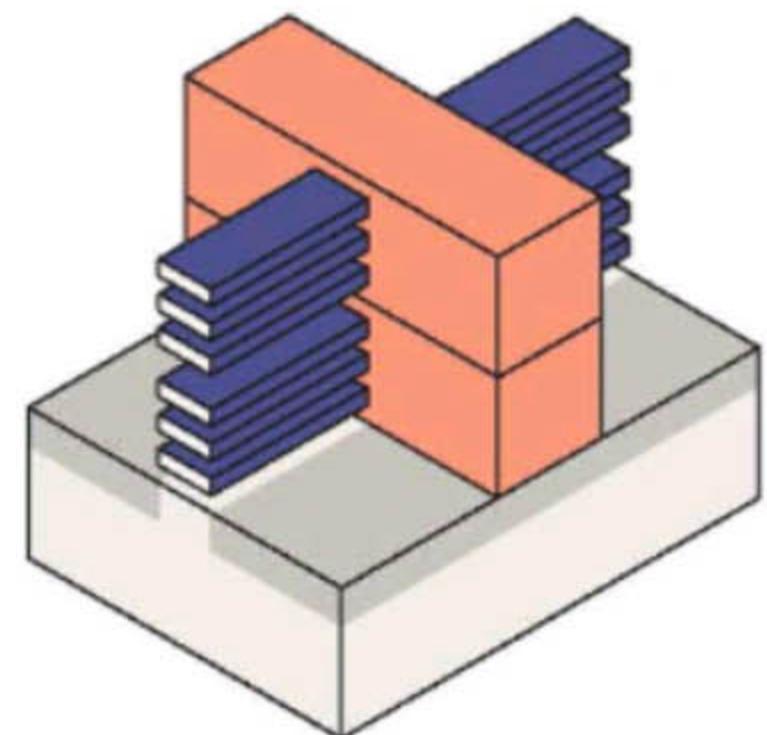
FinFET, 2011



Gate-all-around, 2022



CFET, proposed



The original design was prone to charge leaking through when the gate was closed

The gate envelops the channel on three sides, reducing leaks and improving control

The gate envelops the channel on four sides, granting even better control

Stacks transistors on top of each other, so more can be packed onto a chip

► sign relies on two different types of transistor. Making either type is easy in silicon, whereas the new materials tend to be better suited to just one type.

Another contender to replace silicon is the carbon nanotube (CNT), a rolled-up sheet of carbon atoms that forms a cylinder with a diameter of 1.5nm (six times the diameter of a water molecule). A CNT transistor is built like an ordinary transistor with source, drain and gate terminals made of regular semiconductor. But the channel is made up of tiny, parallel nanotubes instead of the silicon channel in an ordinary transistor. The smooth structure of the nanotube allows electric charge to be switched on and off three times faster than through a silicon channel. The thinness of the channel also allows the gate more control over the channel, reducing leakage current and making it more energy efficient.

Eric Pop of Stanford University believes that foundries are leaning towards 2D semiconductors over CNTs, because they are easier to manufacture and integrate with silicon. Though CNTs could offer superior performance and are ideal for GAA transistors, they are harder to control due to manufacturing challenges.

Nanotubes are not easy to build. CNTs are prone to imperfections in the fabrication process which change

### One contender to replace silicon is the carbon nanotube

their electrical properties. Most turn out as semiconductors that turn on and off depending on the gate voltage. About a third are metallic structures that are on all the time and cannot be controlled by the gate. And growing a group of parallel nanotubes as clear parallel lines between the source and drain is hard.

In 2013 Max Shulaker, now at MIT, with Subhasish Mitra and Philip Wong, both of Stanford University, built the first microprocessor using CNT transistors. The researchers designed an “imperfection-immune” processor that functions even if a certain number of CNTs misbehave. By 2019 Mr Shulaker had devised a microprocessor built with 14,000 CNT transistors (half the number found in the 8086, a chip released by Intel in 1978). In 2023 researchers at Peking University built a transistor using CNTs on manufacturing technology that can be scaled down to the size of a 10nm silicon node. The results may seem basic, but they underscore the potential of CNTs as an alternative to silicon.

In 1959 Richard Feynman, a physicist, gave a lecture that presaged the nanotechnology era. He wondered, “What would happen if we could arrange the atoms one by one the way we want them?” With semiconductor device features now atomic lengths, the world has its answer: build smaller transistors. ■

## A node by any other name...

### Moore's law lives on in marketing

PAT GELSINGER, boss of Intel, a chipmaker, loves to brag that his firm is leading the charge in semiconductor technology by entering the “angstrom era”. The angstrom, named in honour of Anders Jonas Ångström, a 19th-century Swedish physicist, is a somewhat archaic unit equal to a tenth of a nanometre (0.1nm, or a ten billionth of a metre). The “process nodes” of Intel’s latest chips are referred to as “20A” and “18A”. If you take those suffixed As as denoting “angstrom”—which Intel never flat out says that they do—that suggests dimensions of just 2nm or so. And at one point, process node was pretty much synonymous with transistor gate length.

But banish any visions you may have of transistors just nine or ten atoms wide. The transistors in the “20A” architecture, which the troubled company has just abandoned so as to double down on the 18A, have gate lengths of around 14nm—140 angstroms, or 140Å.

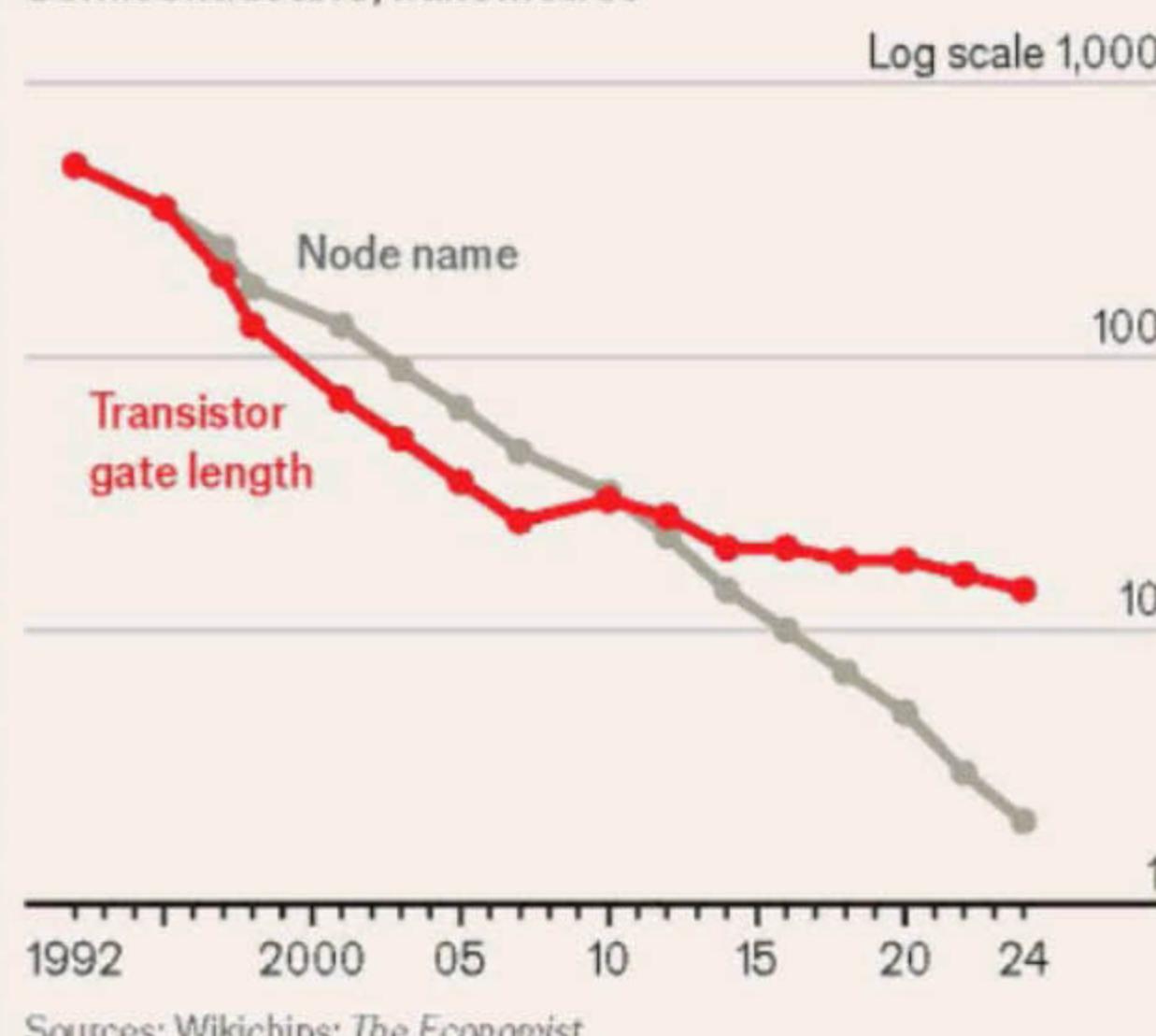
The “20A” node with a 140Å gate length is just one example of a widespread trend. In the past decade and a bit, the dimensions that companies make reference to in their marketing and the dimensions of the structures

on their chips have diverged.

In the 1970s the size of the process node was taken to be the distance between the two terminals of a transistor, the source and drain, also known as the gate length. In practice this meant the process node was also the chip’s “metal half pitch”. The half pitch is half the distance between the end of one metal line (a connecting wire that shuttles data) and the start of the next, which

### Don't believe the label

Semiconductors, nanometres



means, roughly speaking, half the distance between the chip’s components.

In the mid-1990s, gate length started shrinking much faster than the half pitch. Then, in the 2000s, problems with power and waste heat saw progress in shrinking gate lengths slow down sharply. The measurements referred to by the companies caught up with the gate lengths and moved on down below them (see chart). The marketing departments were going to be Moore’s-law-abiding corporate citizens regardless of engineering constraints.

This was considered defensible, in part, because gates were developing internal structures smaller than their overall length. At one point Intel was making chips in which the metal half pitch was 40nm, the gate length 26nm and the fins within the finFET transistors were 8nm wide. They were referred to, somewhat arbitrarily, as “22nm”.

Most in the industry believe gate lengths will bottom out at around 12nm and metal pitches at 14nm. That is about as small as is printable using ASML’s best lithography machines. But the industry cannot give up talking about its advances in terms of increasingly small and entirely notional node sizes. In 2021 Intel rebranded its “10nm” node to “Intel 7”, dropping the “nm”. TSMC talks of 3nm and now 2nm nodes (which it says are more advanced than Intel’s 18A). In March ZDNet, an online publication, reported that Samsung had rebranded its 3nm process to 2nm. The incredible shrinking rhetoric continues.

**Packaging**

# Getting to one trillion

**Manufacturers are trying to package chips in ways that get more work out of them**

THE BLACKWELL chip from Nvidia, shovel-maker for the artificial-intelligence (AI) gold rush, contains 208bn transistors spread over two “dies”, pieces of silicon each about 800 square millimetres in area, that house the processor circuitry. The two dies are linked by a blazing 10 terabytes (ie, ten thousand gigabytes) per second chip-to-chip connection. Each die is flanked by four blocks of high-bandwidth memory (HBM) chips that together store 192 gigabytes of data. The advanced packaging methods used to build this megachip are now in the spotlight, with some speculating that they may lead to production delays.

Blackwell’s putting together of different parts show the limits to which chipmakers must push their technology to boost computing power while keeping energy consumption in check. Over the course of a year one of these megachips, which cost \$70,000, will consume 5.2MWhrs—about half the energy of an average American household. Adding more transistors is the best way to boost a chip’s processing power: commu-

nication within a single chip may be a thousand times faster and use a hundred times less energy than shuttling data between chips. But since Dennard scaling hit a wall in the mid-2000s, shrinking transistors has not significantly improved energy efficiency. Gordon Moore suggested two other tricks to pack in more transistors: increase the die size (ie, make chips bigger) and use “device and circuit cleverness”. In 1971 the 4004, an Intel processor, had a die size of 12 square mm. Current lithographic tools cannot build chips bigger than 800 square mm, about the size of each Blackwell die. Circuit cleverness is the only other path.

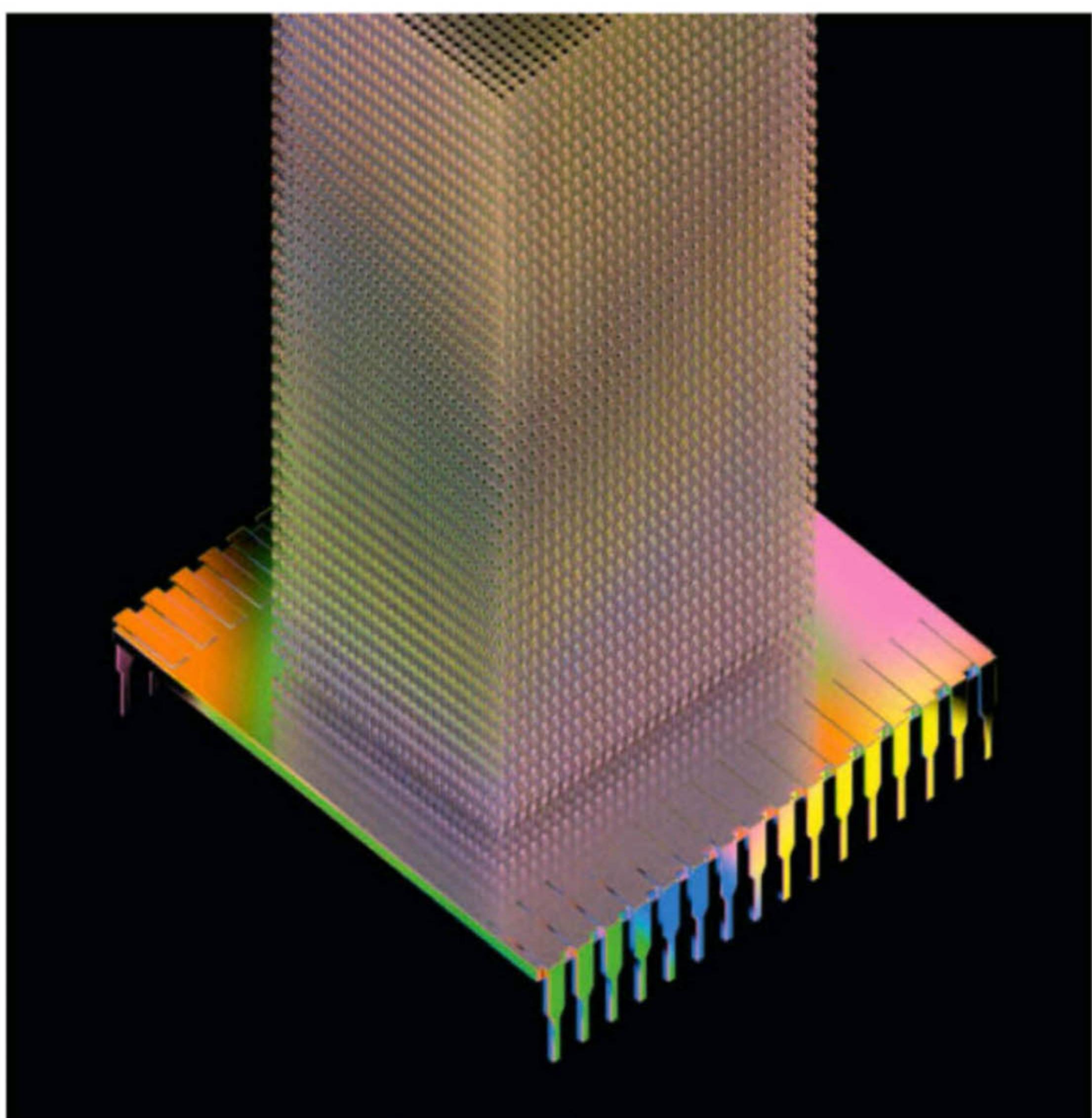
One clever idea is to use the chip area more efficiently. In profile, a semiconductor chip is like a multi-layer cake, with the layers which make up the transistors at the bottom and 10-20 layers of metal wiring stacked on top. Leading-edge chips can use almost 100km of tiny metal wires (the sum of connections between billions of transistors). This turns the chip into a crowded highway of data and power lines. At the top layer are thick metal lines that distribute power across the chip. Since these beefy power lines burrow down from the top layer all the way to the bottom layer to connect to the transistors, they can hog nearly a fifth of the area used for routing electrical signals.

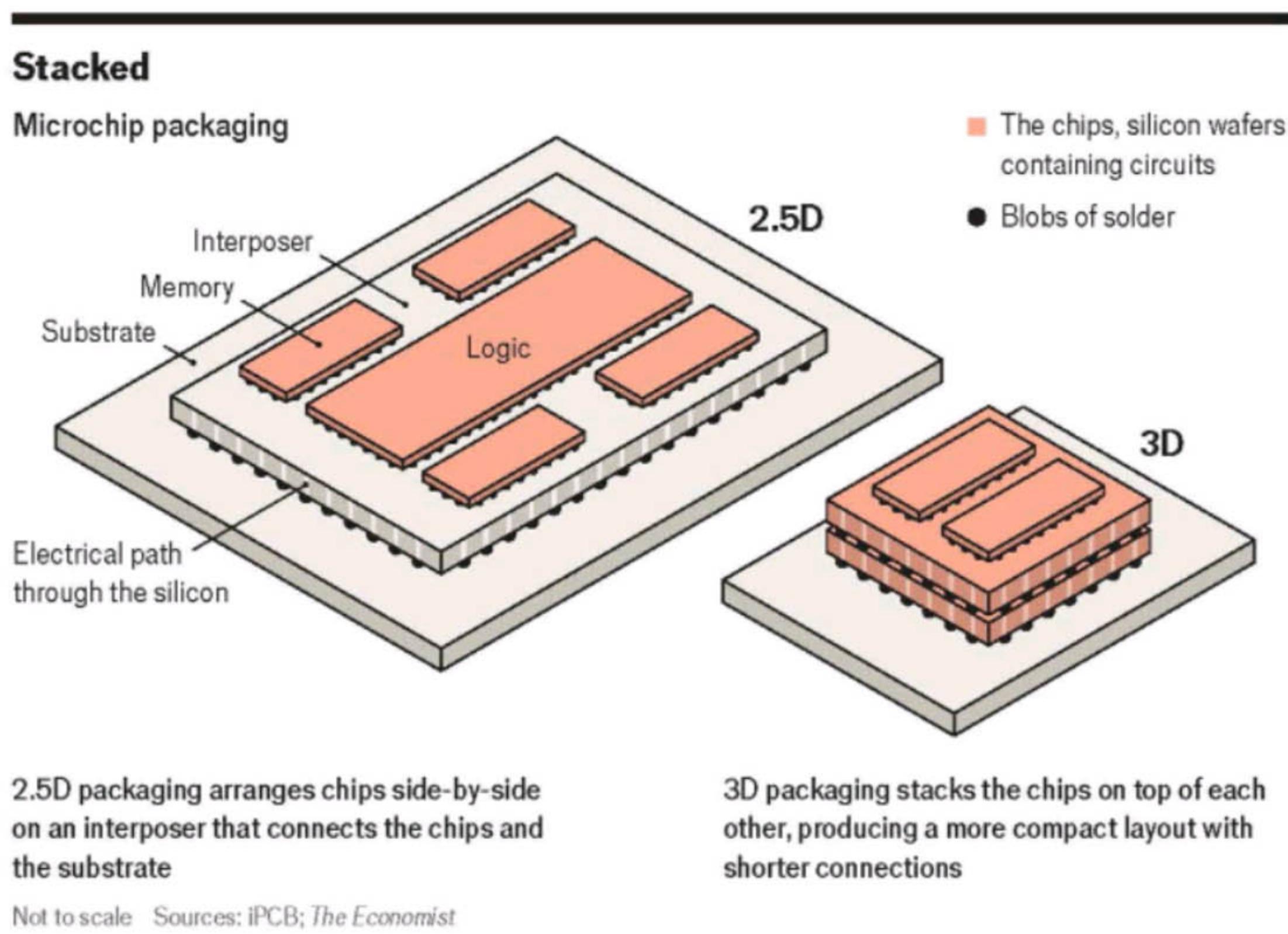
## Baking the cake

To create more space, leading foundries are now working on “backside power delivery” which moves the thick power lines to a layer below the transistors, known as the “back” side of the chip. This has three benefits. First, it frees up space, allowing all the area above the transistors to be used for routing data. With less congestion in the metal wires, groups of transistors, called gates, can be packed more tightly in the same space. Second, the power lines below the transistors need shorter connections to link up with them, and those connections can be thicker, which makes power delivery more energy efficient. Finally, these robust power lines are less susceptible to voltage spikes during demand surges, ensuring faster switching for the transistors. The result is a faster, more power-efficient chip without having to shrink the transistor size.

But moving the power wires below the transistor introduces additional steps in the manufacturing process. Normally, once the multi-layer cake of the chip has been built, the wafer is flipped and enclosed in a package that connects internal circuits to the outside world. With backside power delivery, the flipping has to be followed by polishing and the addition of the power lines. The additional steps are worth the hassle. In 2023 Intel used backside power delivery and the smarter placement of components which it allows to get improvements of 6% in transistor speed and 10% in packing density with components no smaller than the ones it was using before.

Another tactic is not to cram all functions onto a single chip, but to pick the best manufacturing technology for each task. Though the whizzy processors need the most advanced nodes, other parts of the chip, like the modules that communicate with the outside world, don’t need the tiniest transistors. Breaking a chip into smaller blocks called “chiplets”, and then packaging them together, lets chipmakers use the maximum area on a die for the processing units, because the rest of the circuitry is moved onto other chiplets. Communication between chiplets in the same package is much faster and uses less energy ►





than with circuitry outside the package.

Packaging was long the poor relation of chipmaking. Foundries focused on producing wafers of silicon. But with the rise of chiplets, packaging is in the spotlight (see diagram). Chiplets are assembled by placing multiple dies from different process technologies side by side on a layer called the interposer. These dies are then bonded to the interposer with "microbumps".

The interposer, which sits on a substrate typically made of organic resin, acts as a bridge, connecting the dies to each other with high-density wiring, and connecting them to the outside world through the package. This allows for fast data transfer between chiplets and improves power efficiency. Nvidia's Blackwell processor uses TSMC's version of this to combine its two dies and eight HBM chips into a superchip. TSMC plans to develop interposers six times the size of the largest dies, to host multiple processing chiplets and stacks of HBM.

Intel, meanwhile, has unveiled plans to ditch resin and stack its chiplets on glass instead. The ultra-flatness of glass is better for fine-pitch, high-density wiring and it has better thermal and mechanical stability, especially at larger sizes. The firm says this switch could increase connection density ten-fold over organic interposers.

The next big leap in chiplet technology is stacking dies directly on top of each other, slashing the distance between them. Memory-makers have been early pioneers in such 3D stacking. HBM, used in specialist AI chips, typically stacks eight to 12 memory chips connected by high-capacity routing lines, boosting bandwidth between the memory and processor.

Now AI chips are following suit. 3D packaging can provide 10,000 connections per square millimetre, compared with 25 for side-by-side packaging. More connections means smoother data traffic between chiplets. It is also more energy efficient, using less than 1% of the energy of the previous version to move each bit. The MI300X, a competitor to Nvidia's H100 made by AMD, another chip designer, stacks eight accelerator chiplets on four interposer dies, along with eight stacks of HBM, in one package.

These gains come at a cost. Samuel Naffziger of AMD notes that, because multiple chips need to be

tested before being combined into a single package, 3D packaging adds time and complexity to the manufacturing process. Packing chiplets together also increases the heat density in the chip. To facilitate heat dissipation, chip designers locate the layers that make the most heat at the top of the stack, and place less heat-generating components, such as memory, below.

Training AI models requires huge systems in which hundreds of processors are linked together. Even after cramming chiplets into packages, vast amounts of data still need to zip between these separate processors and their connected memory chips. Copper wires, the usual method for connecting components on a motherboard, are sluggish and waste energy. So some firms are turning to light to speed things up.

Fibre-optic cables are the backbone of the internet, carrying 99% of intercontinental internet traffic. These cables are also used over short distances to connect racks in data centres. In both cases, equipment at each end of the fibre turns signals from electrical pulses into light and vice versa. Now optical communication is making its way to silicon as well. Ayar Labs, an American startup, is among the firms that is building a chiplet offering optical communication between processors. Its chiplets sit on the edge of a package and turn electrical signals into light, which is then sent through the fibre. At the receiving end, another set of chiplets converts light back into electrical signals and feeds data to processors in the package. The firm claims this improves chip-to-chip bandwidth up to tenfold with eight times more power efficiency.

### Suburbs and skyscrapers

The ultimate leap in energy-efficient, high-speed chip-to-chip communication would be to collapse all the chiplets into one single chip, multiple layers of processors, memory and sensors. This packs even denser connections between different parts of the chip. Subhasish Mitra of Stanford University likens this to moving from a sprawling suburban layout to a towering skyscraper.

Just as a skyscraper has lifts shuttling people up and down, this megachip would need millions of connections whisking data between layers of compute and memory. These lifts could also help keep the chip cool, channelling heat to the bottom layers. Eventually, chipmakers could cluster these chip towers side by side. Mr Mitra believes that this could boost energy efficiency as much as a thousand-fold.

Making such a chip would be hard. Fabrication temperatures for conventional transistors can exceed 1,000°C. With transistors located in multiple layers, the metal lines criss-crossing the skyscraper transistors would melt. To realise the vertical-chip vision, the logic and memory technologies on upper layers must be fabricated at temperatures below 400°C. Newer transistor technologies like carbon nanotubes and 2D materials, which can be processed below 400°C, might be better suited to this than silicon. Mr Mitra has demonstrated a version of this chip on a 90nm node, built with layers of carbon nanotubes and memory.

Speaking in 2015, Gordon Moore admitted he was "amazed" by how long his prediction had held. But he felt that extending his namesake law for a few more decades would require "a lot of good engineering". TSMC believes that a combination of these approaches could yield a trillion transistors on a chip by 2030. Chipmakers are clearly not done yet. ■

**Training AI models requires hundreds of processors linked together**

**Chip design**

# A Cambrian explosion?

## AI has propelled chip architecture towards specialisation and a tighter bond with software

**E**XACTLY WHEN the process started no one knows, but fossils from the Cambrian period some 540m years ago show life on Earth going through a remarkable period of diversification. The point at which it became clear that a similarly transformational diversification was kicking off in the world of chips can be dated much more precisely. In May 2016, at Google's annual event for developers, Sundar Pichai, the firm's boss, casually mentioned that "We have started building specialised custom hardware."

In the 2000s, software companies like Google, Microsoft and Meta were content with the incremental processing gains that chipmakers delivered every few years. But in the early 2010s, Google realised that enthusiasm for artificial intelligence (AI) applications based on machine learning could overwhelm it. If everyone with an android phone were to use its voice-control feature for three minutes a day, one executive calculated, the firm would need double its data-centre capacity. By 2015 newer machine-learning algorithms

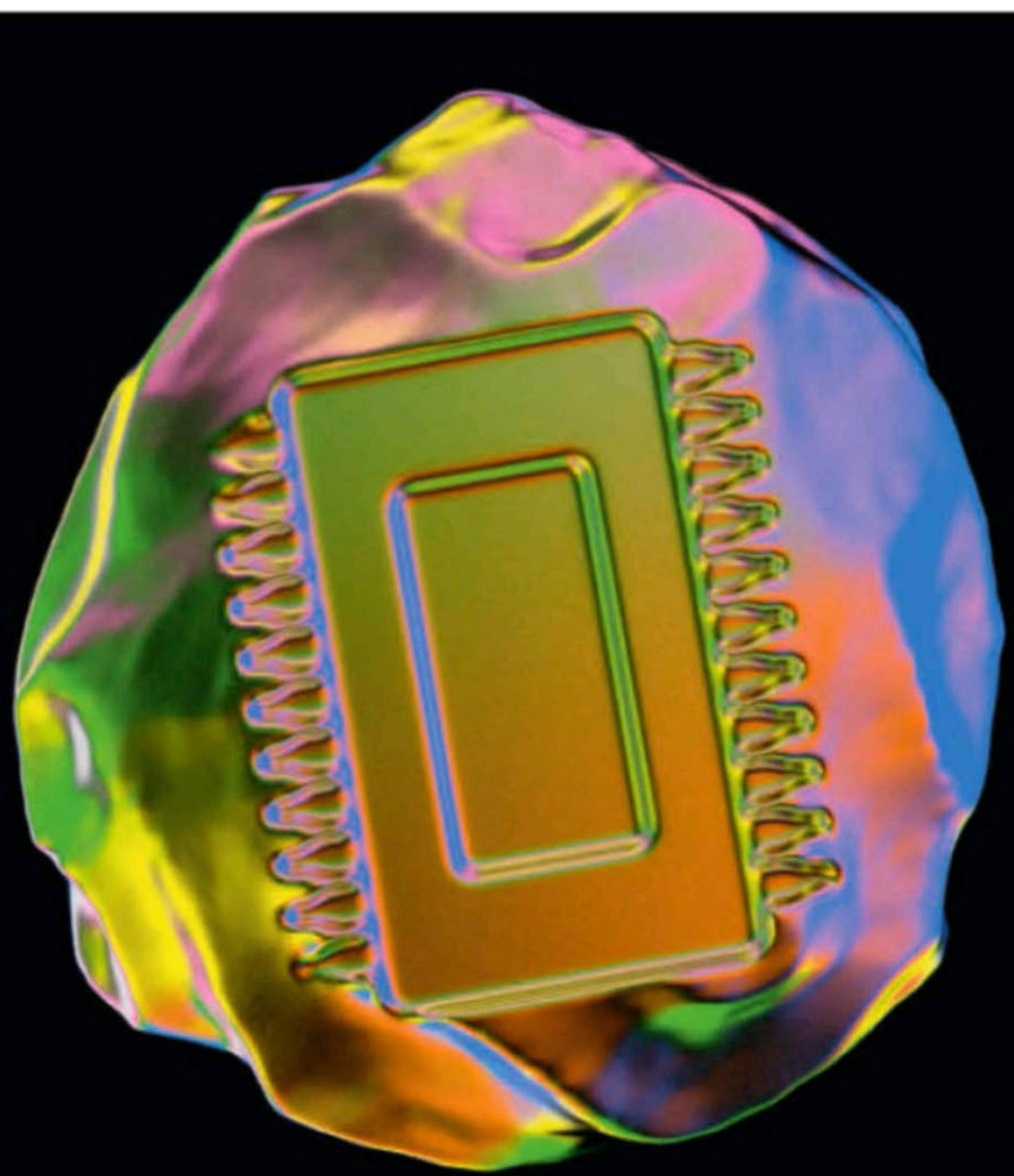
were demanding 100 times more processing power than previous versions. Because the chipmaking industry did not have any idea that would make "everything better" quickly enough, says David Patterson of the University of California Berkeley, who is also an adviser to Google, there was little alternative but specialisation, working on chips that did only a few things, but did them very much better.

Most machine-learning algorithms are based on artificial neural networks—programs inspired by the structure of the human brain. A neural network is made of simulated layers of nodes or "neurons" which accept a set of inputs. Each input is multiplied by a weight and the products are added for a single value. If the value clears a certain threshold, it is passed to the next layer. This continues until the output layer spits out the final answer. Deep-learning networks can be a few layers deep or over 100. While "training", the model's weights and thresholds are tuned until the network's output aligns with the training data. During "inference", the weights are locked, and the trained model responds to user queries.

Neural networks require specific calculations, a series of additions and multiplications known as matrix multiplication, on a large number of nodes. They can be "parallelised", that is, batches of them can be done at the same time. In the early days of machine learning, central processing units (CPUs) were used to run these algorithms. A CPU is an "everything machine" that can run any software, from word processing and email to spreadsheets and browsers. But CPUs are not designed for the large-scale parallel processing needed by neural networks. For every operation, they sequentially load one data item from memory, process it in the core, and store the results back in memory.

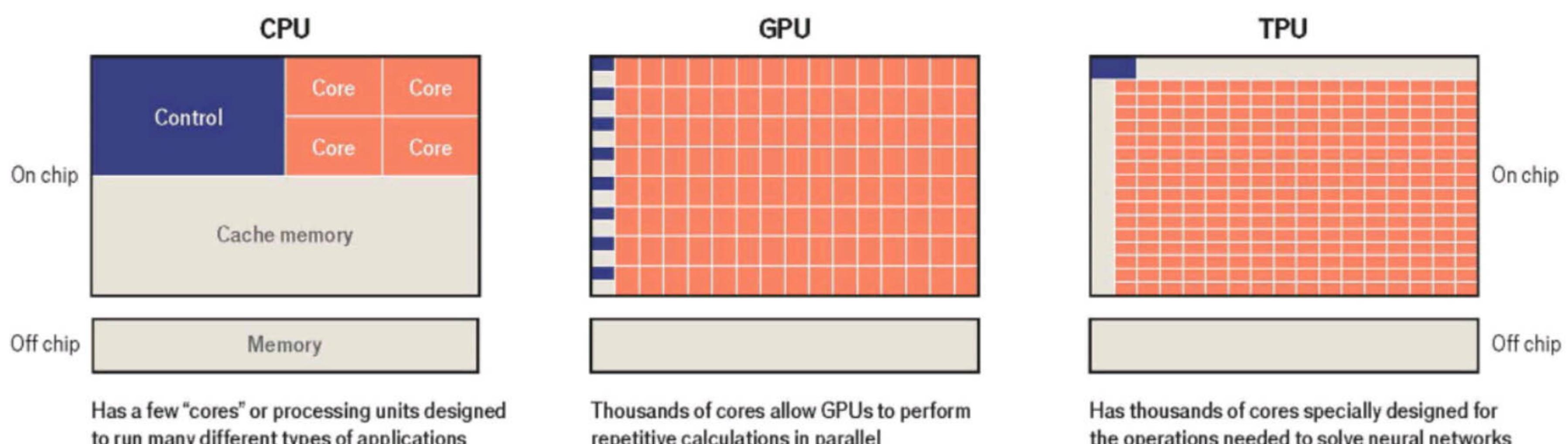
To speed up machine-learning algorithms, spe- ►►

**Big firms are not the only ones making AI chips**



## Hard cores

Computer processor architecture, simplified



Sources: Tsung Tai Yeh, National Yang Ming Chiao Tung University; *The Economist*

► cialist AI chips known as accelerators split tasks into multiple parallel “threads” that run simultaneously. A graphics processing unit (GPU), the earliest example of this approach, has thousands of specialised cores for arithmetic operations crucial for neural networks. By focusing on specific tasks like multiplication and addition, GPUs can outperform CPUs by orders of magnitude. Nvidia’s GPUs, originally designed to speedily render video-game images by processing countless pixels simultaneously, turned out to be very well suited to running neural networks too. But even with this massive processing power, GPUs still need to access memory to store the intermediate results of their computations.

Most processors have a small but zippy memory on the chip called a cache and a much larger but slower-to-access memory unit off the chip. Accessing the “off chip” memory takes about a thousand times longer than accessing “on chip” memory, and uses nearly 200 times as much energy. As AI models have become bigger, the volume of data that they process has grown exponentially. SK Hynix, a South Korean memory-chip maker, estimates that more than nine-tenths of the processing time for inference (that is, using a model to respond to user queries) of OpenAI’s GPT-4 was spent on just shuttling data back and forth. This “memory wall” throttles a processor’s speed by tying it to the pace at which data trickles in from the memory.

### CPU, GPU, TPU

To tackle this bottleneck, Google took the parallel approach of a GPU even further. The firm built a chip specifically for neural networks. Its AI processor, known as the tensor processing unit (TPU), contains thousands of multiply-and-add units directly connected in a giant grid. The TPU loads the data from external memory into its grid, where it flows through in regular waves, similar to how a heart pumps blood. After each multiplication the results are passed to the next unit. By reusing data from previous steps, the TPU reduces the need to access the off-chip memory.

TPUs are a type of “domain-specific architecture” (DSA), processors that are hard-wired for one purpose (see diagram). DSAs designed for AI algorithms are typically faster and more energy-efficient than generalist CPUs or even GPUs. Newer versions of Nvidia’s GPUs now sport hundreds of these units alongside

their traditional cores. Hardware-makers, mindful of battery life, have also joined the fray. Apple, which as a hardware maker started designing its own silicon well before the TPU days, has integrated a neural processing unit (NPU), akin to the TPU, into its smartphones, iPads and laptops to speed up AI tasks. In these devices, the NPU is not a separate chip but a block within the main chip, which also houses CPU and GPU cores.

Big firms are not the only ones making AI chips. According to PitchBook, a research firm, since 2017 investors have poured over \$24bn into AI-chip startups. In the first half of this year alone, upstart chipmakers have attracted \$9.7bn, matching the total raised in the preceding three years. These startups have devised their own tricks to break through the memory bottleneck and rein in runaway energy use.

One of the startling features of the Cambrian revolution was the emergence of complex creatures larger than any seen before. In chipmaking, that is the Cerebras approach. The American startup wants to reduce off-chip memory access by cramming all its circuitry into one huge chip the size of a dinner plate. The latest “wafer chip” from the firm has 900,000 cores and 44 gigabytes of on-chip memory, around half the off-chip memory of the H100, a leading AI chip from Nvidia. By restricting all the data movements to within the wafer, Cerebras claims that its chip has 7,000 times greater memory bandwidth than the leading GPU. But each unit is much pricier, needs its own cooling system and requires a specialised manufacturing process.

Given the vast array of machine-learning models, designing specific architectures to accommodate all of them efficiently can be a challenge. To address this, some firms are exploring chip designs that can be reconfigured based on the algorithm in use. SambaNova Systems, a California-based chip company, has designed its processing unit with small local memory blocks that are laid out in a two dimensional grid, much like the TPU. When a user runs a machine-learning software framework like TensorFlow or PyTorch, SambaNova’s software configures the optimum structure of the grid based on energy and speed.

Although the surge in computational demand has mainly centred on chips for training large AI models, most chip-design innovations are tackling the challenge of inference. Running a single inference is much cheaper but, over time, the total cost often surpasses

► es that of training. Google estimates that three-fifths of its total data-centre energy use goes on billions of inference queries. Jay Goldberg, founder of D2D Advisory, predicts the AI-chip market will eventually split into 45% for data-centre inference chips, 40% for gadget-inference chips and 15% for training chips.

Designing processors that are optimised for machine learning is smart, but tweaking the algorithms offers another way for chipmakers to squeeze out extra performance. There are two ways to improve the efficiency of neural networks: use less precise numbers, and prune the network to remove irrelevant cruft.

Computers typically represent numerical values in “floating point” format across 32 binary digits (bits). But computer scientists have found that machine-learning algorithms can use less precise numbers without sacrificing accuracy. Weights in a neural network often cluster around small numbers and zero, making a lower-precision format ideal. Using fewer bits means less shuttling of data between the processor and memory, which boosts speed and cuts energy consumption. Switching to 16-bit floating-point notation halves the memory and energy consumption compared with a 32-bit implementation.

### What are you inferring?

Another way to improve efficiency is to identify and skip unnecessary operations when performing calculations relating to a neural network. According to Bill Dally, the chief scientist at Nvidia, most neural networks are inherently “sparse”, or contain a large number of zeros, which means you can remove a large number of weights without reducing accuracy. The trick is to find the right balance between the overhead in identifying these zeros and the benefits of skipping the redundant operations.

Nvidia claims a thousand-fold gain in GPU performance on AI inference over the past eight years. Moving to smaller manufacturing nodes, and increasing the die size to pack more transistors into a chip, improved performance six-fold. But the biggest gains, almost 160 times, came from smarter design decisions. Mr Dally admits that when Moore’s law was going strong, chipmakers were playing “the same card” over and over simply by shrinking transistors. Though they have not yet run out of cards, he says the challenge now is to come up with a new card each time.

Without the support of Moore’s law, sustaining exponential gains may be hard. Adi Fuchs, a computer scientist at Speedata, an AI-chip company, points out that during the Bitcoin boom, once the underlying algorithm stabilised, the industry exhausted its “bag of tricks” to eke out new gains. Since 2017 most AI models have used a type of neural-network architecture called the transformer, which is better at identifying patterns in data. Mr Fuchs thinks that to maintain AI’s performance trajectory, the future may lie in developing new algorithms that outperform current transformer models, rather than trying to optimise silicon to run transformer models more efficiently.

For chipmakers this is a problem. It can take up to two years to design a chip. But software models change quickly. If a hardware design is too specialised, it can quickly become obsolete. Mr Patterson believes these are exciting times for researchers because “this is all brand new stuff”. For bosses of chip firms that are building specialist chips amid rapid software changes, he admits it is a “really scary” time. ■

**Some think the future of computing lies not in silicon but in our skulls**

### Beyond digital computing

## OK (analogue) computer

Researchers are turning to biology and light to design powerful, energy-efficient chips

IN 1945 JOHN VON NEUMANN, a Hungarian polymath, proposed an “automatic digital computing system”. His design featured a central processing unit (CPU) for crunching numbers and a memory unit for storing instructions and data, linked by a communication pathway. Von Neumann dreamed of a computer where anything stored in memory would be instantly available to the CPU. In its absence, he came up with a clever fix: a memory hierarchy with small, fast memory close to the CPU and larger, slower memory farther away. Nearly 80 years later, his original blueprint still forms the basis of most modern processors.

But shuttling data between the processor and memory eats up time and energy, particularly for data-hungry artificial-intelligence (AI) models. An analysis by Amir Gholami and colleagues at the University of California, Berkeley found that in the past two decades, processor performance has tripled every two years, while memory access speed has increased only by about half (see chart). This means processors blaze through calculations faster than data can be fed from memory, creating a “von Neumann bottleneck”. This has led some to wonder if it is time for a new architecture. Every engineer, and every reader, carries with them the proof that such a thing is possible.

Brains do not separate processing and storage. They run without the central co-ordinating clock von Neumann architectures use, and do more calculations in parallel than a computer, performing at exaflop speed—a billion billion calculations per second—using just 20 watts. To replicate this scale digitally, an artificial neural network would need 8 megawatts of power. Machine-learning software already mimics the brain’s parallel processing through neural networks. Is the next step to build hardware that mirrors the structure of the brain?

### Sound and light show

“In-memory” computers are processors that use specialised memory devices capable of performing certain computations. The building block for this type of computer is a memristor, a type of a resistor whose conducting properties can be easily adjusted by applying a sufficiently high current or voltage. Crucially it retains its properties even after the current or voltage disappears, functioning as a memory. But unlike transistors which represent values as binary 1’s and 0’s, memristors record values on a continuum between the two, like values in the analogue world. When these devices are arranged in a grid of rows and columns, it is possible to perform a matrix multiplication in a single time step. In machine-learning applications, this ►►



▶ allows weights to be stored within the computation unit, making processing more energy efficient.

Drawing on the brain's efficiency, processing units can be activated only when needed, to reduce energy consumption. "Neuromorphic" computing does away with a central clock—different neurons communicate when they are ready. These "spiking" neural networks are more efficient because they require less communication and computation. Joshua Yang of the University of Southern California believes this can be efficient and yield a "higher level of intelligence".

IBM and Intel have both designed chips that mimic this concept using current digital technology. IBM's NorthPole chip has no off-chip memory. The company claims that its brain-inspired chip is 25 times more energy efficient and 20 times faster than other specialist

chips, called accelerators, for certain AI applications.

Another alternative is to use light, not electricity. Optical accelerators can process information much faster and using less power than their electrical cousins. But until recently these devices relied on components too bulky to be used with densely packed processors. Advances in photonics manufacturing have helped shrink these devices to nanoscale levels.

#### Mach won

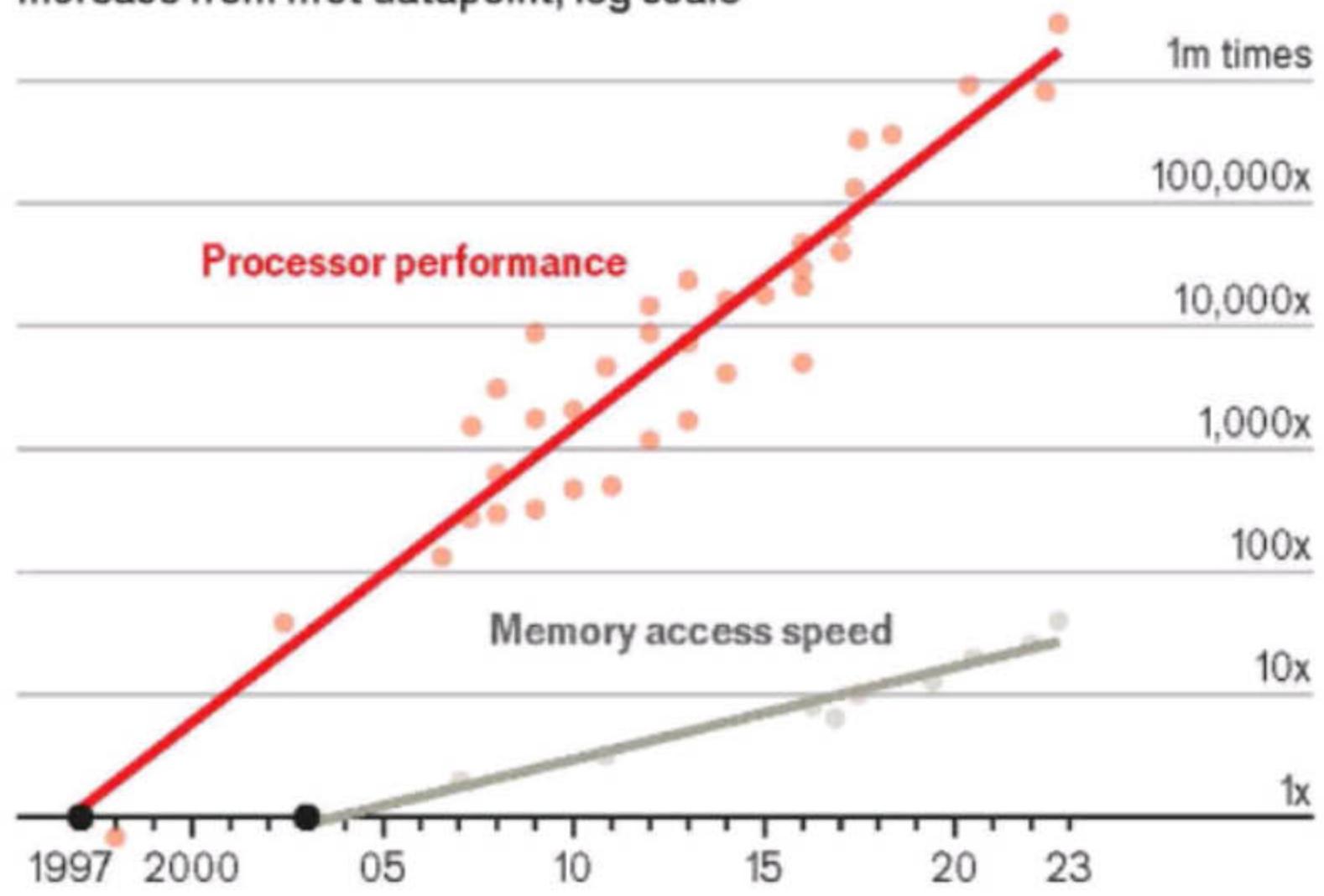
At the heart of an optical computer is an old idea: the Mach-Zehnder interferometer (MZI), invented in the 1890s. This device takes a beam of light and splits it into two paths. Depending on the length of each path, the phase (ie, the timing of the wave's crests and troughs) of the beam changes. The two beams are then recombined so that the amplitude, or strength, of the output beam is the amplitude of the input beam multiplied by a value that depends on the phase difference between the split beams. An optical accelerator has an array of MZIs laid out in a grid. Computation within these arrays occurs at the speed of light and the flow of light through the chip does not use energy.

Nick Harris, boss of Lightmatter, a California-based photonic-chip startup, points out that optical computers are not good for logical operations. But he says that, though they will "never run Windows", they are a great alternative for running neural networks because the energy benefit "scales exponentially".

Promising as these approaches are, analogue computers still need to talk to the digital world. Converting non-digital signals into binary 1s and 0s burns energy. But in inference applications, where a trained AI model answers user queries, speed trumps precision. This trade-off might be enough to bring analogue computers into the mainstream. ■

#### Hitting the memory wall

Increase from first datapoint, log scale



**Looking ahead**

# The relentless innovation machine

## The end of Moore's law will not slow the pace of change

THE CHIPMAKING industry has always existed in a state of paranoid optimism. Ever since Gordon Moore's observation that processing power would double roughly every two years was encoded by others into "Moore's law", a chorus of experts has been warning of its end. That dread is tinged with a fierce belief that there is always a way to stave off the inevitable. The results have been nothing short of spectacular. In the past 50 years, processors have come to operate tens of thousands of times faster, and store a million times more data in the same area. The cost of a transistor has also fallen by a factor of a billion, making technology a global deflationary force. They are also ubiquitous: semiconductors are now the third-most traded commodity in the world by value, after oil and cars.

But decades of success have not quelled the industry's jitters over the end of Moore's maxim. In 2017 Jensen Huang, boss of Nvidia, now the world's most valuable chip company, declared that the law was dead. In June, Pat Gelsinger, chief executive of Intel, the firm that Mr Moore co-founded, insisted that the law was "alive and well". This Technology Quarterly has argued that if not dead, Moore's law is on life support.

For much of the transistor's history it followed a "happy scaling" path—as the logic gates shrank, they got faster and used less power. That era is over. Leading-edge AI processors cram more transistors on a single chip or stack multiple "chiplets" into one package to boost computing oomph. But the performance gains have come at a cost: the energy consumed by a chip has ballooned. A single Blackwell chip, Nvidia's latest, runs five times faster than its predecessor, but uses 70% more power in the process.

Data centres lash hundreds or thousands of these power-hungry chips together to run large artificial-intelligence (AI) models. By some estimates, OpenAI, maker of ChatGPT, guzzled more than 50 gigawatt-

hours of electricity to train its latest model (see chart). The International Energy Agency calculates that in 2022 data centres consumed 460 terawatt-hours, or almost 2% of global electricity demand. The agency expects this figure to double by 2026.

The tricks chipmakers have used to boost processing power for AI models without causing runaway energy growth hint at shifts in the semiconductor industry. The first change is the decline of the computer as a general-purpose machine. Neil Thompson of MIT argues that, for decades, Moore's law held computing together. Every successive generation of semiconductor technology was faster and more energy efficient than the previous one. That allowed the tech world to rely on a universal processor—the central processing unit (CPU)—that could be programmed for lots of tasks. But the end of Moore's law makes it harder now to improve performance across all applications.

The response, in the case of AI chips, has been to specialise or fine-tune chips for specific software. Mr Thompson believes this could split computing into two lanes: the fast lane, where cutting-edge applications benefit from powerful customised chips, and the slow lane, where ordinary applications get stuck using general-purpose chips whose progress is slowing.

## The biggest merger

The need to specialise has precipitated a second shift—the rise of firms that control both hardware and software. For over five decades, the tech world was neatly split into two camps: the hardware crowd who tinkered with their circuits and the coding geeks who wrote software. The "Wintel" alliance whereby computers would run Microsoft's Windows operating system on chips made by Intel has been one of the most successful partnerships in technology history.

Now the wall separating the two camps has cracked. Bill Dally, Nvidia's chief scientist, says that improvements in software and chip architecture yield bigger gains than moving to newer manufacturing processes. At the cutting edge, specialist silicon is the future and the giants are doing a lot of it themselves.

Apple, Amazon, Google, Microsoft and Meta all now use custom silicon that is optimised for their own software. Google's processors are designed to run TensorFlow, its machine-learning software. Apple's homemade chips are tuned to run its own software on the gadgets it makes. These firms partner with firms like Broadcom, an American chip company, to design these chips, and a foundry like TSMC to build them. Nvidia is the only one to have made a great business out of making AI chips for others—but this is in part because its chips are optimised for CUDA, its software platform, which has become an industry standard.

According to BCG, a consultancy, between 2018 and 2023 the "big six" firms (the five tech giants plus Nvidia) accounted for roughly 60% of the value in the technology sector. But that will not slow innovation. This new world is even more inventive than the previous era that sparked the computer revolution. There are now so many more ways for computers to become better—through silicon cleverness, better packaging, innovative chip designs and new materials. It will be competitive in ways the Wintel world never could be, and may create things even more wonderful. A combination of silicon, dread and fierce belief are going to achieve even more in the next 70 years than they have in the past 70. ■

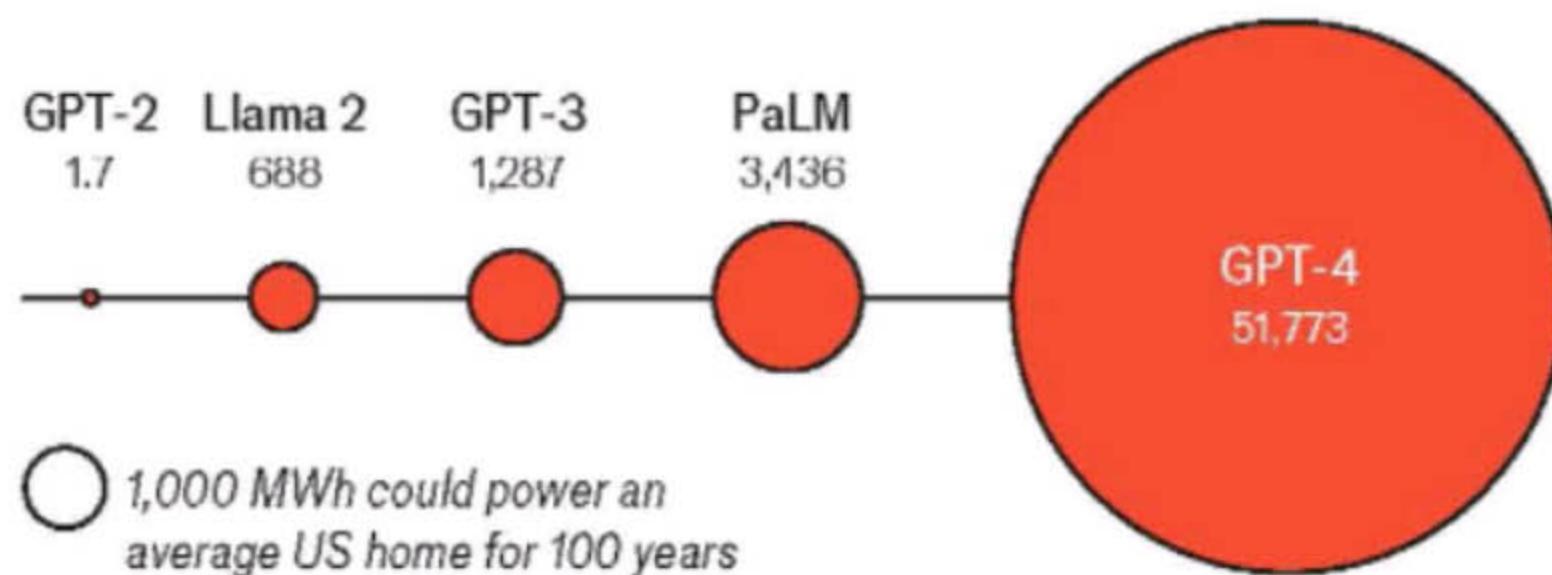
**Acknowledgments** A list of acknowledgments and sources is included in the online version of this Technology Quarterly

**Licensing our content**  
For information on reusing the articles featured in this Technology Quarterly, or for copyright queries, contact *The Economist* Syndication and Licensing Team.  
Tel: +44 (0)20 7576 8000; email: rights@economist.com

**More special reports**  
Previous TQs can be found at [Economist.com/technology-quarterly](http://Economist.com/technology-quarterly)

## Burning up

Energy used to train models, MWh



Sources: Epoch AI; Freeing Energy

## Middle East & Africa



**Supply-chain sabotage**

### Electronic warfare

DUBAI AND JERUSALEM

**Two attacks on Hizbullah may not change Israel's strategic dilemma**

**F**IRST IT WAS pagers; then, walkie-talkies. On September 18th another wave of explosions rocked Lebanon: two-way radios detonated in homes, offices and even at a funeral, a day after some 3,000 pagers blew up across the country and in Syria. In both cases the devices were used by members of Hizbullah, the Shia militia that has fired rockets at Israel for almost a year.

Some 20 people were killed and 450 injured in the latest attack, on top of at least 12 killed and nearly 3,000 hurt, many badly, in the pager blasts. Hundreds of people were blinded because they looked at their pagers just before the devices exploded. Others lost fingers and hands.

Israeli officials have not said much, and they surely will not claim responsibility. But no one else has both means and motive to carry out such attacks. "I said that we would return the residents of the north safely to their homes, and that is exactly what we will do," said Binyamin Netanyahu,

the Israeli prime minister, in a statement after the second round of explosions. Yoav Gallant, the defence minister, said the war had entered a "new phase" focused on Israel's northern border with Lebanon.

All of this raises three questions: how these devices were made to explode; why Israel would have detonated them now; and what this means for its year-long conflict with Hizbullah.

The answer to the first question leads from a bunker in Beirut to an office park outside Taipei. Earlier this year Hassan Nasrallah, the leader of Hizbullah, urged

the group's rank and file to stop using mobile phones, warning that Israel could hack the devices for surveillance and to target assassinations. Instead the militia ordered pagers that seemed leakproof: they can only receive messages, not transmit them.

In photos from Lebanon, the devices that exploded on September 17th seemed to bear the trademark of Gold Apollo, a Taiwanese company. But the firm denied making the pagers and said a Hungarian firm, BAC Consulting KFT, had a "long-term partnership" to produce them. "Our company only provides the brand trademark authorisation and is not involved in the design or manufacturing," Gold Apollo said in a statement the day after the blasts.

From there, the story gets weirder. Before it was taken offline, BAC's buzzword-laden website said the firm was a consultancy working on sustainability and development. A LinkedIn profile for its "CEO" says that she worked for the UN's nuclear agency, supported small businesses in Libya and helped women in rural Niger adapt to climate change. It makes no mention of a side business in pager manufacturing. The firm's address is listed as a villa on a residential street in Budapest. Calls to the number listed went unanswered.

Wherever they were built, it seems clear that Israeli agents hid explosives inside the pagers before they reached Lebanon, and ➤

#### → ALSO IN THIS SECTION

**42 A theatre in Jenin**

**43 Hobbling Israel's Supreme Court**

**43 Falling crime in Kenya**

**44 Floods in Nigeria**

did the same with the walkie-talkies. Thousands of the militia's operatives were unknowingly carrying small bombs on their bodies, which Israel then detonated almost simultaneously.

Despite the operational success, the timing underscores Israel's strategic dilemma. Wounding lots of Hezbollah members and damaging the group's communications would have been an ideal prelude to a major Israeli offensive. Since October 7th there have been voices calling for this, in order to reduce Hezbollah's arsenal of long-range missiles and occupy a buffer zone inside Lebanon. But the government has not approved an incursion; instead, a low-level war of attrition has set in.

Israeli generals still talk of war in terms of when, not if, but the timing is hotly debated. Some want to take advantage now of the presence nearby of American aircraft-carriers and fighter squadrons, which would help shield Israel from Hezbollah's missiles. But with their army still fighting in Gaza, albeit at a lower intensity, others would rather take time to rest and refit.

That Israel activated the bombs without any further action indicates that, for now, it is not rushing to all-out war. It may also suggest that Israeli spies feared that Hezbollah would soon discover the vulnerability, and they decided to act before the militia swapped out the pagers.

Hezbollah may not rush to war either. People close to the group describe a state of shock. It has been obvious for months that Israel had penetrated the militia: it has had no trouble assassinating a string of top commanders. But the back-to-back bombings are by far the biggest security breach in its history. "Hezbollah's military arsenal is virtually paralysed," says Lina Khatib of Chatham House, a think-tank.

The group will need to spend months repairing its communications network and searching for leaks—hardly ideal conditions for a major attack against Israel. The attack also highlights a broader vulnerability for Iran and its allies: their reliance on imported electronics. Militias across the region will be nervous about what other devices might be compromised.

Members of Hezbollah often keep their affiliation secret. Mothers, wives and siblings will have discovered this week that their loved ones were part of the militia. That could cause tensions between Hezbollah and its constituents, some of whom are frustrated with the group's war against Israel. It could also produce new intelligence for Israel in intercepted phone calls and social-media videos from Lebanon.

None of this, though, changes Israel's dilemma. On September 16th the Israeli cabinet updated the official aims of the war. They had been to defeat Hamas in Gaza and free the Israeli hostages held there. Now ministers also pledge to "return

## A Palestinian theatre

# Staging protests

JENIN

**A theatre in a Palestinian refugee camp offers a different kind of resistance**

THE EXISTENCE of a theatre in the middle of any refugee camp would be unusual. But in Jenin, in the occupied West Bank, it is particularly striking. The camp and its adjacent city have long been a symbol of deadly terror for Israelis and fierce—often violent—resistance for Palestinians. And yet the Freedom Theatre has become the symbol of a different kind of Palestinian struggle.

The theatre was established in 2006 by Zakaria Zubeidi, a former militant, and Juliano Mer-Khamis, an actor born to a Jewish Israeli and a Christian Palestinian. Their vision was of cultural resistance. "We are like fighters, but our weapon is the theatre," says Ranin Odeh who runs the theatre's youth programmes. They put on everything from Shakespeare to plays written by those living in the camp.

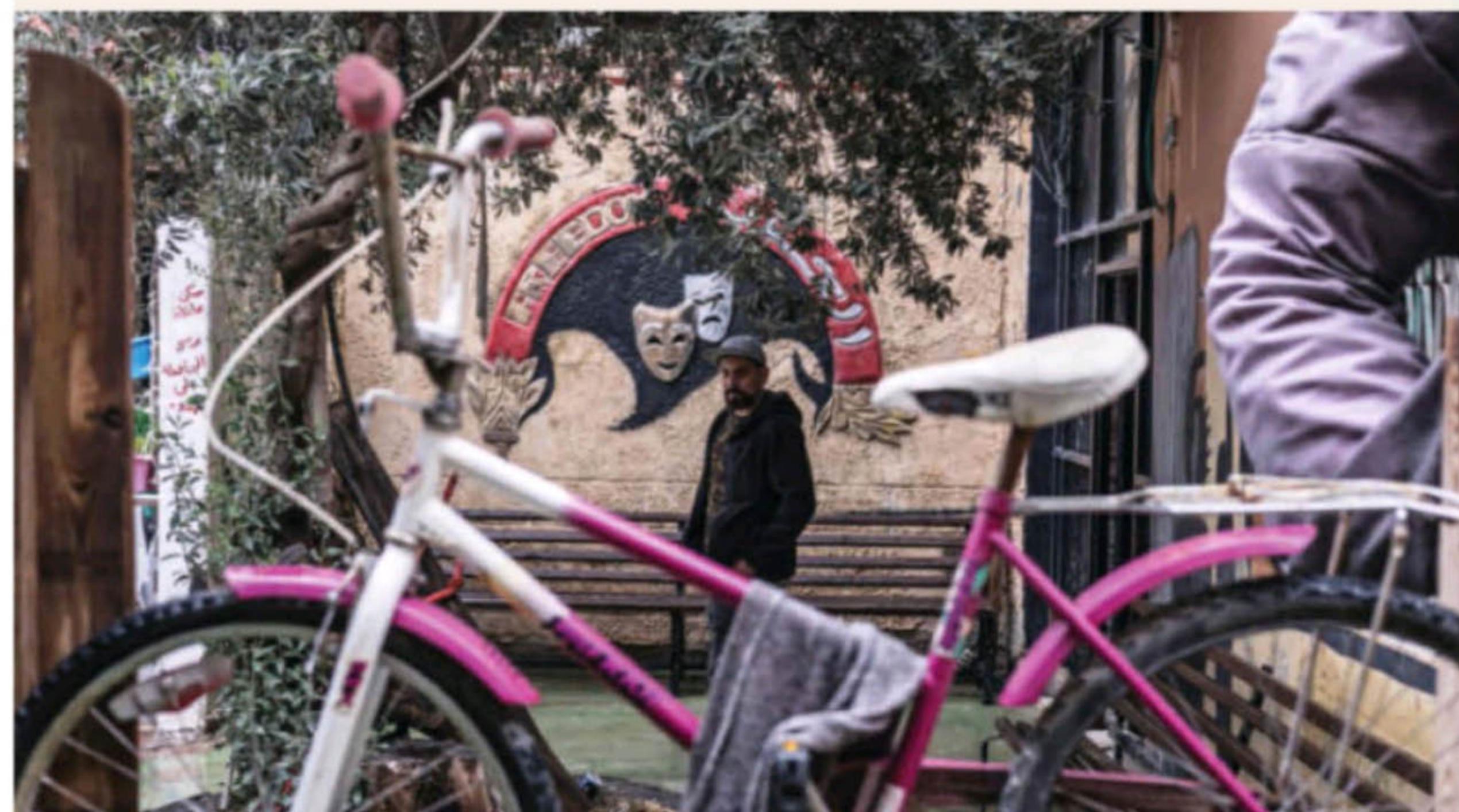
And yet today the thespians of Jenin are caught between an increasingly aggressive Israel which is pursuing deadlier raids into the restive camp, and a

growing number of uncompromising Palestinian militants who see an armed struggle as the only way to respond.

Those involved in the theatre have become targets—for both sides. Mr Zubeidi is serving a lengthy sentence in Israel for attacks committed during the second *intifada*. Mr Mer-Khamis was assassinated by a masked gunman thought to have links to Hamas in 2011. Another of the theatre's staff has been in an Israeli prison since December.

It is growing ever harder for the theatre to function. Israel's most recent raid on the camp left 21 people dead. The theatre survived unscathed, but around it the streets are filled with craters and stained with blood. And it is hard to justify its role when the bullets are flying, Ms Odeh admits.

And yet the weekly workshops for children are still full. Dozens of youngsters relish a few hours' relief from the grinding misery of the camp. That in itself is a kind of resistance.



**Not full of sound and fury**

the residents of the north safely to their homes". It seems no coincidence that the pagers exploded the next day.

Since October 8th, when Hezbollah began firing rockets at Israel, the prevailing view has been that only a ceasefire in Gaza will end those hostilities. But the prospects of a deal look dim. Israel thus wants to decouple the two fronts. It hopes the exploding pagers and radios will remind Mr Nas-

rallah of the damage that Israel can do to his militia and its standing in Lebanon.

For Lebanese, the blasts reinforced a feeling of despair. Many drew comparisons to the massive explosion at Beirut's port in 2020, another ordinary Tuesday on which death seemed to arrive from nowhere. Whatever their views on Hezbollah, they are nervous about what comes next and feel powerless to do anything about it. ■

## Israel's Supreme Court

# Politicians v judges 2.0

JERUSALEM

**Israel's government is trying once again to hobble the Supreme Court**

FOR NEARLY a year Israel's Supreme Court has been without a president, as the country's right-wing government has tussled with the judiciary over the court's powers. As soon as it was elected at the end of 2022, the government of Binyamin Netanyahu presented plans for "judicial reforms" which would limit the powers of the Supreme Court and give politicians control of the appointment of judges. The proposals prompted huge protests and were abandoned when the war in Gaza began. But they are back on the agenda.

The justice minister, Yariv Levin, has provoked the new crisis. Mr Levin wants the judicial-appointments committee, which he co-chairs, to abandon the tradition whereby the senior serving judge on the Supreme Court is appointed president. His reason? He is determined to keep the current top judge, Yitzhak Amit, a vocal opponent of his reforms, from the job.

Having tried—and failed—to change the make-up of the committee, Mr Levin has refused to convene it since the previous president retired. The Supreme Court has now ordered him to present his candidate by September 22nd and then convene the committee. So far, he has refused to do so, accusing the judges of "an unlawful usurpation of the minister's powers".

Mr Levin and other members of Mr Netanyahu's government have long sought to rein in what they regard as an activist court. In the past it has overridden government decisions and laws on grounds of constitutionality. With Israel now at war, the role of the Supreme Court has become even more contentious. It is the only forum where questions about how Israel is conducting the war, such as its obligations to supply humanitarian aid to the civilian population in Gaza and the treatment of prisoners, are being investigated, a fact that has not endeared it to hardliners in the governing coalition.

The court's president has a crucial role in scheduling such hearings, and in appointing any national commissions of inquiry. So far Mr Netanyahu has withstood public pressure to create such a body. If the prime minister were to relent, perhaps to fend off his possible prosecution in the International Criminal Court, the president would decide who is on the commission.

If Mr Levin persists in his obstructionism, the court could order the other committee members to convene without him.

But that would be an unprecedented clash between the branches of government and could in turn provoke other ministers to defy legal rulings. That is already happening. Itamar Ben-Gvir, the hard-right politician in charge of the police, has proceeded with the promotion of a police officer accused of throwing a stun-grenade at protesters, despite instructions from the attorney-general and a court order to wait until an investigation is concluded.

The government and court are also at odds over a ruling to draft rabbinical students into the army and end funding for their seminaries. This is a red line for the ultra-Orthodox parties in Mr Netanyahu's coalition and his ministers are in no rush to carry out the court's orders.

"The Supreme Court judges created this confrontation at a time of war," insists Simcha Rothman, chair of the law committee in the Knesset, Israel's parliament and one of the architects of the coalition's judicial reforms. "Instead of trying to reach a compromise with the justice minister, they are forcing a vote. This constitutional crisis is on their heads."

Others disagree. Yaniv Roznai, an expert in constitutional law at Reichman University in Tel Aviv, says: "Beneath the radar, while the guns are firing, the government is taking advantage of the lack of attention to legal issues to try once again to achieve the objective of the legal reform—power without limits." ■

## Crime in Kenya

# Daylight robbery

NAIROBI

**Nairobi's reputation for crime is outdated. Don't rush to thank its police**

THESE ARE AN era in the history of many cities that is inextricably linked, in the public imagination, to crime and lawlessness—think 1920s Chicago or 1980s New York. For Nairobi that period is the 1990s. In the old business district, carjackings were a daily occurrence, remembers Farida Ali, a shop-owner there. Violent crime was so common that residents dubbed the Kenyan capital "Nairobberry".

For years Nairobi was spoken of in the same breath as Johannesburg or Lagos, two of Africa's most dangerous cities. A survey in 2000 suggested that Nairobians were more likely to be robbed or assaulted than people who lived in central Johannesburg. Not much had changed by the 2010s. Robert Ochalo, a Kenyan security wonk, says the gangs which emerged in the middle of that decade were so lawless "they would rob their own relatives."



Foul crimes, burnt and purg'd away

Kenyan tabloids still paint their capital as hopelessly crime-ridden. And official statistics suggest little improvement. But speak to experts as well as ordinary residents—not to mention the city's perennially security-conscious expats—and a different picture emerges. Stories of "home invasions" in wealthy neighbourhoods are much rarer than a decade ago. It is now generally considered safe to drive, if not yet walk, at night in all but the most notorious neighbourhoods. Mrs Ali's part of the central business district is no longer deemed a no-go zone. "Violent crime has gone down overall," says Mutuma Ruteere, director of the National Crime Research Centre and the country's foremost crime expert. "We've come from 'Nairobberry' to a fairly safe city."

What might explain this? New technologies, including the spread of CCTV, have probably helped. More controversial is whether Kenya's police force can take any credit. In 2009 its reputation for corruption and lawlessness was so terrible that the UN dispatched a special rapporteur to investigate it. (The resulting report denounced the use of police death squads to eliminate suspects and a "climate of impunity".) Even today few Kenyans believe their cops do much to prevent crime. Statistics on wrongdoing are so unreliable largely because most poor Kenyans do not trust the police enough to report it.

Kenyans do, however, seem often to approve of their more heavy-handed tactics. When lawlessness in the central business district runs amok, says Benjamin Maina, a shop-owner there, the police "kill two to three people, and once they do that, crime completely goes down." These kinds of execution-style killings have a long history, dating back to the early days of Kenya's independence (and, indeed, before). In the 2000s an undercover squad of killer cops ►

▶ was credited with dismantling some of Kenya's most notorious gangs, such as the Mungiki sect, which at its peak is thought to have had over a million members. Sometimes they killed innocent people, but overall "these guys were really effective at combating crime," argues Mr Ochalo.

The current government has tried to scrub up the police's image. William Ruto, Kenya's president since 2022, disbanded an elite special unit soon after taking office, accusing it of "killing Kenyans arbitrarily". He also offered to send 400 officers to gang-racked Haiti to lead an international peacekeeping mission. In June America designated Kenya a "major non-NATO ally", the first in sub-Saharan Africa.

But their overseas deployment has put Kenya's police in the international spotlight just as they have been dealing with demonstrations back home against Mr Ruto's proposed tax rises. The ensuing crackdown, in which police have so far killed scores of protesters, and abducted dozens more, reveals how little there actually is to show for 15 years of police reform. And a growing number of police are involved in criminality themselves, such as human trafficking or lending their guns to gangs.

Still, there have been some improvements. Over the past two decades the police have received gradually higher pay and more resources. This has helped reduce some of the worst corruption in their ranks, says John Githongo, an anti-graft campaigner. Others point to the growth of community policing, initiatives to improve relations between cops and the people they serve. Giving residents more ownership over their own security has helped make poorer areas safer, argues Kennedy Odede of SHOFCO, an NGO working in Kenyan slums. In such places the spread of neighbourhood watches, community justice centres and self-help groups among former gang members may have done more than the police to reduce crime.

Some local efforts simply fill a vacuum where the state should be. In rich areas, security is overwhelmingly the job of private firms, not the police. Streetlights, which make it safer to walk around at night, are typically installed by residents, not the government. And in some areas, justice is often handed down by vigilantes, not the courts. Mrs Ali reckons "mob justice" is the main reason crime is down in her neighbourhood. Videos of lynchings in which suspected criminals are forced inside burning tyres appear on social media.

The prevalence of such practices points to a deeper problem. Currently, when crime spikes in one area, the police or local mobs move in and use force to contain it. That may work temporarily. But the more fundamental causes of crime—which include high levels of inequality and youth unemployment—are far harder to fix. ■

## Nigerian floods

# A perfect storm

MAIDUGURI

**Floods in Nigeria's north-east are exacerbating a humanitarian crisis**

THE AMBULANCE rolled into the main teaching hospital in Maiduguri, the capital of Borno state in north-east Nigeria. Through the open back door two limp, swollen legs were visible. Skin that was once brown was ashen and wrinkled. The body had the telltale signs of drowning. Medics took it to the mortuary, one of the few parts of the hospital still functioning.

Flood warnings had been ringing out across Nigeria's north-east for weeks. Schools in Maiduguri were closed for a fortnight as the torrential rains came. The reservoir of the Alau Dam began to overflow; yet the state government continued to insist that the area was safe. But in the early hours of September 10th, the dam collapsed and brought the worst floods the city has seen in 30 years. Houses and farms have been completely submerged and livestock have drowned. Corpses floated out of the cemetery and reptiles escaped from the zoo. Flooded roads have left entire towns inaccessible. So far, around 400,000 people are estimated to have been displaced and more than 30 to have died. The true numbers are almost certainly higher. Rescue efforts are still going on.

Many people in Maiduguri had already been forced to flee from their homes to avoid murder or kidnap by Boko Haram, a jihadist group. The government had tried to close refugee camps in the city's centre in hope of restoring some sense of normality. Now those camps have had to reopen.

They are already overwhelmed by crowds of newly displaced people seeking shelter.

Children shout "hunger!" at the trucks bringing in food. Even before the floods, hunger was the worst it has been in north-eastern Nigeria for nearly 15 years, according to the World Food Programme. Its treatment facilities have seen a 70% increase in the number of malnourished people from last year, with children and mothers worst affected. Hopes that the upcoming harvest would provide relief have faded; over 115,000 hectares of farmland throughout the country have been ruined by the deluge so far. "Goats, rams, sheep, turkeys, chickens, most of the domestic animals we rear, we couldn't rescue them," says Balad Mutiza, a teacher, who fled his home with his family in the middle of the night when the floods came.

One camp is currently hosting over 16,000 people. Buses of those who have been rescued from the floods are still arriving. Overcrowding and disrupted water supplies have increased the risk of cholera and other waterborne diseases. With Borno's biggest hospitals still only partially open, those who become ill have limited options. A nine-day-old baby who had not been able to breastfeed for three days was turned away at the teaching hospital. Medical staff cannot make it to work.

Much of the city is expected to remain waterlogged for weeks, as heavy rains continue. A dam in neighbouring Cameroon, which has also been damaged by the rains, could wreak further devastation on other parts of north-eastern Nigeria. This year's rainy season has been particularly bad in Nigeria, as it has been in much of the Sahel. The country's National Emergency Management Agency says that almost 1m people have been affected nationwide. A region reeling from one humanitarian crisis has been pitched into another. ■



Waves of misery

## Europe



**CEE economies**

### Bringing it all back home

Near-shoring is a boon for central and eastern Europe and a bridgehead for China

THE EUROPEAN UNION has tried hard lately to restrict Chinese imports. Yet this summer China made it easier to import one European product: Polish poultry. The gesture was economically insignificant. But it is part of a broader push by China to cultivate and invest in central and eastern Europe (CEE).

China is not alone. CEE countries are benefiting from firms shifting production closer to the European market (near-shoring) or to places considered politically reliable (friend-shoring), as well as old-fashioned offshoring for lower costs. In his recent report on European competitiveness, Mario Draghi, a former head of the European Central Bank, argued that the EU needs to build more resilient supply chains and invest in domestic production of key goods such as semiconductors. Globalisation in the early 2000s fuelled impressive growth in the EU's newer members. Now they are set to benefit again.

Take Poland, which has not had a recession since 1991, except during the pandemic. Its real consumption levels per person have caught up with Spain's. Net foreign direct investment has doubled from an already large \$10bn per year in the mid-2010s to about \$20bn these days. A survey by Kearney, a consultancy, ranks Poland in the top 25 destinations for FDI in the coming years, behind Mexico and Taiwan.

There are three reasons to expect more investment into the region. The first is the

global transition to climate neutrality. From electric vehicles (EVs) and batteries to heat pumps and windmills, new production capacities have to be built. Upgrading legacy factories in Germany or France costs about as much as building a new plant in Poland or Hungary. Rich countries may offer more subsidies, but CEE countries have cheaper land and labour, looser regulations and lower taxes.

The second reason is Chinese overcapacity. As growth slows, China is doubling down on its outsized manufacturing sector, especially in new areas such as EVs. The EU is the only market still fairly open to Chinese imports, increasing the pressure on European producers to compete. That pushes them to lower-cost regions of the single market. In a decade, "most of the car production in Europe could be in CEE countries and other, cheaper places such as Portugal and Spain," says Zoltan Torok of Raiffeisen Bank Hungary.

Finally, tension between America and China, with Europe in between, can disrupt supply chains. This is why firms have started to bring production closer to markets (near-shoring). Chinese EV makers will try to produce in Europe, using Hungary as their bridgehead. The biggest announcements of Chinese FDI in the past three years were in Hungary and Serbia, according to fDi Intelligence, a consultan-

#### → ALSO IN THIS SECTION

- 46 German politics
- 47 Balkan arms boom
- 47 EU commissioners
- 48 Finland's vulnerable islands
- 49 Charlemagne: Shrinking Schengen



activity that on top requires a lot of energy and water," says Gergely Tardos of OTP Bank in Budapest. "There is debate about whether it is good for the country or not."

Foreign investors also need assurances that they can find workers. That is a challenge for countries with declining working-age populations. Millions of their citizens have moved to richer economies in the West. "Importing labour for blue-collar jobs is now common," says Mr Torok. Firms turn to private agencies and governments for help. "We go as far as India, even Laos to find them," says Jakub Fekiac of Edgar Baker, an agency in Slovakia. Foreign services firms do not show up much in FDI numbers, but analysts say they employ as many people as industrial ones do. The number of foreign students at Hungarian universities has doubled over the past decade, lured by European visas. Importing workers may not play out well in countries where voters oppose immigration.

The investment boom in CEE countries will boost their standing in the EU along with their economic prospects. It will also make them more friendly towards China and other authoritarian countries seeking to nearshore to Europe. Already, Hungary is resisting EU tariffs on Chinese EVs. Some analysts worry that CEE countries' chicken exports will prove a poor trade for a Chinese Trojan horse. ■

### German politics

## The old pretender

BERLIN

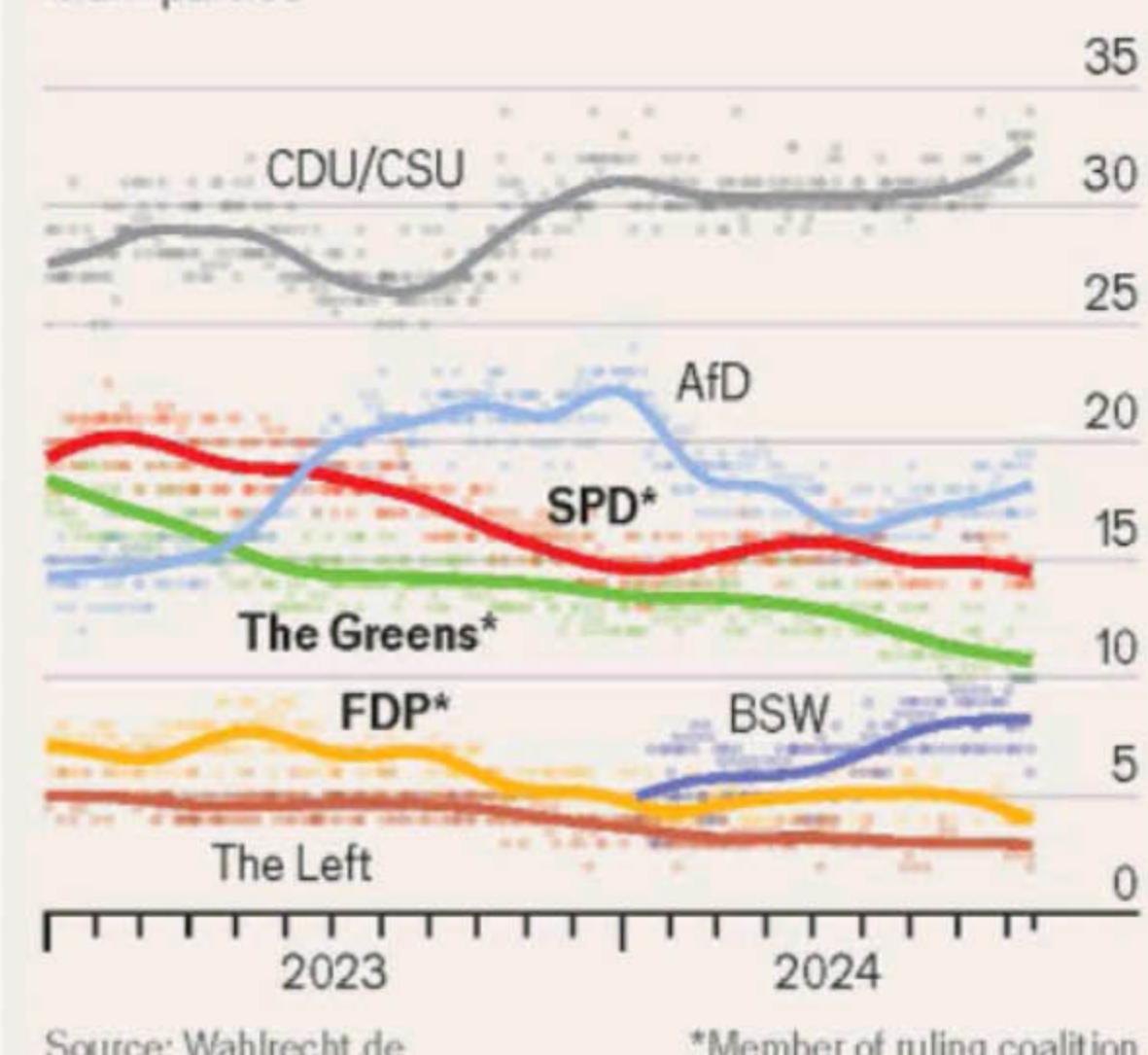
**Friedrich Merz is in pole position to take over as chancellor next year**

**F**RIEDRICH MERZ is doing it, and I'm fine with that." This brief statement by Markus Söder, head of Bavaria's governing Christian Social Union (CSU), was enough to confirm what had long been clear: that Mr Merz, leader of the centre-right Christian Democratic Union (CDU), the CSU's larger sibling, would be the parties' joint candidate at next year's federal election. Mr Merz will thus lead the conservatives' bid to unseat Olaf Scholz, the Social Democratic (SPD) chancellor.

The decision was no surprise. Mr Söder, a mercurial sort who has never worked out how to convert his regional success into the national leadership he craves, was bowing to the inevitable. Many in the CDU blame him for hobbling the CDU/CSU's disastrous election campaign in 2021 by endlessly sniping at Armin Laschet, who had defeated him for the nomination. At a hastily assembled joint appearance in Berlin on September 17th, Messrs Merz and

### Conservative bet

Germany, voting intention in federal election, %  
Main parties



Söder made it clear that debacle would not be repeated. Germany's election is due on September 28th 2025. That leaves Mr Merz, who has bags of parliamentary experience but none of the governing sort, a year to introduce himself to a sceptical electorate.

Germans are deeply unhappy with Mr Scholz's government, leaving Mr Merz in position to steal his crown. The CDU/CSU is polling at around 33%, more than the combined figure for the three parties in the disputatious "traffic-light" coalition (comprising the SPD, Greens and liberal Free Democrats). The CDU did reasonably well in two state elections in Germany's east earlier this month, but will probably have to govern with awkward partners.

A sprightly 68-year-old private-jet-owning millionaire with multiple lives in politics, business and law, Mr Merz has shifted the CDU, the party of Angela Merkel, rightward since taking the reins in 2022. Two previous botched bids to lead the party, and a reputation for arrogance and bluster, left many in the CDU wondering whether he had what it took. His dreadful relationship with Mrs Merkel—he never forgave her for besting him in an intra-CDU power struggle two decades ago—worried many who appreciated her talent at winning elections. He has sometimes seemed unsure whether he wanted the top job.

Yet Mr Merz has silenced the doubters, at least for now. He has diligently worked to win over the CDU's moderate, or "social", wing while stamping his brand of crunchy conservatism on the party. "As old as he is, he is able to learn from his mistakes," says Johann Wadehul, a senior CDU MP. In May Mr Merz was re-elected CDU leader by nearly 90% of party delegates.

Mr Merz's bombastic style—his speeches are punctuated by both physical and rhetorical jabs—contrasts with Mr Scholz's reticence. He has hammered the government on everything from its spending plans to what he considers its halting support for Ukraine. In recent weeks he

cy; Hungary got the first European factory of BYD, a Chinese EV producer. Western firms are doing it too. Olaf Scholz, Germany's chancellor, went to Serbia on July 19th to sign a deal to mine lithium for EVs. Intel, a chipmaker, picked Poland for a \$4.6bn plant, though it has paused European investments amid financial woes.

But the FDI boom also carries risks. Foreign investors are not exactly popular. A big chunk of the region's economy is already foreign-owned. The value added in car production is almost entirely in foreign hands. Two of the top four banks in Poland are subsidiaries of ING, a Dutch bank, and Santander, a Spanish bank. Populist parties like Poland's Law and Justice claim the FDI model leads to lower wage growth and rising inequality. (In fact Polish wages have grown handily.)

Weaning countries off foreign firms, capital and know-how is hard, though. CEE countries spend much less on research and development than western European ones do, and lack deep capital markets. Poland's attempt to build an EV of its own has barely started, even after it joined forces with Geely, a Chinese EV maker, for much of the technology. The country's biggest bus manufacturer, Solaris, was recently acquired by CAF, a Spanish firm.

CEE countries must compete for FDI with countries such as Germany and France, which can afford bigger subsidies, and those with much cheaper energy, such as the Nordics and Spain. Labour costs are still lower in CEE countries but the gap is narrowing: their wages are set to go from 44% of the western EU average today to 59% by 2035, according to Tomas Dvorak and Mateusz Urban of Oxford Economics, a consultancy. To compete, CEE governments offer foreigners cheap land, which displeases local firms; subsidised energy, which other consumers pay for; and lighter regulation, which enrages environmental groups. "Battery assembly with lots of imported inputs is locally a low value-added

▶ has been especially strident on irregular migration, following the murder of three Germans by a Syrian asylum seeker who had evaded a deportation order. Having found receptive ears for that message, Mr Merz will surely stick to it as the election approaches—even if he insists that his campaign priority will be Germany's faltering economic performance.

The SPD relishes the fight. Mr Scholz will portray his opponent as a reckless, out-of-touch sort who will slash pensions and undermine workers' rights. (He will also hope to goad him into a hot-tempered remark or two in the heat of the campaign). Mr Merz struggles especially with female and younger voters. Although the SPD's ratings are dismal, for now voters seem no more keen on either man as chancellor. A big plurality would prefer neither of them.

Yet without an unpopular record to defend, Mr Merz is in a better position than his rival. Indeed, Mr Scholz's own candidacy is not even assured. Should the SPD fail to take first place at an election in Brandenburg, another eastern state, on September 22nd, some in the party will call for the chancellor to make way for new blood. Mr Merz's position is more secure. Having won over his party, and now the Bavarians, his biggest challenge awaits: to convert himself in voters' eyes from an opposition leader to a chancellor-in-waiting. ■

#### West Balkan arms

## The cogs of war

#### Ukraine is a booming market for Serbian and Bosnian arms factories

**T**ERRORISTS AND gangsters enjoyed a weapons bonanza after the breakup of Yugoslavia in the 1990s. Now it is Western governments' turn. With war raging in Ukraine, they are hoovering up the region's ammunition and mortars. Western Balkan arms-makers are booming. Serbian arms exports have quadrupled since 2020; some €800m (\$890m)-worth of its ammo has gone to Ukraine since the invasion. Bosnia's exports in the first four months of 2024 nearly doubled compared with the same period last year. Its ammunition factories are working around the clock, says Jasmin Mujanovic of the New Lines Institute for Strategy and Policy, a think-tank.

During the cold war, security-paranoid Yugoslavia had a large army supported by a sprawling military-industrial complex. Vestiges of its defence industry are now concentrated in Bosnia and Serbia, which account for over 90% of the western Balkans' military exports. Of particular inter-

est to Ukraine and its backers is the industry's ability to churn out both Soviet- and NATO-standard munitions and equipment. Its wares are also generally cheap: a Bosnian shell may go for a quarter the price of a Western one.

Both Bosnia and Serbia have laws that restrict them from hawking weapons to war zones. But they have found workarounds through third parties. America, for example, is the main buyer of Bosnian bullets, which it reroutes to Ukraine. Serbia, despite its refusal to impose sanctions on Russia, has funnelled thousands of artillery rounds via the Czech Republic, Turkey and a thicket of shell companies. Balkan NATO members—Croatia, Albania, Montenegro and Macedonia—have transferred much of their inventories of old Soviet kit. Recent reports suggest that Croatia could refurbish clapped-out Kuwaiti M-84 tanks (Yugoslavia's version of the Soviet T-72) to be sent to Ukraine.

For some regional governments it is an opportunity to win political credit with America and the European Union. That is especially true of those aspiring to join the EU, such as Bosnia and Albania. Ukraine is tapping into that sentiment. In February Ukraine's president, Volodymyr Zelensky, called for joint arms production with western Balkan countries to ensure Ukraine's "survival". Economic motives are also at play, suggests Katarina Djokic of the Stockholm International Peace Research Institute, another think-tank. Bosnian ammunition factories, once on the verge of shutting down, are now fully staffed.

For Aleksandar Vucic, Serbia's president, weapons sales to Ukraine are part of a delicate balancing act between the West and Russia. But they are also good business. "I adore it when we export arms," he once crowed, "it is a pure influx of foreign currency." Serbian weapons tend to show up in far-flung conflicts. In July Amnesty International, a human-rights watchdog, reported finding vast quantities of Serbian arms in war-torn Sudan. An investigation by BIRN, a network of Balkan reporters, and *Haaretz*, an Israeli newspaper, found a spike in Serbian weapons flown to Israel since the October 2023 attacks.

Serbia's arms exports do not always suit its nationalists' tastes. Milorad Dodik, who as leader of the Republika Srpska (the Serb-dominated part of Bosnia) calls for an ethnic Serbian superstate, criticises the sale of weapons to Ukraine. Some ethnic Serbs have gone to fight for Russia. Others in the region worry about Serbia's arms imports, not its exports: its recent purchase of French-built Rafale fighter jets delighted Western governments, but has made Croatia and Kosovo jittery. In any case, decades after the end of the wars that followed the breakup of Yugoslavia, the Balkan arms trade is still going strong. ■

#### EU commissioners

## Brussels reboot

BRUSSELS

A new team of commissioners will try to revive Europe

FOR A SENSE of what Europeans fret about, look at the job titles given to European commissioners in Brussels. Five years ago a Greek official was put in charge of "protecting our European way of life"—a job that largely entailed keeping migrants out. (After a furore he was merely asked to "promote" this elusive way of life.) The recurring theme of the job titles handed out to a new set of commissioners on September 17th is that the European Union is now fretting about its place in the world, particularly its economy. One commissioner has been asked to look after not just trade but also "economic security", another aims to promote "tech sovereignty", yet another to deliver "prosperity". To add to the anxious vibe, for the first time the bloc will have a straight-up defence commissioner.

The fretful tone is warranted. War is still raging in neighbouring Ukraine, whose prospects will dim if Donald Trump wins the American election in November. Last week Mario Draghi, a former Italian prime minister, issued a gloomy report on the EU economy, spelling out reforms needed to rekindle the bloc's growth. Politically, Europe is rudderless. Governments in France and Germany, the bloc's two biggest countries, are unpopular and crippled by coalition woes.

Ursula von der Leyen, who in June was picked by national leaders to serve a second term as the European Commission's ➤



Let's try this again

► president, thus has lots of scope to shape the EU's executive arm. Each of the 27 countries nominates one commissioner, but it is up to the president to decide who does what. (The European Parliament will grill the nominees in the coming weeks.) In the past many top jobs went to politicians from small, open countries in northern Europe. This time it is officials from big countries with statist instincts in southern Europe that dominate.

The most important fresh face in Brussels will be Teresa Ribera, until now the Spanish ecology minister. One of six vice-presidents of the commission, her sprawling portfolio includes Europe's flagship decarbonisation efforts. Once known as the Green Deal, it is now to become a "clean, just and competitive transition"—a concession to those who think environmental rules have burdened businesses and imposed costs on consumers, too.

Included in her brief will be the EU's powers to enforce antitrust rules, and to prevent national governments from showering favoured companies with subsidies. Such "state aid", in Eurocratese, soared in recent years as the EU faced first covid-19 and then an energy crisis linked to the war. The outgoing competition enforcer, Margrethe Vestager, a Dane with liberal instincts, often stood in the way of the *dirigiste* policies egged on notably by France. But it has been an increasingly lonely fight.

In recent years the chief proponent in Brussels of the statist approach was Thibault Breton, a former French finance minister. He had been expected to return for another five years as the commission's point man on industry, regulating and subsidising EU firms to do politicians' bidding. But a spat with Mrs von der Leyen led her to suggest to Emmanuel Macron that he be dumped. Instead it will be Stéphane Séjourné, a close ally of the French president, who will take over the job. Defence—meaning mainly trying to co-ordinate the continent's fragmented arms industry—will be the purview of Andrius Kubilius, a former Lithuanian prime minister.

Another prominent southern European will be Raffaele Fitto, until now a minister in the hard-right government of Giorgia Meloni in Italy. His "cohesion and reforms" brief includes oversight of the vast Next Generation fund, which involved national governments deploying €750bn (\$835bn) of money jointly borrowed in the aftermath of the pandemic. Mr Draghi in effect recommended rebooting the scheme to invest hundreds of billions more euros into making the EU more productive. His advice, often echoing the *dirigiste* faction, has been adopted wholesale by Mrs von der Leyen. Perhaps Mr Draghi is the official who will have mattered most of all: incoming commissioners have been asked to implement his suggestions. ■

## Protecting Aland

# Temptation islands

ALAND

**Finland worries that Russia might seize a demilitarised archipelago in wartime**

**E**VERYTHING HAS become more intense," murmurs Juri Jalava as his coastguard cutter plies the waters of the Aland Islands. Tension with Russia means he is spending longer at sea than ever: "We do not want to be caught out." Aland, a Skye-sized island surrounded by 7,000 islets and rocks, is awkward for Finland. Over 95% of its trade passes through or near the islands, as do crucial data and electricity cables linked to the rest of Europe. But Finland is bound by treaty to keep these Swedish-speaking islands demilitarised in peacetime. They have been so since the Crimean War, when Britain and France tried to strangle Russian trade through the Baltic.

With Finnish soldiers banned from training or storing weapons on the islands, security types worry they may be unprepared. Russia would need to take Aland to dominate the Baltic in any conflict with the West. Sweden remilitarised nearby Gotland after Russia annexed Crimea in 2014; Russian soldiers have practised seizing both islands.

"Why should we leave this hole in our defences that benefits only Russia?" asks Pekka Toveri, a former head of Finnish military intelligence. He worries a small Russian force could disrupt NATO reinforcements bound for Finland. Kjell Torner, who once commanded the force tasked with racing to Aland during

wartime, worries about undercover agents sent to cause trouble. He claims there are weapons in the cellar of Aland's Russian consulate. "It just makes life so much more difficult," snaps an official involved in planning Aland's defence. The Russians may have prepared to cut the cables around Aland, another warns.

Yet reopening long-standing agreements risks opening a can of worms, says Matti Pesu from the Finnish Institute of International Affairs. Russia, which is party to two deals forced on a defeated Finland in 1940 and 1947, would surely object. "Would it not be more dangerous to start ripping up international treaties?" asks Mats Lofstrom, a local MP. Among some two dozen pensioners protesting against the war in Ukraine in front of the clapboard Russian consulate, none wanted Aland remilitarised. "It makes us safer," said Sonja Nordenswan.

Alanders are supposedly the happiest people in the happiest country on Earth. It is not hard to see why, after walking the coastal paths lined with boat houses and bird-watching haunts. Most dismiss mainlanders' discussions about remilitarisation as populism at their expense. "It is all pretty absurd," snorts Michele Ferrari, a local politician. "We are demilitarised and shall remain so. The world needs more demilitarised places."



Sea of tranquility

# CHARLEMAGNE

## *Shrinking Schengen*

*Europe is bidding a slow but steady farewell to passport-free travel*



**S**TARING OUT over France and Germany from the vine-covered hills of Schengen, a village at the southern tip of Luxembourg, it is hard to tell where one country ends and the other begins. That is in no small part thanks to a deal signed there in 1985, which committed the Benelux countries, France and Germany to abolish the frontiers separating them. The Schengen passport-free travel area has since grown to include most of the 450m citizens of the European Union's 27 countries, and some neighbours too. Keen to capture the mysterious essence of Euro-federalism, a trickle of tourists still flock to the village where it all started, as Charlemagne did this week. Alas, visitors face three kinds of disappointment. First, a museum celebrating the agreement is currently under renovation. Second, the village has turned into a Saudi prince's fantasy: with just a few hundred inhabitants, it has eight sprawling petrol stations in its vicinity, serving motorists keen to fill their tanks before leaving low-tax Luxembourg. Finally, and most distressingly, the freedom of travel that put the place on the map is steadily being chipped away. A symbol of the EU's success at bringing countries together risks succumbing to reinvigorated nationalism across the bloc.

Starting this week, Schengen will have a Germany-shaped hole at its heart. On September 16th Europe's most populous country opted out of passport-free travel by reintroducing controls at all its borders, initially for a period of six months but probably for longer. To those committed to an ever-closer union, this raising of drawbridges in a country that sits squat in the middle of the continent bodes ill for one of the EU's signature achievements. On the ground, to be sure, little seems to have changed. Wandering on foot across the Moselle into Saarland on the first morning the new measures were in place, your columnist saw no sign of border posts; they have long since been removed. (Germany has promised "targeted" checks that will not disrupt the many workers who commute across borders. Woe betide anyone inconveniencing a Luxembourg asset manager on his way back from the office.)

Still, the new measures are yet another blow to a system that has endured a thousand cuts, and may not be able to withstand many more. Like other European *grands projets*, such as the euro or

the single market, Schengen requires each national government to trust that their counterparts in the union are doing the right thing. Increasingly, they do not. That is particularly true when it comes to migration, which worries voters (and thus politicians) from Athens to Dublin. Germany reintroduced restrictions not because it worries about Danes or even Frenchmen visiting. Rather, it has lost faith in its neighbours' policing of their own borders: their propensity for letting in migrants from farther afield, who then make their way to Germany.

This highlights Schengen's central flaw. The implicit deal when internal frontiers were abolished in 1995 was that those countries bordering non-EU countries would have to police them assiduously, in a way that others could count upon. That is only occasionally true: nearly 400,000 illegal crossings into the EU occurred in 2023, the highest since a wave of migration in 2015-16. Once in the Schengen zone, migrants can travel uncontrolled wherever they please. Often that means making their way from a poorer country like Italy to a richer one like Germany. A continued flow of migrants that authorities are powerless to do much about is fertile ground for hard-right politicians, who are keen to denounce both migrants and the EU. The German Schengen measures come after a surge in support for the Alternative for Germany, a xenophobic party that has done well in recent state elections.

In theory, Germany could enforce the safeguards to Schengen that already exist. Irregular migrants found to have travelled across European internal borders can be sent back to the first EU country in which they set foot, which has to either grant them asylum or send them back to their place of origin. In practice the system doesn't work. The countries meant to take back migrants, such as Italy, Greece and Hungary, say they cannot cope with migration flows outside their control. The bolstering of Frontex, a pan-European border force, since 2016 has thus far made only a marginal difference. A wide-ranging "migration pact" agreed last year is meant to improve matters, for example by building facilities at the EU's borders to process irregular arrivals quickly (and thus send many of them home before they can travel on to places like Germany). But implementation is at least two years away. German national elections, in contrast, are next year.

### Your papers, please

Thus the last-straw solution for frustrated interior ministers: reintroducing border controls within Europe. This goes against the spirit of Schengen, and indeed some of its formal rules. In theory suspensions of passport-free travel are authorised only for up to six months. In practice some countries, like France and Denmark, have quietly accumulated years of such "temporary" restrictions. Many fear Germany will do the same. The EU authorities in Brussels ought to protest but have tacitly allowed countries to reimpose controls in the hope of preserving the system.

Seen from Luxembourg, the raising of the German drawbridge seems manageable for now. Léon Gloden, the country's interior minister (and for many years mayor of a town just up the road from Schengen, bordering Germany) says that EU member states should ideally refrain from unilateral measures, even temporary ones. Luxembourgish authorities are working with their German counterparts to prevent traffic blockages. It is an irritant, but far from the hard German border he remembers from his childhood, which has long since been forgotten. "If I tell my children [about border posts] now, they think I lived in the 19th century." ■

## Britain



### Higher education

## Universities challenged

READING

**Frozen fees + fewer foreigners = trouble**

THE LABOUR PARTY barely talked about higher education in the run-up to the general election in July. In government, universities' problems are harder to ignore. In a dour speech on September 10th Sir Keir Starmer, the prime minister, included universities among a list of public services that he said were "crumbling" and "worse than we expected".

Rising costs, combined with a fall in the number of more lucrative foreign students, are forcing cuts: some 70 institutions are retrenching in one way or another, according to a list compiled by the University and College Union, a trade union. In May the Office for Students (Ofs), a regulator, said that 40% of universities and colleges expected to be in deficit by the end of the 2023-24 financial year. In a "reasonable worst-case scenario" that could rise to 80% in three years. At least one or two universities are rumoured to be close to insolvency. On September 17th the BBC reported that

Universities UK, a lobby group, had asked for more funding to fill financial holes.

At the root of universities' difficulties lies insufficient funding for domestic undergraduates (see chart 1 on next page). The tuition fee they may charge British students was capped at £9,000 (\$11,880) a year in 2012, and has scarcely risen since. Inflation has gobbled away at its value: it is now worth less than £6,500 in 2012 prices.

A crunch might have come sooner but

#### → ALSO IN THIS SECTION

#### 52 Bagehot: The Lib Dems

→ Read more at: [Economist.com/Britain](https://Economist.com/Britain)

— Indyref, ten years on

— Nuclear-test veterans

— Fossil-hunting on the Jurassic Coast

— Farms on Instagram

for a sudden and sharp influx of foreign students, whose fees are not capped and who can often pay double what their English peers are charged. Their numbers began to soar five years ago, in response to a change in visa rules that permitted foreign students to remain in Britain for two years after their courses ended. This unleashed demand from students in places such as India and Nigeria (who find it much easier to pay for rich-world courses if they come with the right to stay and work once they have finished). They flocked to universities that until then had not taken many foreigners, and enrolled mostly in one-year masters courses.

But the foreigner boom is now turning into a bust. Arrivals from abroad peaked in the 2022-23 academic year, and are falling fast (see chart 2). So far this year the government has granted 17% fewer student visas than it did during the same period of 2023. One vice-chancellor thinks that the worst-affected universities could be facing falls of 30-50%. Some of the reasons, such as an economic crisis in Nigeria, lie outside anyone's control. But government policy has also played a role. At the start of this year the Conservatives, seeking to bring down net migration, began forbidding most foreign students from bringing their spouses or children. That is having a bigger impact than most had expected. ➤

This is not just a problem for universities that are highly reliant on foreigners. As a hedge against trouble, many institutions have this year sought to enroll more British undergraduates than they usually would. Prestigious ones have found this easiest: the number of British youngsters winning places in "high-tariff" institutions, such as those in the Russell Group collection of universities, is up by around 13% this autumn. That has left universities lower down the food chain short of new domestic entrants. (It doesn't help that rising living costs make student life less appealing.)

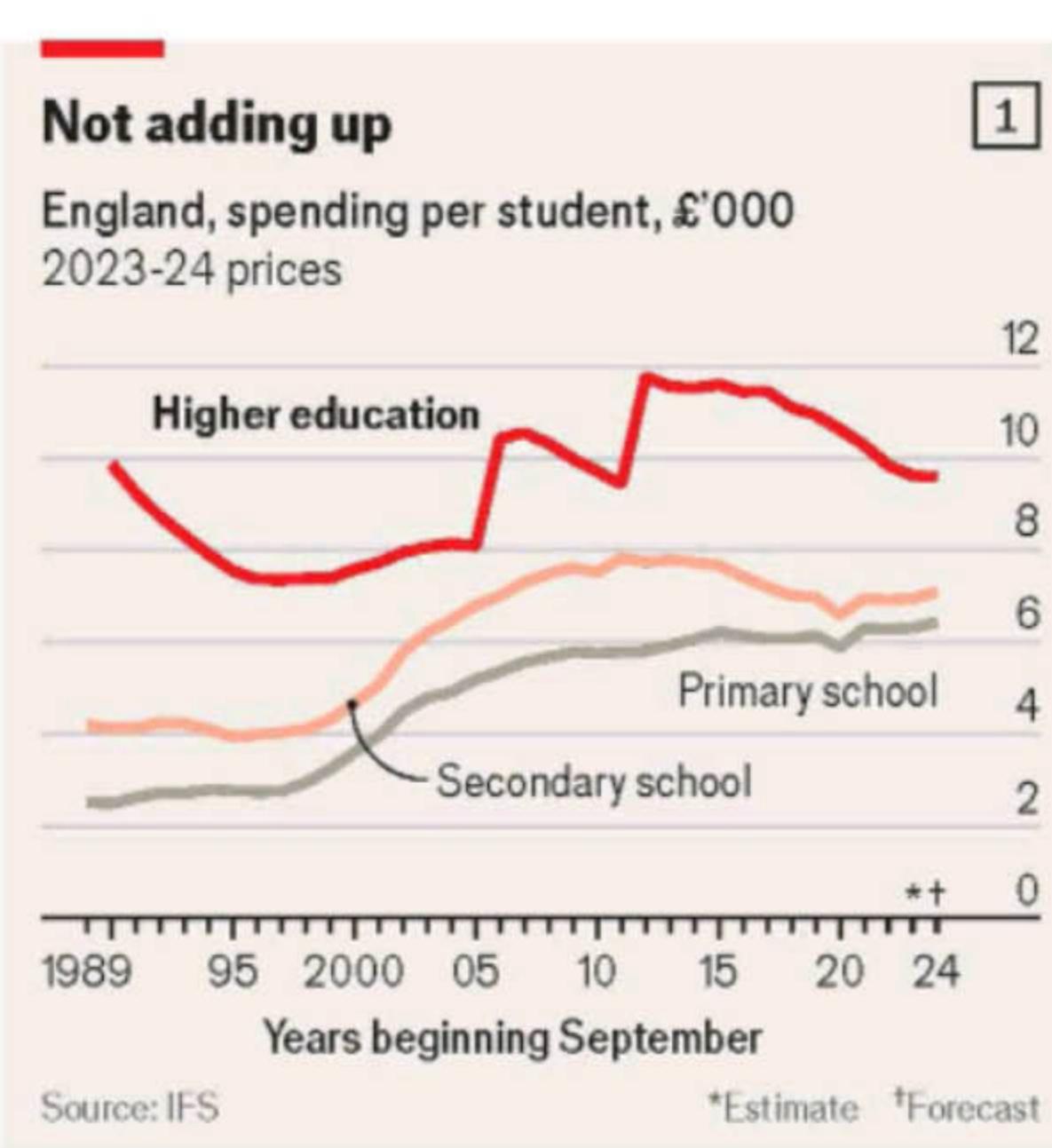
The financial risks are rising as a result. "I would be surprised if, after this round of annual reports, there is not one university that has to have some form of significant intervention," says Jonathan Simons of Public First, a think-tank. Things will get a bit clearer once term starts—when universities are able to count how many successful applicants have actually turned up—but conversations with creditors are already happening. "Some institutions are talking to banks about potential breaches of covenant on loans," says John Rushforth, executive secretary of the Committee of University Chairs, a charity that advises university leaders. "And we know that there have been some discussions with auditors about 'going concern'."

### Failure and fees

For Labour, two questions stand out: how to handle a university that runs out of money and how to put the sector onto firmer ground. On the first issue, the official line is that failing institutions should not expect government help. On August 15th Jacqui Smith, the minister for skills, said that "if it were necessary" the government would let a university go bust.

That line might just about hold should problems strike at institutions that are fairly small or in a city such as London, which has several dozen universities that could soak up displaced students. In many cases, however, the government would probably find the fallout from a collapse intolerable. Administrators would neither prioritise refunds for students nor make much effort to help them continue their studies elsewhere. Local bigwigs, terrified of losing one of their biggest employers, would scream for help. Spooking foreigners would only deepen universities' malaise.

During the covid-19 pandemic the then government set up a process, the "higher education restructuring regime", whereby universities that risked running into financial trouble could discuss their options with the government. Nick Hillman of the Higher Education Policy Institute, a think-tank, believes Labour should create something similar. "It wasn't a perfect process, by any means, but it was a process—and what we have at the moment is nothing." If



the government is really willing to contemplate wind-downs then it ought to rig up a "special administration" regime of a sort that already exists for colleges of further education, reckons Mr Simons. That would grant administrators permission to consider the interests of students, in addition to those of big creditors.

Even if Labour sidesteps a university bankruptcy in the coming months, the party will still have to decide what to do about the sector's overall financial footing. Since coming to power the government has confirmed that it has no plans to further tighten visa rules. But it is very unlikely to reverse the ban on foreign learners bringing relatives with them.

The problem is not just that dependents were boosting net migration figures: between 2019 and 2022 the number of dependents arriving with students rose from 16,000 to 134,000. It was also feared that the system was being gamed. Under the old regime spouses were permitted to work in Britain while their partners studied as well as for the two years after they graduated. Politicians began to worry that students from poorer countries were enrolling in British universities solely to gain these working rights.

The other obvious way to steady the ship would be to push up funding for Brit-

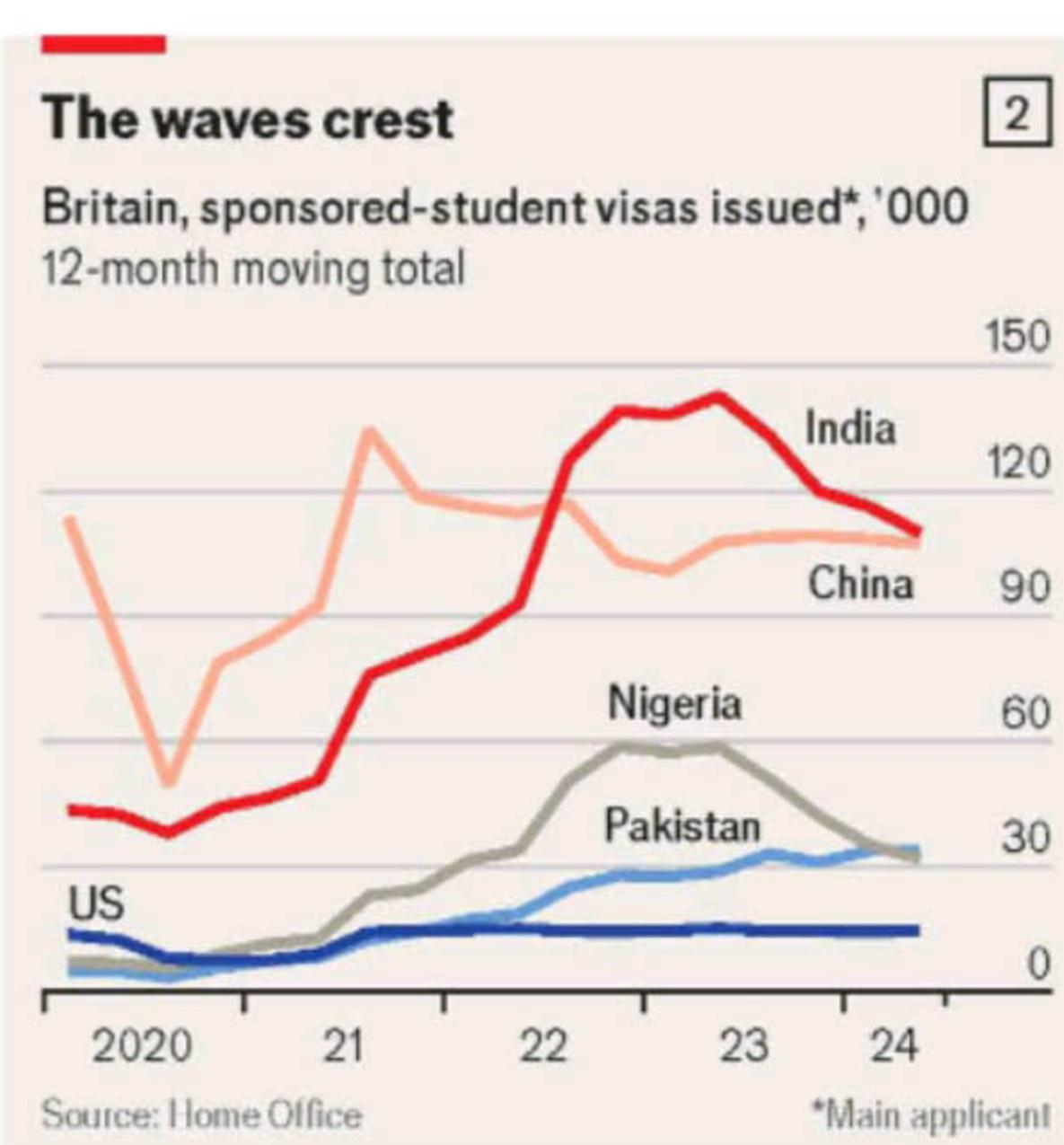
ish undergraduates. There are two ways to achieve that. The government currently doles out about \$1bn annually in "teaching grants" designed to help fund high-cost courses such as medicine and dentistry. Widening and increasing these payments would please people who think Britain loads too much of the cost of higher education onto its students (public spending provides only about 25% of all funding for universities and colleges, compared with an average of 67% in the OECD club of rich countries). Higher teaching grants was one recommendation in the last big government review of university funding, in 2019.

The cheaper, and therefore much likelier, approach is to increase tuition fees. The Institute for Fiscal Studies, another think-tank, reckons that this would cost the government only about a quarter as much as expanding teaching grants (because graduates would cough up the lion's share of the extra cash in student-loan repayments). Only a few years ago Labour was promising to abolish fees entirely; it would not relish the prospect of raising them. But policymakers have overestimated the furor this would cause, says Mr Hillman: "The funding system is not broken; what's broken is politicians' bravery."

Were it to go down this path, Labour could perhaps dampen discontent by bundling a higher fee with reforms to the loan system. In opposition Bridget Phillipson, now the education secretary, said that she was interested in ways to reduce monthly repayments for newer graduates, so as to give them more "breathing space at the start of their working lives".

She has also claimed that changes made by the Conservatives last year, which increased the amount of student debt that low-earning graduates pay back to the government while reducing lifetime costs for well-paid ones, are "desperately unfair". The party is said to be interested in alternative repayment models that might use sliding interest rates to dramatically increase the sums high-earning graduates are asked to contribute. In theory this might generate money that the government could then spend reintroducing grants to cover living costs for poorer students, which the previous government juked in 2016.

Universities fret that Labour will end up deciding all these options are unappealing and put off decisions by setting up a meandering independent review. On September 12th Lady Smith, the skills minister, sought to reassure the House of Lords that her party would not be hanging about. Fixing university funding "will take some time to get right", she said. "But I do not believe that it will take as long as some people fear." If institutions start to get into real trouble, Labour may not have much choice but to act fast. ■



## BAGEHOT

### *Rightward, ho!*

*If the Lib Dems want to overtake the Conservatives, they must move further right on the economy*



IT WAS ALL worth it. The paddle-boarding, the alpaca-stroking, the thrusting in the Zumba class, the makeover on morning television, the rollercoasters, the falling off the surfboard, the falling off the paddleboard, the falling off an obstacle course, the bungee-jumping. Every gimmick that Sir Ed Davey, the usually serious-to-the-point-of-pompous leader of the Liberal Democrats, endured during the election campaign was worth it when, on July 4th, the party enjoyed its best result in a century.

The Lib Dems won 72 seats, snatching 60 of them from the Conservatives. Nearly all their gains came from the loveliest, and most prosperous, parts of southern England. The party's task at the next election is to replace the Tories as the main opposition. The party finished in second place in 27 seats, 21 of which are Conservative-held. Conquer them and the two parties would be almost-level pegging for the first time since the Edwardian era. "Let's finish the job," said Sir Ed at the party's annual conference in Brighton on September 17th.

As a strategy, it is clear. But the consequences of pursuing it are overlooked. Britain has a two-party system designed, broadly, to produce one party more to the left economically and another more to the right economically. Labour has sewn up the left. The Conservatives have only a loose grip on the right. There is only one place for the Lib Dems to go on economics: right.

Pointing this out to a Liberal Democrat triggers outrage or confusion. The party's MPs and activists put themselves somewhere between the centre and beyond Labour's left on the political spectrum. Partly this is a trauma response: bad things happen to Liberal Democrats when they drift right economically. In 2004 high-flyers in the party published the "Orange Book". It was a radical manifesto, which ranged from a tax lock, insisting that no one should ever pay a marginal tax rate above 50%, to turning the National Health Service into an insurance system.

The Orange Book did not have a happy ending. Its authors enjoyed mixed fortunes. Three, Sir Ed among them, have become party leader. Others were less lucky. One ended up in jail for perverting the course of justice. Another's career ended after he was embroiled in a scandal that the now-defunct *News of the World* de-

scribed as a "bizarre sex act too revolting to describe". More important, the party's economic shift to the right paved the way for it to enter into a coalition with the Conservative Party in 2010. Voters deserted the party at the next election in 2015. Luring them back took both the best part of a decade and Sir Ed repeatedly hurling himself into bodies of water.

It is natural, then, that shifting right makes Lib Dems nervous. Yet Britain's third party does not have to move far. It may be socially liberal, but on the economy it is already further to the right than people think. Ostensibly left-wing policy is often, on closer inspection, anything but. For instance, Sir Ed wants the very richest to pay more inheritance tax. The example given by his team is that estates worth tens of millions often avoid inheritance tax altogether. A crackdown on the mega-rich would allow lower rates for those lucky enough to own a £1.5m home in, say, Oxfordshire. The most likely result would be that the extremely rich find ways to avoid paying, and that prosperous Lib Dem voters in the home counties toast Sir Ed's generosity.

Opposing VAT on private schools is another case in point. This is a matter of principle, according to Sir Ed. Politically, it makes sense too. The sort of parent who would send their child private is likely to be a prosperous professional who lives in the south-east. In short, the archetype of the new Lib Dem voter.

The bulk of Lib Dems may feel closer to their Labour peers. But it is Tory-to-Lib-Dem switchers who will determine the party's fate. The seats gained in July include some of the most conservative places in the country, such as Surrey Heath, a wealthy web of commuter villages outside London. Tory voters who jumped ship to the Lib Dems were ever so slightly more economically right-wing than the ones who opted for Reform UK, according to Paula Surridge from Bristol University. Clinging on to them is key.

#### From FBPE to FDP

Drifting right need not interfere with the long-held concerns of Britain's third party. Why should returning to the EU necessarily be a left-wing thing? European integration was a centre-right project, with a cabal of Christian Democrats trying to ensure that the continent did not do *that* again. It evolved into a neoliberal project, with strict rules constraining state action. Electoral reform, another long-held Lib Dem goal, is not an inherently leftie project either. An obsession of sandal-wearing, pony-tailed pensioners who dominate Lib Dem land it may be. But it is also a preoccupation of Nigel Farage, the leader of Reform UK.

The Liberal Democrats are left-wing in one crucial way. They want—or, rather, need—a second Labour term. The party does not control its own destiny. Labour must be competent enough for wavering centre-right voters to be prepared to gamble on the Lib Dems, and thereby give Sir Keir Starmer another term, rather than reverting to the Tories. Meanwhile, the Conservatives must stay cracklers. If the state of the Tory party's leadership election is anything to go by, Sir Ed is in luck.

What the Lib Dems do have to decide is if they are happy to ensconce themselves on the centre-right. For those members and MPs who wince at memories of the coalition, or who were never on board with the Orange Book, it is an uneasy shift. For all the campaign gimmicks, Sir Ed admitted one idea went too far. An aide thought it would be fun for him to shove his arm up a cow. Mercifully, party wallahs thought better of it. Some things are too much, even for a Lib Dem. Drifting further right may be another. ■

## International



**America and the UN**

### UNintended consequences

NEW YORK

**How the Gaza war is weakening America's clout in the world**

**T**HE RUSSIANS are not the bad guys any more. Now it's the Americans." Thus, explains a European diplomat at the UN, the war in Gaza is eclipsing the one in Ukraine. These days many countries are wary of criticising Russia's aggression. Instead their outrage is directed at Israel and, increasingly, at America for arming and protecting the Jewish state. The accusation of Western double standards, gleefully amplified by Russia and China, resonated across the halls of UN headquarters on September 18th as the General Assembly adopted a far-reaching resolution to exert pressure on Israel to end its occupation of Palestinian territories within a year. It passed with an overwhelming 124 votes in favour to 14 against (and 43 abstentions).

The war is hastening the broader realignment of global forces: America, stretched by multiple crises, is losing its old supremacy. Russia has recovered the military initiative and is determined to disrupt the America-built order. China hopes to refashion it to its liking, convinced of its

own inexorable rise. And lesser states seek opportunity in the space created by competition among the big powers.

This new world disorder will be on display as leaders gather in New York this week for the UN's annual summitry. Much about the talkfest is, inevitably, theatre. The Security Council is increasingly paralysed by the rivalry between the big powers. Even so, the diplomatic battles reflect the shifting power balance of the world beyond, and affect it.

#### Lawfare and warfare

As Hamas battles Israeli troops in the ruins of Gaza, its rival, the Palestine Liberation Organisation (PLO), which runs a patchwork of autonomous territories in the West Bank, has been waging a diplomatic and legal fight against Israel in international courts and institutions. Doubling as the Palestinian Authority in the West Bank, the PLO may be weak, corrupt and besieged at home. It is nevertheless advancing abroad in the face of opposition

from Israel and America.

Palestine is the oldest obsession at the UN. In 1947 the organisation voted to partition the British-ruled territory into a Jewish state, creating Israel; and a Palestinian one, which neither diplomacy nor war has yet been able to establish. Many members regard Palestine as the last great anti-colonial cause; many in Israel see the UN as anti-Israeli, if not antisemitic. The recently departed Israeli ambassador, Gilad Erdan, wore a yellow star, a symbol used by the Nazis to identify Jews, to protest against the UN's failure to condemn Hamas formally for its attack on October 7th.

One front in the international battle has been the creeping recognition of Palestine as a quasi-state at the UN. It currently ranks as a non-member observer, akin to the Holy See. In May, after America vetoed Palestine's bid to become a full member, the General Assembly conferred several new privileges on the Palestinians, including the right to submit resolutions.

Another front has been legal. Two recent rulings by the International Court of Justice (ICJ), the UN's judicial body, have turbocharged the campaign against Israel. In January an interim ruling appeared to give some credence to South Africa's submission that Israel was committing acts of genocide (the case is separate from war-crimes accusations against Israeli and Hamas leaders by prosecutors at the International Criminal Court). In July the ICJ is-

▶ sued an advisory opinion that Israel's occupation of the West Bank, East Jerusalem and the Gaza Strip—territories it captured in 1967—was illegal.

Using their new privileges, the Palestinians tabled a resolution at the General Assembly, intended to give force to the ruling. It tells Israel to withdraw from all Palestinian land, sea- and air-space; dismantle Jewish settlements; return seized property; and pay reparations. It also calls on countries to create an international register of damages, similar to one being set up by the Council of Europe, a regional group, to prepare Ukrainian claims against Russia. Furthermore, countries are urged to impose arms embargoes on Israel; restrict trade in products from Jewish settlements; and impose travel bans and asset freezes against "natural and legal persons" maintaining Israel's occupation.

The resolution was passed with the support of Russia and China, but also some American allies, including France and Japan. Israel and its small band of loyal friends—among them America and some Pacific island states—opposed it. Britain, Canada and Australia abstained.

The resolution will not end the bloodletting in Gaza. Nor will it create a Palestinian state. General Assembly texts are not binding on members, and would be vetoed by America if presented to the Security Council. Still, it could encourage more countries to recognise Palestine as a state, as Ireland, Norway and Spain did in May. It could also encourage more arms embargoes against Israel, such as the partial one imposed by Britain this month.

More extreme upheavals are possible. The Palestinians could make another bid for full membership, which America would again veto. The General Assembly might then resort to the nuclear option: stripping Israel of its voting rights in the body, as it did with apartheid-era South Africa in 1974. Such a move would provoke fury from America's Congress, which could decide to halt its funding for the UN. An existing law already commits Congress to stop payments to any UN body that treats Palestine as a full member. America remains the UN's biggest contributor, paying for about a third of its spending, counting both mandatory and voluntary contributions.

Palestinian officials say legal and political pressure on Israel is the best alternative to a wider war. For Israel, it is the flip-side of a campaign to delegitimise and ultimately destroy the Jewish state. "The Palestinians work with both arms," says Danny Danon, Israel's ambassador to the UN. "Hamas commits terrorism on the ground. The Palestinian Authority commits diplomatic terrorism."

American officials, struggling to secure a ceasefire in Gaza, say the Palestinian move is "unhelpful". They argue a Palestin-

ian state can be created only by agreement with Israel, not by outsiders imposing a settlement. It does not help that the resolution comes ahead of the UN summit and in the final weeks of the American presidential election campaign. But discomfiting America may be precisely the point.

Having thrice vetoed Security Council resolutions demanding a halt to fighting, America in June secured the council's support for its own three-phase ceasefire plan to stop the war, release Israeli hostages and Palestinian prisoners, and rebuild Gaza. America hopes there will later be a "credible path" to Palestinian statehood. For months American officials have claimed that the deal is close, yet the fighting goes on. Both Binyamin Netanyahu, Israel's prime minister, and Yahya Sinwar, the Hamas leader hiding in Gaza's tunnels, seem to think time is on their side. America seems unable or unwilling to impose a ceasefire on Israel; has little purchase on Hamas; and President Joe Biden's hand is weakening as his term comes to an end.

As for the war in Europe, Ukraine enjoyed Palestine-like levels of support at the General Assembly for the first year of Russia's all-out invasion, such was the shock at the blatant breach of the UN Charter's injunction against taking territory by force. Until February 2023 Ukraine won a succession of votes, with more than 140 countries supporting it and no more than seven backing Russia—a rogue's gallery including Belarus, North Korea and Syria.

By the summer of 2023, as Ukraine's counter-offensive faltered, support for Ukraine began to fade. Martin Kimani, a recently retired Kenyan ambassador to the UN, now at the Centre on International Co-operation, a think-tank in New York, notes that Russia's narrative—that the war was provoked by NATO's eastward expand-

sion—"found a ready ear" among many in the global south, where suspicions of Western imperialism still run deep. The memory of America's invasion of Iraq in 2003 brought charges of hypocrisy. Since the war in Gaza, though, anti-American feeling has intensified. The West stands accused of caring more about carnage inflicted by Russia than by Israel.

On the back foot, Western diplomats these days urge Ukraine not to submit resolutions, fearing they would expose falling support for it. It does not help that Ukraine abstained in a General Assembly vote in May seeking to advance Palestine's full membership of the UN. Nevertheless, in July Ukraine presented a resolution about the safety of the Russia-occupied Zaporizhia nuclear power plant. It passed with 99 votes to nine, but many Arab and Islamic countries abstained.

### Forget me not

Though the Security Council holds frequent and competing meetings on Ukraine, Sergiy Kyslytsya, Ukraine's ambassador to the UN, admits that "We have to fight to keep Ukraine meaningfully on the radar." Once friendly to Israel, Russia now positions itself as the champion of the Palestinian cause. "The Russians behave as though they have been exonerated," says Mr Kyslytsya. For instance, at a session of council on September 16th, the Russian ambassador, Vasily Nebenzya, denounced the "horrific" conditions in Gaza, the "arrogance" of Israel, America's "unconditional support" and the "hypocritical" West. The same day, a Russian glide-bomb struck a block of flats in Kharkiv, killing at least one person and injuring 42.

For all its swagger, Russia has yet to recover from repeated diplomatic snubs, such as losing its seats at the ICJ and bodies such as the Human Rights Council and UNESCO (the education, scientific and cultural body). That said, Russia has thrown its weight around on a growing number of issues. It has helped to push UN peacekeepers out of Mali; halted the supply of UN humanitarian aid to areas of Syria controlled by rebels; and blocked the work of a panel monitoring North Korea's compliance with UN sanctions. Russia, it seems, does not mind being the spoiler. "We see instability as a risk, as something to fix," says a Western diplomat. "The Russians see it as an opportunity, and something to exploit."

China plays an altogether different game, often supporting Russia but at times co-operating with the West, for instance on how to regulate artificial intelligence (AI). In March it co-sponsored an American resolution on AI; America reciprocated by supporting a Chinese one in July.

At the UN, China stands as a defender of state sovereignty against the intrusions ➤



The theatre of summity

► of outsiders, for example, in the use of economic sanctions. It reinterprets human rights as the expectation of economic development, rather than individual liberties; and democracy as equality among states rather than the right of people to choose their leaders. It sees itself as the vanguard of the developing world, where it often finds a receptive audience for its interests-first, values-second approach. "Russia does not mind being seen as a wrecker of the system. China wants to remake it in its own image," says the diplomat.

As the big powers jostle, others seek space to manoeuvre. For instance, India pursues a "multi-aligned" foreign policy, triangulating between its old Russian friend and its newer Western pals. It has refused to impose sanctions on Russia, benefiting handsomely from the resulting trade. Turkey, though a member of NATO, has similarly stood apart from the West.

It is difficult to measure influence. Despite its troubles, "America is still the main game in town," says Mr Kimani. But Western countries "are much easier to resist now than they were a few years ago".

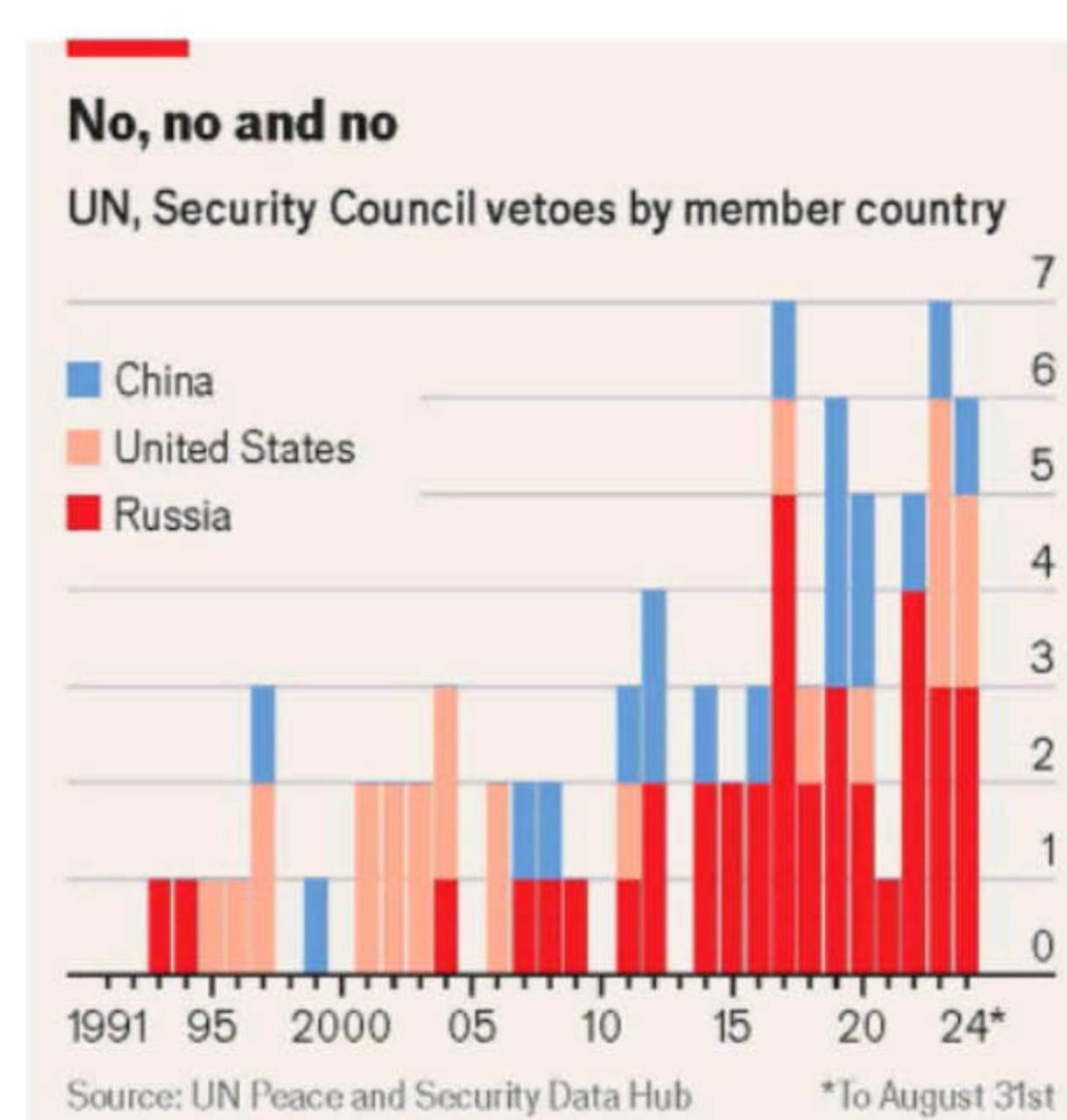
Yet many countries, especially those that feel threatened by bullying neighbours, are also drawing closer to America for protection. The war in Ukraine has fortified the NATO alliance. Similarly in Asia, where Japan, Australia and the Philippines have bound themselves more tightly to America, and to each other, fearing China's military build-up.

In the Middle East mighty Israel has relied heavily on the presence of America's armed forces to deter a regional war with Iran and its "axis of resistance", and to help shoot down missiles fired at it. Gulf monarchies, which dislike Hamas, still seek American protection against Iran and several maintain ties with Israel. As for Gaza, only America has any chance of negotiating an end to the war.

### Hobbled hegemon

America has belatedly woken up to competition with China for support in the global south amid signs that sentiment is shifting. An opinion survey of 31 countries, conducted for *The Economist* by GlobeScan, found strong support for Ukraine in many of them. But respondents in India, Indonesia, Vietnam, Egypt and Saudi Arabia sided more with Russia. The survey also found strong support for American leadership in the world, though places like Turkey, Egypt and Saudi Arabia leaned towards China.

A separate annual survey of elite opinion in South-East Asia, by the ISEAS-Yusof Ishak Institute in Singapore, for the first time recorded a majority saying that if asked to choose between America and China, they would side with China in a crisis. Western diplomats say it has become



harder to meet senior figures in Muslim-majority countries such as Malaysia and Indonesia. Some in America's Congress worry the damage to America's standing is becoming irreparable, though they also think showing loyalty to an embattled ally will reassure friends worldwide.

A more anarchic world has thrown the UN into a profound crisis. The body is busy, for instance, providing humanitarian aid to afflicted peoples, but it is increasingly marginalised. Even as conflicts rage from Mali to Myanmar, the Security Council is hamstrung. "The challenges we face are moving much faster than our ability to solve them," warned António Guterres, the UN secretary-general, on September 12th.

Mr Guterres hopes two big talkfests this month will lead to a "stronger and more effective multilateralism". The Summit of the Future on September 22nd-23rd will seek agreement on a "pact" that would, among other things, steer a path towards the difficult, perhaps impossible, reform of the UN. Then, starting on September 24th, leaders will take part in the "high-level" meeting of the General Assembly—a week of pretentious speeches and quiet diplomacy. Expectations are low. "The UN now suffers from a surfeit of summits," says Richard Gowan of the International Crisis Group, a think-tank. "It is still quite good at getting leaders together to pledge things. The follow-up is typically meagre."

The Security Council, complains Mr Guterres, is "stuck in a time warp". It grants veto powers to five permanent members—the "P5" of America, China, Russia (as heir of the Soviet Union), Britain and France—representing the victors of the second world war. Ten elected members, who lack the power to veto decisions, are selected for two-year stints. As great-power enmity deepens, the number of vetoes has risen. Since the start of 2020 Russia has cast a veto 13 times, America six times and China five times (see chart).

The flaws are ever more glaring. There is no permanent seat for India, the world's most populous country; nor for Japan and

Germany which, though not nuclear powers, have larger economies and populations than either Britain or France. America has long supported giving each of these three countries a permanent seat. It has also endorsed a permanent seat for Latin America and the Caribbean, and one for Africa (without specifying which countries should hold them). On September 12th Linda Thomas-Greenfield, America's ambassador to the UN, went further, saying the US supported the establishment of two permanent African seats, as well as one for small island states, such as Pacific countries, threatened by climate change. Few believe America or any other P5 members want to share power, but America's move seems calculated to wrong-foot China.

Crucially, America says none of the new permanent members should have a veto. That may upset India, in particular, which is pushing hard for equality with the P5. "If we expand that veto power across the board, it will make the council more dysfunctional," said Ms Thomas-Greenfield. Instead, she suggested, countries should focus on reducing the use of the veto. In 2022 the General Assembly changed its rules so that countries wielding the veto had to come before it to explain why. This mild shaming has had little effect.

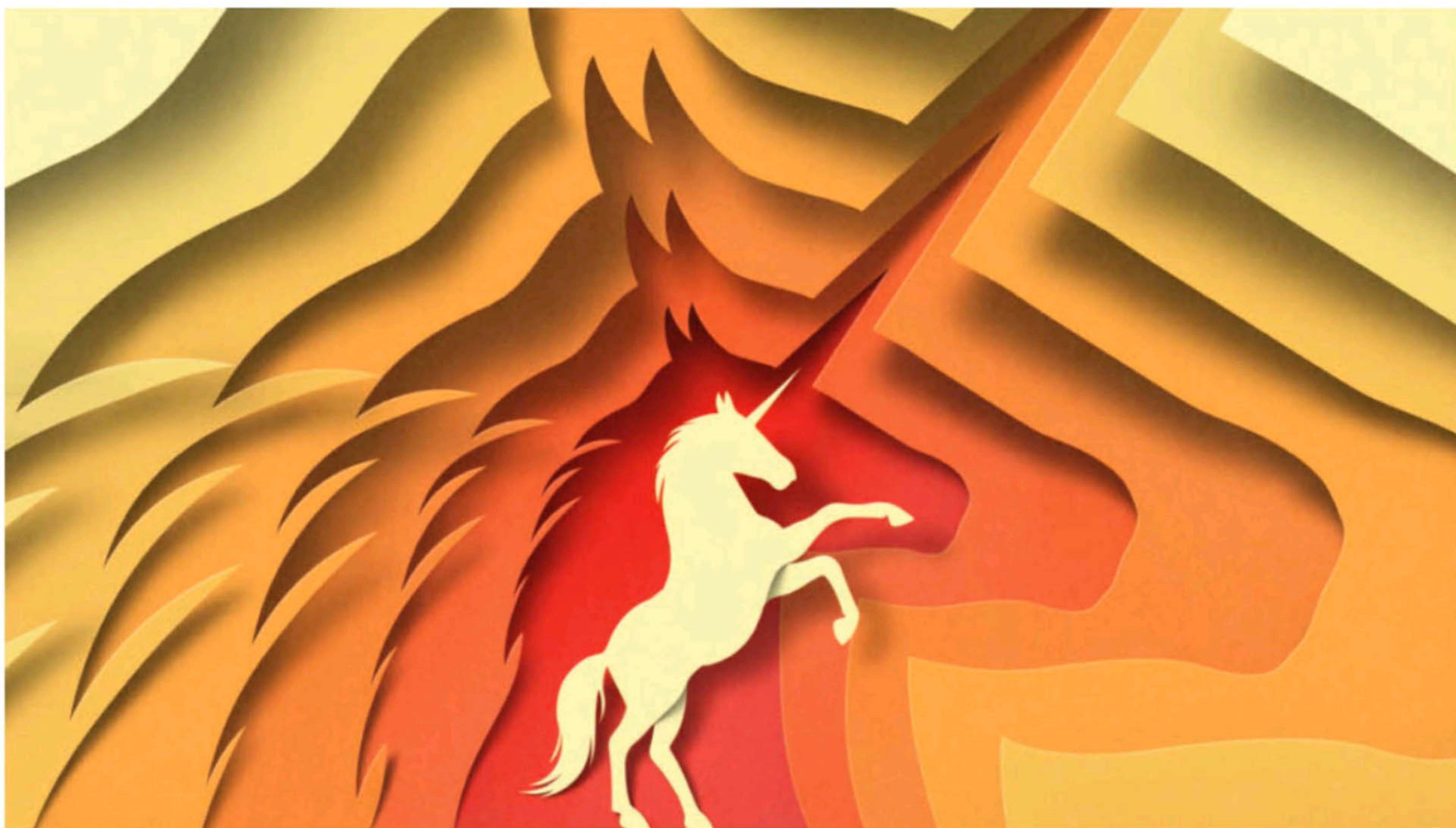
### Seeking order in the chaos

Diplomats say Russia, ever the spoiler, has entered 135 amendments and reservations to the draft text of the Pact for the Future. They include removing mention of the evils of "aggression" and of climate change as a threat to peace and stability. It also wants to excise calls for the total elimination of nuclear weapons. Others will have objections, too. In the end, however, members will probably weaken the text and then, as one diplomat puts it, "hold our nose" and adopt it.

Meanwhile, alternative international institutions are emerging. The BRICS group of non-Western states, dominated by China and Russia, has expanded to nine countries, and will hold a summit in Russia next month. Though a disparate lot, one thing that binds them is the common desire to break their dependence on the American dollar and Western payment systems.

A fluid, multipolar international order, says Mr Kimani, is welcomed by many states. "Competition among big powers offers countries many opportunities. What one power will not give you, another might." That may explain why some at the UN seem to be untroubled by the possible return to power of Donald Trump. But would an increasingly transactional international system with a weakened America really create a more equitable world? Instead, as the wars in Ukraine and Gaza seem to warn, it may be one that is far more chaotic and dangerous for all. ■

## Business



**Artificial intelligence**

### The age of the hectocorn

SAN FRANCISCO AND SEATTLE

How generative AI is transforming Silicon Valley

A RARE BEAST may soon lumber across the hills of Silicon Valley: not a \$1bn unicorn, nor a \$10bn decacorn, but a hectocorn—a startup valued at more than \$100bn. OpenAI, the maker of ChatGPT, is understood to be in talks to raise \$6.5bn from investors to fund the expansion dreams of its co-founder, Sam Altman. If it pulls off the deal, OpenAI's valuation will be about \$150bn, making it only the second ever \$100bn-plus startup in America after SpaceX, a rocketry giant led by Elon Musk (who co-founded OpenAI in 2015 and is now Mr Altman's nemesis).

All this makes OpenAI sound like a typical tech sensation: a sizzling startup reliant on intrepid investors to develop a new way of doing things that it hopes will change the world. Think Google, Facebook or Uber. Yet its significance goes further than that. Generative artificial intelligence (AI), the technology on which OpenAI is built, is changing the rules of the game in Silicon Valley itself.

There are three big challenges posed by

the new technology: many venture-capital (VC) stalwarts cannot afford the huge sums of money that firms like OpenAI need to train and run generative-AI models; the technology scales in different ways than they are used to; and it may rely on unfamiliar approaches to making money. In short, generative AI is bringing disruption to the home of America's disrupters-in-chief. Enjoy the *Schadenfreude*.

The first shock for venture capitalists is the size of the cheques required to fund the builders of large language models

(LLMs) like those powering ChatGPT. According to PitchBook, a data gatherer, the average size of a VC fund raised in America last year was about \$150m. OpenAI is looking to collect more than 40 times that from investors. The biggest cheques for LLMs are thus being written not by the VC industry but by tech giants. Since 2019 Microsoft has invested \$13bn in OpenAI; this year Amazon invested \$4bn in Anthropic, one of OpenAI's main rivals.

The tech giants do not just offer money. Their cloud services provide computing power to train the startups' LLMs and also distribute their products—OpenAI's via Microsoft's Azure cloud, and Anthropic's via Amazon Web Services. Microsoft is expected to invest more in OpenAI's latest funding round. Apple (which will offer ChatGPT to iPhone users) and Nvidia (which sells huge numbers of chips to OpenAI) are also likely to take part. So are sovereign-wealth funds, demonstrating the vast sums of money that are required for a seat at the table.

A few venture investors are undeterred by the high entrance fee. OpenAI's fund-raising is being led by Thrive Capital, an investment firm based in New York that has made other big investments in highly valued startups, including Stripe, a payments company most recently valued at \$65bn. Big Silicon Valley investors such as Sequoia Capital and Andreessen Horowitz helped provide part of the \$6bn raised in

#### → ALSO IN THIS SECTION

- 57 Boeing v the workers**
- 58 Bartleby: Should you be nice?**
- 59 China's steel onslaught**
- 60 FIFA 0, Electronic Arts 1**
- 60 The hype for hybrid cars**
- 61 Schumpeter: Auditing PwC**

► May by Mr Musk's XAI, and contributed to the \$1bn raised this month by Safe Superintelligence, a model builder led by Ilya Sutskever, a former founder of OpenAI, that currently has negligible revenues.

But the size of the sums involved means some VCs are adopting a new modus operandi. Typically venture firms have sprayed capital thinly across an array of startups, knowing that if a few strike it rich, the returns will eclipse what is lost on those that do not. In the generative-AI era, where startups with access to the most capital, computing power, data and researchers have a big advantage, some are betting more on those that are already well-established, instead of kissing a lot of frogs.

The second big challenge to recent VC investment practice comes from how the new technology scales. Funding LLMs is coming to look more like the early days of Silicon Valley, when venture capitalists invested in companies cracking tough scientific problems, such as chipmakers, than the more recent trend of backing internet startups.

One of the venture mantras of the past decade has been "blitzscaling". With the software behind most internet firms cheap to build and cheaper to run, startups could focus their money and attention on growing as fast as possible. Nowadays, the concept on everyone's lips is "scaling laws": the more computing power and data that you throw at AI, the cleverer models become. You thus have to invest fistfuls of money upfront to develop a competitive product, or else invent a new approach.

In a recent blog Ethan Mollick of the Wharton School at the University of Pennsylvania grouped state-of-the-art LLMs into four loose "generations", each requiring ten times more computing power and data than the last. He calculated that in 2022, when ChatGPT was released, models typically cost \$10m or less to train. Some cutting-edge models developed since then may have cost \$100m or more. Those coming soon could cost \$1bn. He thinks training costs will eventually exceed \$10bn. As pundits quibble over how predictable these scaling laws really are, the cost of training continues to rise (see chart).

Inference is also becoming more expensive. On September 12th OpenAI introduced a new pair of models, called o1 (nicknamed Strawberry), which are designed to take multiple "reasoning" steps to produce a more accurate response to a query, relying heavily on a process called reinforcement learning. (Ask the latest version of ChatGPT how many rs in strawberry, and it immediately says two. Incorporate o1, and after four seconds of what it calls "thinking", it gives the right answer.) That step-by-step approach, particularly useful for complex subjects like maths and science, improves as more computing power is used

to think through a response.

As LLMs become ever more computationally intensive, those developing them are furiously searching for ways to bring down their cost. Meanwhile, many VC firms are being priced out of the market. Instead of pouring money into models, some are instead funding the startups that are building on top of them, such as those providing coding tools, or virtual health care, or customer support.

This is bringing about a third big shift in the VC playbook, as the industry is forced to work out how startups that rely on costly LLMs can become profitable. Digital advertising, the favoured monetisation model in Silicon Valley for decades, is tricky to incorporate into generative-AI tools without undermining their credibility with users. Subscriptions may also be difficult. Software firms typically charge per user per month. But as companies roll out AI agents that can help humans do their work, the number of users may fall.

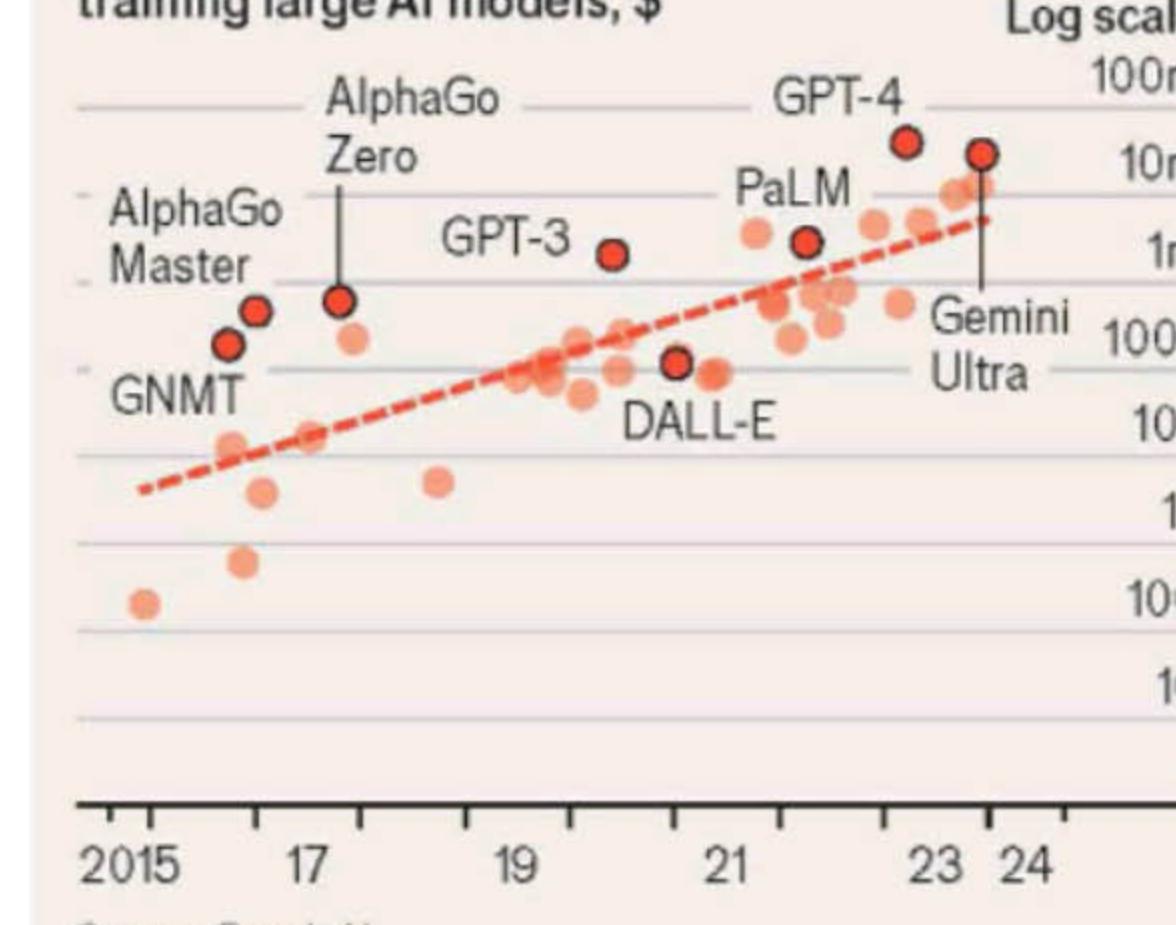
### Backchat

OpenAI still has its sceptics. They struggle to see how its revenue growth can justify such a stratospheric valuation, especially given the competition it faces from smaller, cheaper models, some of which are at least partially open-source. Big investments from deep-pocketed sovereign wealth funds are often a sign of overly exuberant expectations. Scientific breakthroughs in model-building could upend the industry. Sceptics also think the rapid turnover of top talent at OpenAI underscores lingering corporate-governance and safety concerns, following the ousting and subsequent reinstatement of Mr Altman less than a year ago.

It will certainly not be easy for the would-be hectocorn to continue galloping ahead of its rivals. Anthropic is investing heavily, with Amazon's backing. Google, Meta and XAI all have strong offerings of their own. Competition is fierce. If the rest of Silicon Valley wants in on the action, it will need to think differently. ■

### Compute that

Hardware and energy costs of training large AI models, \$



### Aerospace

## Flying pickets

A protracted strike at Boeing could cause lasting damage

WHEN KELLY ORTBERG landed in the chief executive's chair at Boeing last month the list of problems he had to confront at the aerospace giant was already daunting. Production of the 737 MAX passenger jet, Boeing's most important product, has been curtailed after a mid-flight blowout of a fuselage panel in January. Production of the larger 787 Dreamliner has also slowed down owing to supply-chain problems. Plans to launch the even bigger 777X are years behind schedule. Add to that losses at Boeing's usually lucrative defence division and an embarrassing software failure that left astronauts piloting its Starliner spacecraft stranded on the International Space Station and some may wonder why Mr Ortberg took the job.

Boeing's boss now has yet another crisis to deal with. On September 13th a strike by 33,000 union members, a fifth of the company's workforce, hit sites in Washington state, where the firm assembles the 737 MAX, bringing production to a halt. Morgan Stanley, a bank, estimates that the strike will cost Boeing \$2bn of cash a month at a time when its finances are already under strain. To conserve funds, Boeing said on September 18th that it would furlough tens of thousands of white-collar workers for one in every four weeks the strike continues. The last big walkout at the company, in 2008, dragged on for 58 days. This one may still prove to be short-lived. But, if it doesn't, it could leave lasting damage.

Pay is at the centre of the latest dispute. Boeing offered its employees a 25% rise over four years; its workers are demanding 40%. That would be less of a problem for the company than it sounds—assembly accounts for a small fraction of the total cost of producing its planes, and wages are a small fraction of that.

By holding out, Boeing will delay its effort to return production to previous levels. The firm says that it has been making around 30 737 MAXs a month, so each day of picketing means one fewer plane. Even if the strike is short, Boeing is expected to deliver just 400 planes this year, half of what it managed at its peak in 2018.

A protracted strike would make Boeing's financial position even worse. The 737 MAX should be its cash machine, but has not dispensed reliably since two fatal crashes linked to faulty software led to its temporary grounding in 2019. Since ►

► then Boeing's operations have burned through \$25bn of cash and the company has racked up net debts of \$45bn. Airbus, its main rival, has almost none.

Before the strike, analysts projected that the firm would stop burning cash in the second half of this year, having lost \$7bn of it through its operations in the first half. A prolonged stoppage would reverse its progress.

Boeing will also risk having its credit rating downgraded by the big agencies if

the stoppage is prolonged. That will make it more expensive to top up its \$11bn cash pile. The company also has \$22bn of bonds that will need to be refinanced in the next three years, for which the interest bill would go up. To maintain its investment-grade rating Boeing may thus choose to raise money by issuing stock (most analysts reckon that \$10bn should be enough). That would be a further blow to the company's long-suffering shareholders; Boeing's share price is already down by

65% from its high in 2019.

Boeing may take comfort in its vast backlog of orders for passenger jets. But Airbus's is far bigger. The European firm is likely to manufacture around 770 planes this year, and its share price is close to its pre-pandemic high. Airbus also recently announced that it would launch a new aircraft by the end of the decade. Boeing may not be at risk of collapse, but the longer it takes to spin up its engines again, the further behind it will fall. ■

## BARTLEBY

### *Cool to be kind*

*How nice should managers be at work?*

KINDNESS IS IN the air. Publishers produce business books with titles like "The Power of Nice" or, simply, "Kind". LinkedIn, which is ostensibly a networking site for career-minded professionals, is overrun with sickly videos showing people being improbably generous to the homeless. Firms publicly embrace the values of compassion: one manufacturer of safety-gear talks of "offering grace internally", which sounds terribly intrusive.

The fashion for niceness is both trite and revealing. Trite, because it is really not surprising that people respond well to decent behaviour from colleagues and bosses. It would take a brave author to write a book called "Stand Up for Psychopathy" or "Three Cheers for the Dark Triad". Revealing, because it shows how the leadership pendulum has swung.

A recent meta-analysis of research into niceness and effective leadership, by Andrew Blake of Texas Tech University and his co-authors, concludes that the two do often go together. Studies into bosses' agreeableness, one of the "Big Five" personality traits (along with openness to experience, conscientiousness, extraversion and neuroticism), have found that it is tied to ethical behaviour, workplace trust and psychological safety, among other beneficial things.

That, in turn, can improve aspects of a firm's performance. A recent paper by Charles O'Reilly of Stanford University and his co-authors looked at the relationship between chief executives' personalities and reviews of their organisations' culture on Glassdoor, an employee-ratings website. Agreeable bosses were associated with cultures that were more collaborative and innovative.

Niceness seems to matter more than it once did. A meta-analysis of research



ending in the late 1990s did not find evidence of a strong connection between agreeableness and effective leadership. Some of this shift doubtless reflects the way organisations have evolved: teams matter more, along with the social skills that ease co-operation. Some of it may also reflect more volatility in the outside world. A study by Soo Ling Lim of University College London and her co-authors looked at the performance of MBA students at London Business School across ten academic years, and found that agreeableness improves outcomes when levels of uncertainty about a task—and presumably, the need to work together harmoniously—are higher.

It is progress to get away from the era of "nice guys finish last", not least for those people who aren't guys: women have long suffered more from perceptions of lower competence if they display warmth. But you can have too much of anything, even kindness.

Agreeableness is not the only trait that matters for a boss: a delightful but highly neurotic person may struggle in stressful

situations. Employees vary too: some people care less about empathy and more about money. There are moments—when employees have suffered a personal trauma, for example—when warmth is the most important test of a company's character. But in other circumstances, different traits matter.

People who score less well on agreeableness are liable to be less trusting, more competitive and more confrontational. That may not recommend them as friends but could well be an advantage in certain contexts. Mr O'Reilly's paper finds, for example, that different industries attract leaders with varying personality types: bosses in the financial-services industry are comparatively less agreeable, for example, than those who work in health care. Kindness may also count for less in negotiation-heavy roles like sales.

A recent paper by Daniel Keum and Nandil Bhatia of Columbia Business School looks at how changing economic conditions can affect the types of bosses who lead firms. The researchers gauge chief executives' "prosociality" (their concern for the welfare of others) by looking at things like their charitable activities and their language on earnings calls. Prosocial bosses can be slower to restructure firms in bad times, and the authors find that during periods of intensifying competition they were more likely to be replaced by less caring types. When layoffs are necessary, boards don't want Samaritans in charge.

What there is no excuse for is unkindness. There is a basic level of decency, civility and courtesy to which everyone is entitled and from which all organisations benefit. Kindness is not a management doctrine. But its absence is a management failure.

**Steelmaking**

# Smelted

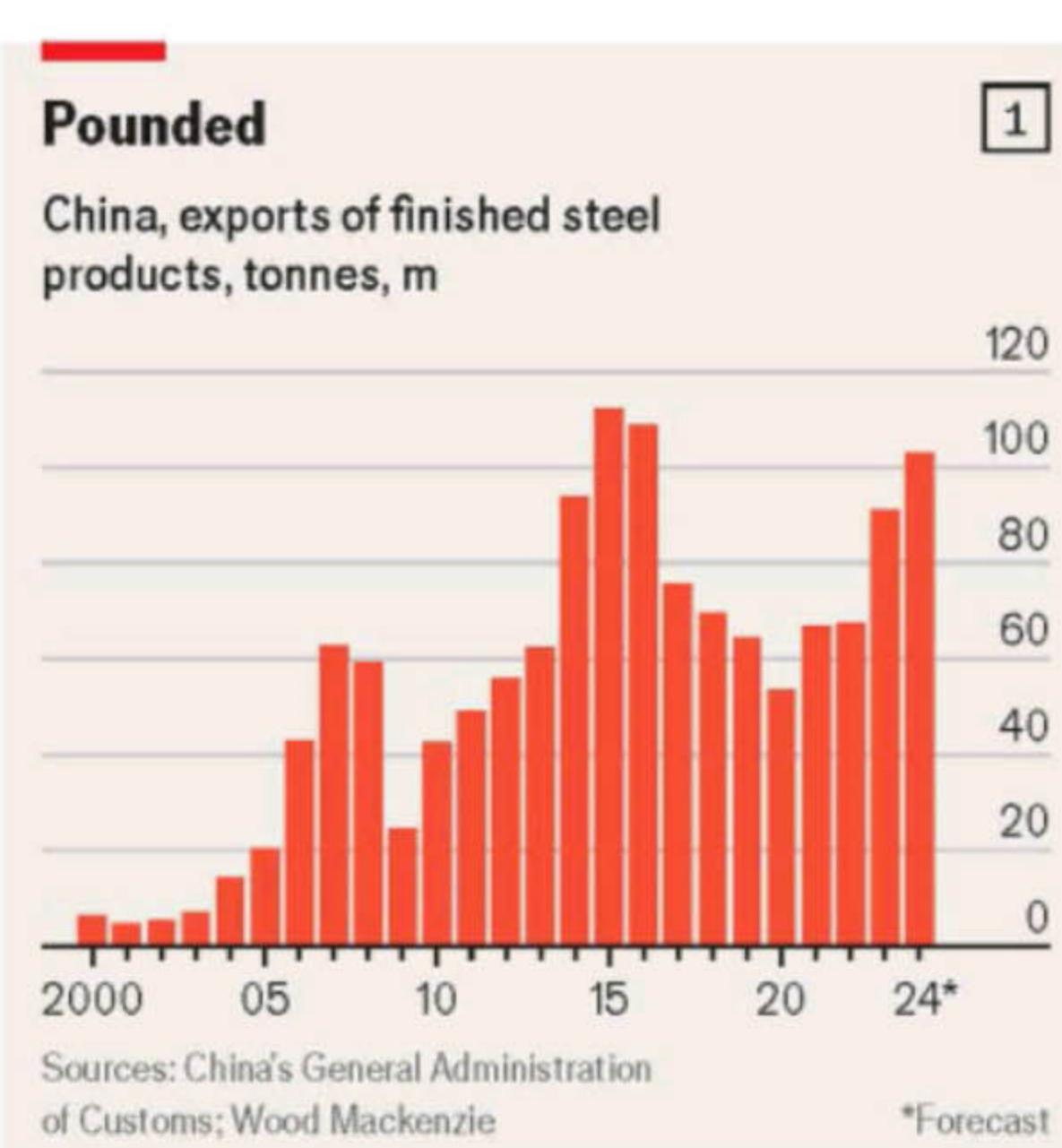
## Chinese overcapacity is crushing the global steel industry

**E**ACH YEAR China makes as much steel as the rest of the world combined. The vast scale of its output—around 1bn tonnes a year—is obscured by the fact that most of it stays in the country. Lately, however, China's exports of the metal have surged, reaching 90m tonnes in 2023, up by 35% on the previous year (see chart 1). That may be a fraction of China's total production, but it is more than what America or Japan make in a year. And it is enough to build a thousand Golden Gate bridges.

With China's economy struggling, its steelmakers are selling abroad at bargain prices, to the distress of foreign competitors and politicians alike. Last month Nippon Steel, Japan's biggest steelmaker, called on the government to impose anti-dumping duties on Chinese imports. In the quarter to June its net profit shrank by 11% year on year. ArcelorMittal, Europe's steelmaking champion, has been hit even harder: its net profit for the same period was down by 73%. "We want fair competition, and we know that the competition against China is not fair," says Genuino Christino, the company's chief financial officer. Such complaints tend to carry weight with politicians. Steelmaking is often seen as a symbol of a country's industrial heft. And although a glut means lower prices for a diffuse group of consumers, politicians worry about the concentrated pain it inflicts on manufacturing workers and regions.

The rich world has experienced surges in Chinese steel exports before, including in 2008 and 2015. Each of these episodes led to trade barriers being raised; between 2008 and 2018 America, Britain, Canada and the European Union implemented more than 500 trade measures affecting imports of the metal from China. The consequences this time, however, are likely to be much wider-ranging.

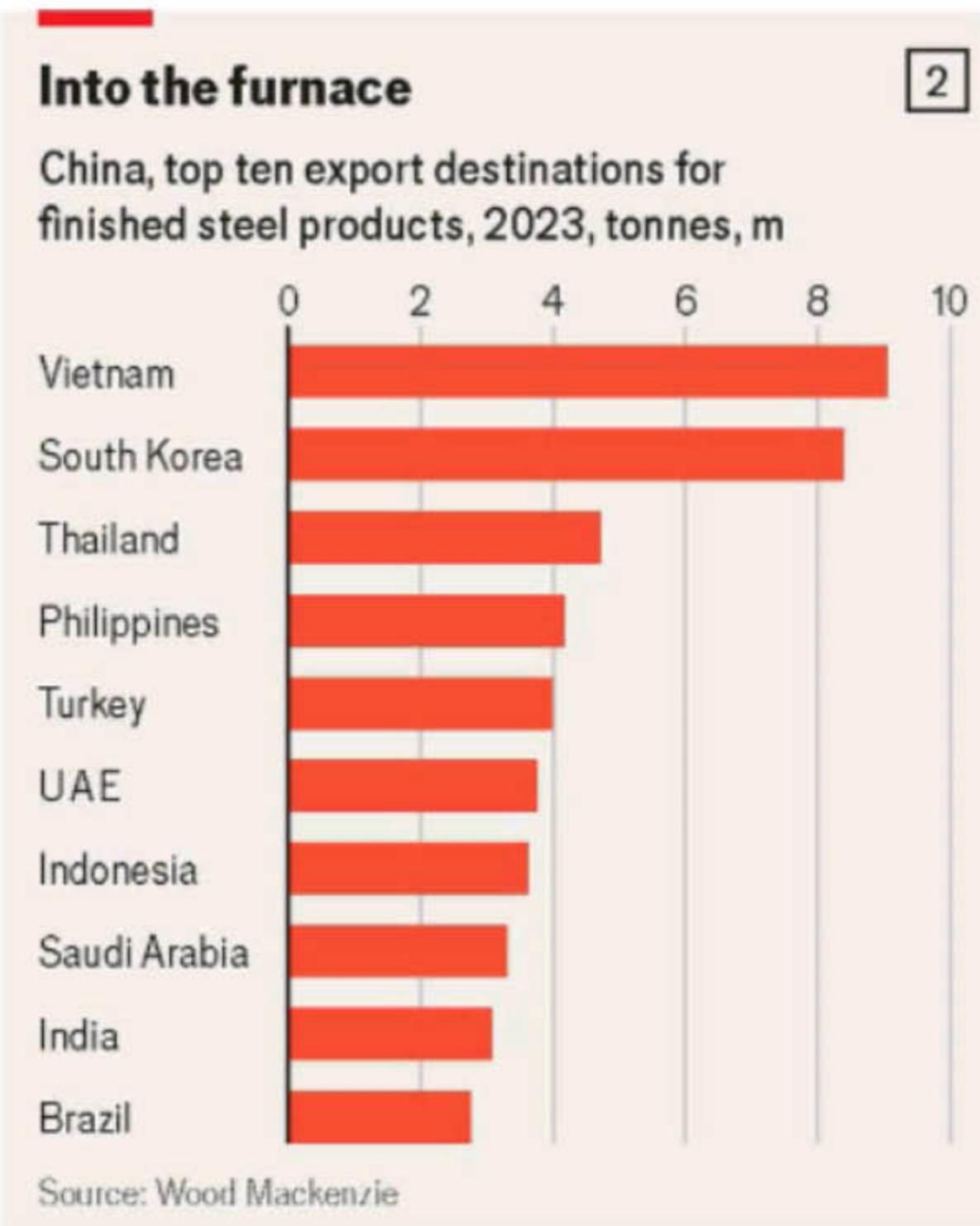
That is partly because China's economy is in a worse way. As its commodity-intensive property sector has suffered, its steelmakers have taken a beating. In August barely 1% of the 250 steel mills in China that report their finances to the government turned a profit, according to Isha Chaudhary of Wood Mackenzie, a consultancy. The domestic price for hot-rolled coil steel, a benchmark product, has fallen by 16% over the past year. Despite the slump in prices, many of the country's producers have been reluctant to curtail production; idling a blast furnace can take



months and is often costlier than keeping it running. Facing lacklustre demand from their usual customers at home, steelmakers are looking elsewhere.

The result is surging exports—and a fresh round of tariffs. Last month Canada joined the fray, imposing levies on Chinese steel. Even in America, where hefty tariffs already keep out most Chinese steel imports, producers still face cut-price competition as global prices fall. In July America announced a 25% duty on any steel coming from Mexico that had not been melted and poured in North America, in a bid to keep out any trace of Chinese steel that may travel via other countries.

The backlash is not confined to rich countries. These days most of China's steel exports go to the developing world, which



accounted for nine of the top ten foreign destinations for its steel in 2023 (see chart 2). Unlike in the rich world, demand for the metal is roaring in much of the global south. India's steel consumption, for instance, is expected to grow by 8% this year and at a similar rate next year thanks to a boom in infrastructure investment, according to the World Steel Association, an industry group. The Belt and Road Initiative (BRI), China's global infrastructure bonanza, has helped its steelmakers expand their global reach. Chinese construction companies building ports and laying railways in poorer countries have done so largely with Chinese steel.

Yet steelmakers in developing countries are also starting to grumble about Chinese exports. In August Thachat Viswanath Narendran, the boss of Tata Steel, India's biggest steelmaker, complained of "predatory pricing" by Chinese competitors. As in the West, governments in the global south are taking notice. This month India announced that it would impose tariffs of up to 30% on some steel products from China. Brazil, Mexico, Thailand and Turkey have also slapped tariffs on Chinese steel this year. Vietnam, the biggest export destination for Chinese steel, is also undertaking anti-dumping investigations.

In response to both the worsening economic situation at home and the deteriorating trading environment abroad, China's government has taken some steps to boost demand and reduce supply. It has offered incentives for Chinese businesses and households to swap old machinery and appliances for new ones. Last month it suspended approvals of new steel mills. But without more forceful reforms it is hard to see much changing. According to S&P Global, a data provider, more Chinese steel capacity will come online by the end of next year than will be shut down.

That leaves Chinese steelmakers with little option but to keep searching for new customers. Wood Mackenzie forecasts that Chinese steel exports will reach 103m tonnes this year. Some producers are also building new production bases in the hope of retaining access to foreign markets. In July China Baowu Steel, the world's largest steelmaker, doubled its investment in a plant in Saudi Arabia. Tsingshan Group, a Chinese metals and mining company, has started production at a steel mill in Zimbabwe. That could worsen the global glut, but at least it creates jobs abroad.

Other Chinese steelmakers are shifting sales at home from the moribund property sector to manufacturers of things like electric vehicles—which also, as it happens, are looking abroad to compensate for lacklustre domestic demand. "Steel will always find a home," says James Campbell of CRU Group, a consultancy. Whether the world's politicians like it or not. ■

## Football

# It's in the game

### How FIFA was outplayed by a video-game publisher

A NEW FOOTBALL season will begin on September 27th: not the Premier League or La Liga, but the annual update of the world's favourite football video-game. "FIFA", as the franchise was known from its pixelated debut in 1993, sells nearly 30m copies a year. In-game spending pushes its annual revenue above \$3bn, estimates MoffettNathanson, a firm of analysts, which calculates that the title contributes nearly two-thirds of the profit of its publisher, Electronic Arts (EA). Gaming has few bigger names than "FIFA".

Yet a year ago EA changed the name of its mega-hit to "EA Sports FC", after its licensing deal with the Fédération Internationale de Football Association, football's governing body, fell apart. FIFA had reportedly demanded more than the \$150m or so that it had been charging EA each year for the privilege of using its name. EA decided instead to embark on what Andrea Hopelain, who runs its sports-game publishing business, calls "one of the biggest rebrands in entertainment history".

The gamble seems to have paid off. EA reported in July that revenue from the game was up by "mid-single digits" compared with the previous, FIFA-branded edition. EA Sports had already become a strong brand in its own right, says Ms Hopelain; English referees have had its logo on their sleeves for years. A marketing blitz has made it even stronger: money that would have gone to FIFA has been spent on promotions like sponsoring the Spanish league (now called "LaLiga EA Sports"). Sony and Microsoft also had reason to keep the renamed game visible in their PlayStation and Xbox app stores. It accounts for as much as 10% of spending on the platforms (of which they take a cut), estimates Clay Griffin of MoffettNathanson.

Dropping the FIFA name has brought with it other opportunities. EA has been able to work more closely with partners like Nike and Pepsi, which had been sidelined by FIFA's relationship with their arch-rivals Adidas and Coca-Cola. EA has had a freer hand to innovate, too. Players can now share video highlights of their footballing heroics with one another within the game and will soon be able to buy merchandise from brands such as Nike to match their avatars' digital outfits.

Will FIFA hit back? In May Gianni Infantino, its boss, said it was working on a rival game that "obviously, as everything

we do, will be the best". Yet Take-Two, a game-maker rumoured to be involved, poured cold water on the idea last month. Konami, which makes eFootball, a free-to-play game that is big on mobile, is another possible partner.

Any rival will struggle to beat EA. Decades of incumbency have created powerful network effects, as players compete with their friends online. EA has spun a web of licensing deals with footballers, clubs and leagues, some of them exclusive, costing hundreds of millions a year. These factors make sport a winner-takes-most genre in gaming, argues Mr Griffin: EA's basketball title, "NBA Live", was crushed by Take-Two's "NBA 2K" for the same reasons. With or without FIFA, EA's football game will be hard to tackle. ■

### Carmaking

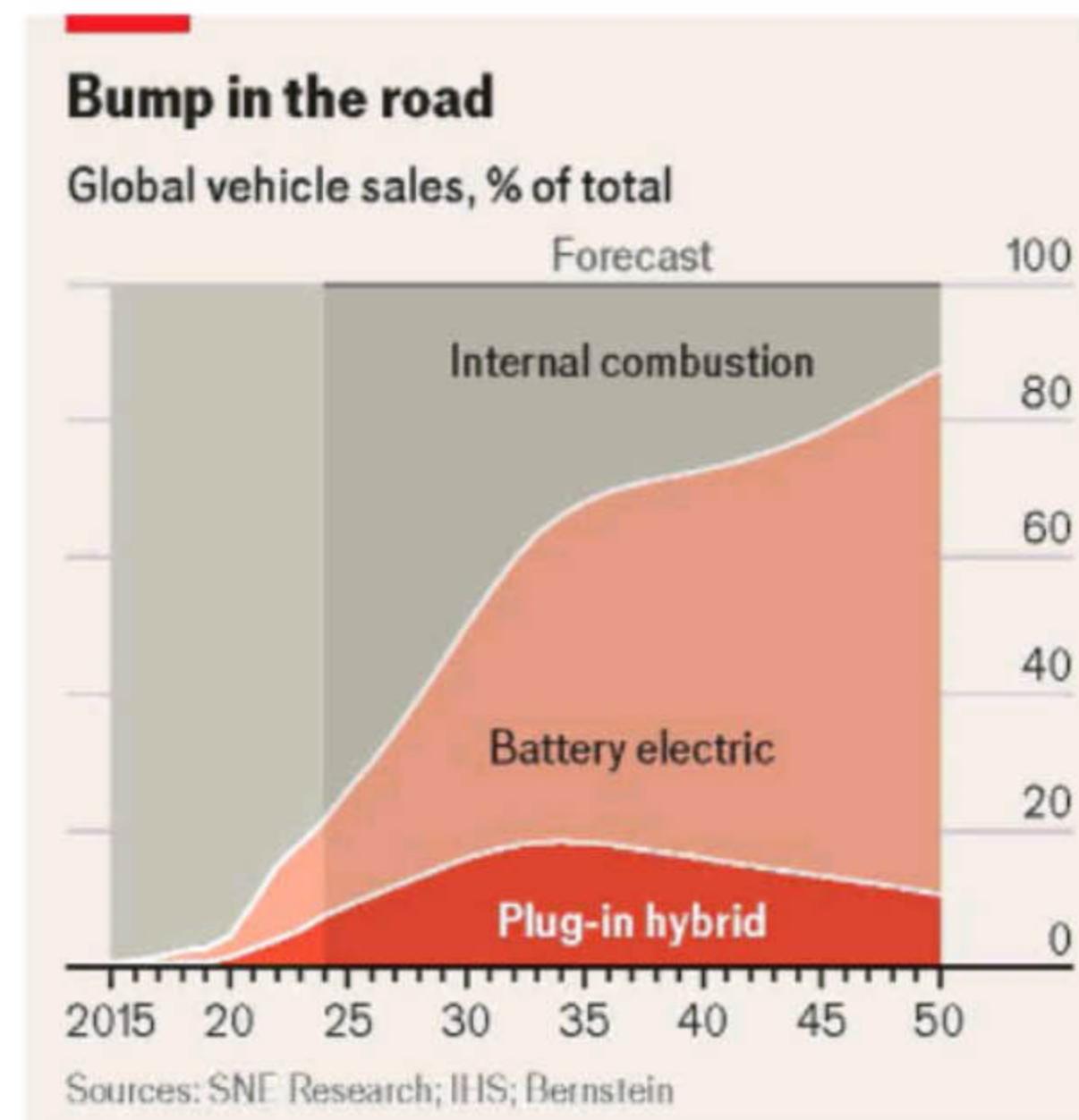
## On a detour

### Why the hype for hybrid cars won't last

THE CAR industry's effort to decarbonise revolves around replacing petrol with batteries. A growing number of customers want both. Buyers who cannot afford a fully electric car, or worry about the availability of charging points, are turning to plug-in hybrid electric vehicles (PHEVs), sales of which are rocketing. But the hype for hybrids may prove to be short-lived.

Worldwide sales of cars running purely on batteries (BEVs) were more than double those of PHEVs last year. But the gap has been rapidly closing. Sales of PHEVs were up by almost 50%, year on year, in the first seven months of 2024, compared with just 8% for BEVs, according to estimates from Bernstein, a broker.

Carmakers have been cooling on BEVs and warming to hybrids. This month Volvo



backtracked on its commitment to go all-electric by 2030. It now says BEVs and PHEVs will together account for 90% of its sales by the end of the decade. Last month Ford announced that it was abandoning plans to make a large fully electric SUV, opting instead for hybrid power. Hyundai is doubling its range of hybrids from seven to 14 models. Volkswagen, too, has pledged to increase investments in hybrids as it re-thinks its plans for BEVs.

Consumers are turning to hybrids partly because they are cheap. The big batteries required to run fully electric vehicles make them far more expensive than petrol cars. That is a problem when it comes to selling to the mass market; most buyers "will not pay a premium", says Jim Farley, the boss of Ford. Plug-in hybrids, by contrast, run on much smaller batteries: they typically have a 20-kilowatt-hour unit, around a third of the size of those in BEVs. As a consequence, PHEVs are only a little more expensive than petrol-powered cars, and cost less to run. Although hybrids can typically travel only around 40 miles on their batteries, the option of using petrol avoids the anxiety many drivers of BEVs have about running out of charge.

For their part, carmakers are fond of hybrids because they are usually as profitable as petrol-powered cars, in contrast to BEVs, many of which are loss-making. Smaller batteries mean lower production costs. Hybrids also allow legacy carmakers to draw more on their existing expertise and supply chains.

The fashion for hybrids, however, may prove to be fleeting. Rules in California, adopted by 16 other American states, stipulate that by 2035 only 20% of the new vehicles sold by carmakers can be plug-in hybrids; the remainder must be fully electric. The EU plans to slam the brakes on even harder: the bloc will ban the sale of all cars that run on petrol engines, including hybrids, by 2035.

Hybrids may already be less competitive by then. Battery prices have been falling, and will fall further as production expands and new chemistries are developed. Carmakers such as Renault have plans to roll out BEV models that cost significantly less than their current offerings, spurred on by Chinese competition. Charging networks are continuing to expand.

Bernstein predicts that PHEVs will capture a growing share of the car market until around 2030, but that sales will then stabilise and eventually decline as those of BEVs speed up (see chart). Hybrids are "winning now, but BEVs will win eventually", reckons Patrick Hummel of UBS, a bank. Xavier Smith of AlphaSense, a consultancy, thinks the obsession carmakers currently have with hybrids will prove short-sighted. Those that lose focus on electrification could soon fall behind. ■

## SCHUMPETER

### *When size is unaccounted for*

*PwC and its professional-services rivals need a thorough audit of their global governance*



LIKE HIS fellow Victorian bean counters, Edwin Waterhouse made his name in part by unearthing frauds perpetrated during the railway mania that gripped late-19th-century Britain. These days the accounting-and-consulting powerhouse that traces its history to his successful sleuthing more often makes news for failing to detect financial malfeasance—or for engaging in mischief itself. Between 2010 and 2023 it faced around \$450m in fines and settlements related to botched audits and other misconduct in various countries. The firm, which now goes by PwC rather than PricewaterhouseCoopers, at least spares Edwin's memory the indignity of having his name openly tied to the mess.

The latest stain on PwC's reputation came on September 13th. China's authorities slapped its affiliate in the country, PwC Zhong Tian, with a record \$62m fine and barred it from doing business for six months. Its staff, regulators said, "concealed or even condoned fraud" in the accounts of Evergrande, a property developer which inflated its revenues by nearly \$80bn in the two years before its collapse in 2021.

In anticipation of a ban, big mainland clients have been fleeing PwC's "assurance" practice, as auditing is known in the industry. Some may never be reassured enough to come back. The fallout could spread to Hong Kong, where Evergrande was listed and whose accounting watchdog is carrying out its own investigation. PwC has reportedly downed shovels on a new \$140m Chinese campus for "building trust in leadership", possibly concluding that it might be wise to rebuild trust in its brand first.

Mohamed Kande, PwC's newish global boss, admitted that its work for Evergrande "fell well below our high expectations and was completely unacceptable". Six partners and five other staff have been sacked, the top-ranking partner in China has stepped down and a crisis manager from PwC's head office in London has been parachuted in to replace him.

If only that were the end of it. Such mea culpas are becoming distressingly common in the professional-services business, which is dominated by PwC and its three giant rivals: Deloitte, EY and KPMG. Since 2019 the "big four" have on at least 28 occasions found themselves on the hook for multimillion-dollar fines and

settlements related to behaviour in the past decade or so. In the five years before 2019 the like-for-like figure was four.

One explanation is that regulators are becoming more watchful. If so, about time. Yet the profusion of scandals also coincides with a period of rapid expansion in the quartet's size and reach. Growth may be putting intolerable strain on the franchise-like model adopted by the big four, which have long functioned as networks of independent national partnerships. That structure makes it impossible for Mr Kande and his counterparts to supervise their sprawling empires.

The big four's sheer bigness is something to behold. Together they check the books for nearly all American and European blue chips, as well as offering advice on dealmaking, digitisation and plenty besides. Their collective fees have ballooned from \$134bn in 2017 to \$203bn last year. In the same period their combined ranks swelled by 500,000 employees, to 1.5m. In 2023 alone PwC hired 130,000 people, more than its total head count in 2002. And it bid farewell to 94,000. Lots of young hires just want a reputable employer on their CV and to move on after a year or two. With so many coming and going, fewer have a long-term stake in ensuring that the firm's reputation remains intact.

Staff face pressure to cut corners in other ways. Fresh-faced accountants can expect to earn around \$60,000 a year at the big four in America, compared with around \$100,000 for a young management consultant at prestigious strategy shops such as McKinsey, Bain or BCG. Yet that difference narrows substantially once you become a partner, meaning there are big gains to doing whatever it takes to climb up the greasy pole. "You don't make partner because you are a good auditor. You make partner because you close deals," recalls a former big-four employee in China.

Such misalignments are especially acute in the rough-and-tumble markets of the emerging world. Laxer corporate oversight means more temptation for bad behaviour. Employee churn also tends to be higher, because workers are readier to jump ship to secure even a modest pay rise. With little management from the top, these problems could become widespread as a greater share of the firms' business comes from poor countries. Around two-thirds of the corporate entities that make up EY's global network reside outside the rich world. "It's a wonder there aren't more scandals," says Tom Rodenhauser of Kennedy Intelligence, a research firm.

#### Split attention

Adopting a more top-down structure is, alas, out of the question for the big four: most countries have laws that require accountancies to be domiciled locally and owned by citizens. Still, the giants could simplify their businesses by hiving off the fast-growing consulting arms, as EY attempted last year before some American partners got cold feet. Such a split has a commercial logic: it would allow the consultants to raise the pots of money needed for technologies such as artificial intelligence. It would also allow the global leadership of the rump assurance networks to focus single-mindedly on audit quality. Splitting apart will not be easy, as EY's experience shows. But it is probably inevitable.

In the meantime, another way to beef up oversight is to get serious outsiders onto the firms' boards. That requires regulators to relax rules barring auditors from enlisting independent directors with ties to their clients. Given that the big four serve the world's finest companies, such rules exclude just about any business figure of note. That is no way to run a company—or audit one. ■

## Finance & economics



### Economic development

## End of the road

### The world's poorest countries have experienced a brutal decade

THERE ARE now a billion fewer people subsisting on less than \$2.15 a day than in 2000. Each year since the turn of the millennium, a cast of aid workers, bureaucrats and philanthropists, who often claim credit for this extraordinary plunge in extreme poverty, has met on the sidelines of the UN's General Assembly to celebrate progress in their catchphrase-cum-targets of "sustainable development goals". When on September 22nd the latest gathering begins in New York, many will once again be feeling pleased with themselves.

But here are some startling facts. Almost all of the progress in the fight against poverty was achieved in the first 15 years of the 2000s (see chart 1 on next page). Indeed, in 2022 just one-third as many people left extreme poverty as in 2013. Progress on infectious diseases, which thrive in the poorest countries, has slowed sharply.

If the share of people contracting malaria, in countries that have the disease, had continued to fall at the same pace as from 2000 to 2012, there would have been half as many cases as there in fact were in 2022. Developing-world childhood mortality plummeted from 79 to 42 deaths per 1,000 births between 2000 and 2016. Yet by 2022 the figure had dropped only a little more, to 37. The share of primary-school-aged

#### → ALSO IN THIS SECTION

- 64 The Federal Reserve's gamble**
- 65 Buttonwood: Rate cuts and stocks**
- 66 China's communists love privatisation**
- 67 European regulation gets political**
- 68 Free exchange: The history of money**

children at school in low-income countries froze at 81% in 2015, having risen from 56% in 2000. Poverty is a thing of the past in much of Europe and South-East Asia; in much of Africa it looks more ingrained than it has in decades.

The poor world has, in short, experienced a brutal decade. Development agencies have responded by pouring cash into education and health care, in a form of emergency triage. Now money is growing scarce and few countries show signs of economic take-off, despite the best efforts of institutions such as the IMF and the World Bank. Across the world, 700m people are still extremely poor and 2.8bn people reside in regions that are getting no closer to rich-world living standards.

What is going on? The answer begins with economic growth. In theory, poor countries should be able to roll out rich-world technology, dodging the costs and mistakes that are associated with invention. Capital should also become plentiful as investors search far and wide for the best returns on offer. Together these benefits ought to lead to higher growth in the poor world. In 2021 Dev Patel of Harvard University and Arvind Subramanian, a former adviser to the Indian government, now at Brown University, established that this

sort of “catch-up” growth really did begin to happen around 1995. Over any given five-year period, low- and middle-income countries saw their GDP per person grow 0.1 percentage points faster than high-income countries. China, India, East Asia and eastern European countries that escaped the Soviet Union were responsible for the vast majority of this progress.

In the following decade, catch-up growth briefly became widespread. The world's 58 poorest countries—home to 1.4bn people—grew by 3.7% a year between 2004 and 2014, against average annual growth of just 1.4% in the OECD club of mostly rich countries. Since 2015, however, the wealth of a country has had no influence on its economic growth, according to Paul Collier at the University of Oxford.

Much of East Asia and eastern Europe is now rich, meaning that the regions' robust growth contributes to divergence between the rich and poor world, rather than convergence. A new generation of fast-growing countries might have picked up the slack were it not for a series of shocks. The covid-19 pandemic was a disaster for all countries, but particularly those in the developing world. Interest-rate rises that followed, to bring down inflation, proceeded to squeeze budgets and drag on investment. Climate change adds to the pressure, as does an increase in the number of conflicts around the world. Coups and corruption remain big problems.

### Stuck in the 1970s

The result is that by the end of last year, GDP per person in Africa, the Middle East and South America was no closer to that in America than in 2015. Things are particularly grim in Africa (see chart 2). The average sub-Saharan's inflation-adjusted income is only just above its level in 1970. Consumption remains depressed. Last year domestic savings on the continent fell to 5% of GDP, down from 18% in 2015.

Aid is not coming to the rescue. In the early 2000s the unlikely duo of Bono, front man of U2, an Irish rock band, and Presi-



dent George W. Bush argued that the West had a moral responsibility to help the poor escape from poverty. There was no reason to wait for sluggish economic growth to do the job. By 2005 the world's poorest 72 countries received funds equivalent to 40% of state spending from a combination of cheap loans, debt relief and grants.

Partly as a result, “external resources underpin much of the work of basic health systems from supply chains to drugs,” says Mark Suzman, chief executive of the Gates Foundation, a charity. By 2019 nearly half of clinics and two-thirds of schools in sub-Saharan Africa were built or had workers’ salaries paid by outside cash. The fight against malaria, tuberculosis and HIV, the world’s most deadly infectious diseases, is almost entirely reliant on such funding. Now, however, money is drying up as Western enthusiasm sags and new causes emerge. Today aid provides just 12% of the poorest countries’ state spending.

Competition for funding will only grow as climate change and rich-world refugee problems become more pressing. Last year, for instance, global aid flows on paper increased by 2%. Yet 18% of total bilateral aid was spent by rich countries caring for refugees on their own soil—a loophole that few countries took advantage of until 2014 (see chart 3). A further 16% went on climate spending, up from 2% a decade ago. In total, the world’s 72 poorest countries attracted just 17% of bilateral aid, down from 40% a decade ago. At the same time, Chinese development finance has evaporated. In 2012 the country’s state banks doled out \$30bn in infrastructure loans. By 2021 they handed out only \$4bn.

Whereas development aid has what could be politely described as a mixed record, the efficacy of basic health interventions has been more convincingly established. Thus their absence, combined with low economic growth, is painful. New cases of AIDS and HIV are still falling, but more slowly than before. Much of this is down to the emergence of new clusters of the disease in countries that had been

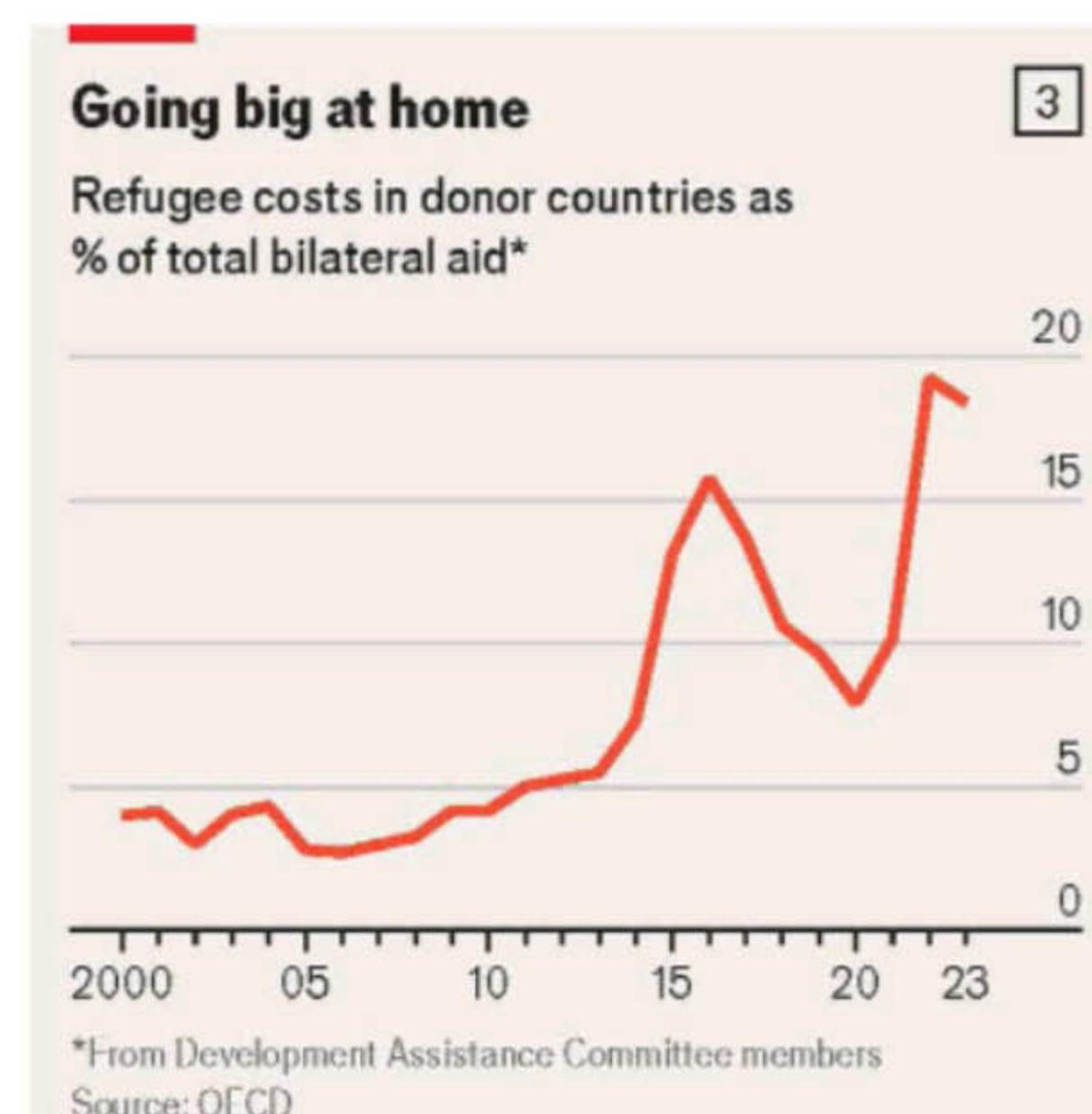
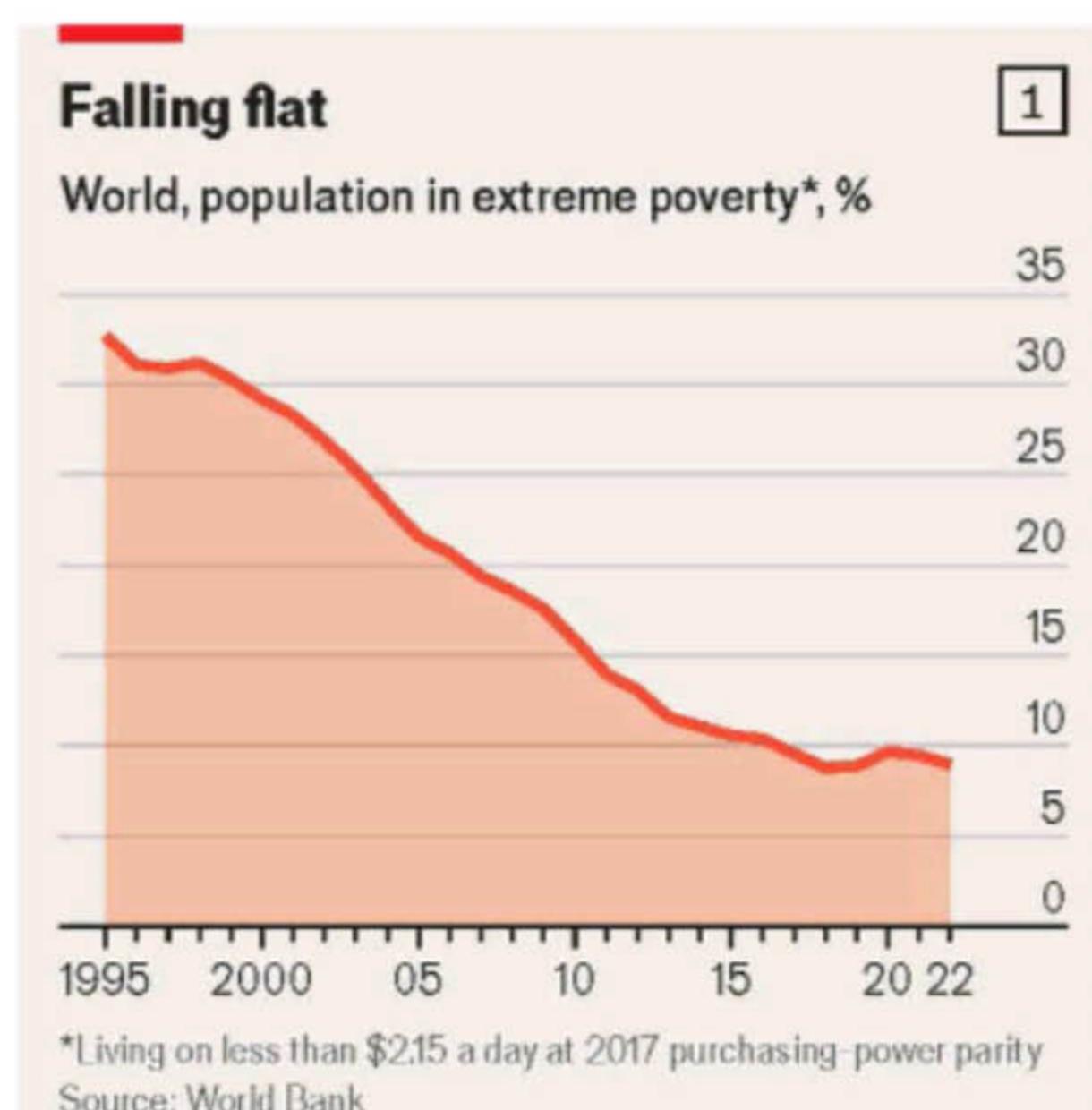
close to eradication. In part owing to the emergence of two new treatment-resistant strains, the number of tuberculosis cases is now once again on the rise.

There is little reason to believe the situation will soon improve. Aid flows are not about to become larger; economic growth is not picking up. How much worse, then, could things get? Many in the development industry used to view aid spending as a sticking plaster to be applied until convergence between the rich and poor world brought incomes in the latter up to speed. Yet Mr Subramanian’s calculations suggest that, even at the more impressive growth rates recorded in the early 2000s, it would take the average developing country 170 years to reach just half the rich world’s income per person. At current growth rates progress will be considerably slower.

And developing-world finance ministers are short of more than just money. What is remarkable is the lack of ideas—either home-grown or emanating from institutions based in Washington, DC—about how to get growth going again. Economic planning is back in vogue everywhere from Brazil and Cambodia to Kenya, with politicians claiming inspiration from China and increasingly America, too, in a little-noticed side-effect of President Joe Biden’s fondness for industrial policy. Their masterplans are often big on manufacturing ambitions, with all the tariffs and handouts you can imagine, regardless of the cost to international competitiveness. World Bank officials note that the governments they deal with are today more focused on boosting jobs than productivity, even if this means receiving investment that is less likely to pay off.

### Perky pen-pushers

Politicians often respond to tight budgets by focusing spending on what they believe will ensure re-election, which is mostly protecting civil servants’ salaries and public services. Some countries, including Ghana and Sri Lanka, are continuing to splurge on subsidies, even at the risk of fis-



cal disaster. Although the IMF implores leaders to shrink the size of their states, its dollars are less persuasive today than they used to be. Not only are the economies with which it deals bigger, the fund has also been enfeebled by an insistence on repeatedly lending to countries that refuse to stick to the conditions on which the money is disbursed. Pakistan has, for instance, enjoyed four emergency packages in the past decade, despite the fact that it has failed each time to trim its lavish subsidies.

Having watered down their “neoliberalism” and insistence on tough rules, Washington’s institutions have failed to come up with another big idea. So far, their best attempt has been “inclusive growth”, which covers matters such as jobs, inequality and sexism, along with more traditional subjects like trade and GDP. But it represents more of a wishlist than a rescue plan, and ultimately lacks rigour. Esther Duflo, a Nobel-prizewinning economist, is blunt: “We can be sure that a lot of [what the World Bank does] is useless.”

For their part, development economists are refining smaller and smaller interventions, rather than trying to come up with ideas that might change the world. New research divides into two strands. One produces elaborate theories to explain how capital and workers in the poor world ended up producing less than their rich-world counterparts. Another crunches the numbers to come up with effective micro-projects, as illustrated by Ms Duflo’s widely admired work—which, for instance, looks at the impact of the introduction of computers in Indian schools. Researchers in both groups insist their work is only relevant to the countries on which it focuses. “There are just not many big ideas left in development,” says Charles Kenny of the Centre for Global Development, a think-tank. “Everything is about the plumbing.”

Some think this a tragedy. For others, it is a relief. Ms Duflo reckons that any given small intervention has a better chance of succeeding than an equivalent policy born of overarching economic theories dreamed up in the rich world. On current population trajectories, poor, slow-growing regions of the world will be home to 4bn people by 2040. The question is whether interventions such as Ms Duflo’s can be conducted at this vast scale. If they really are the best hope, the welfare of billions depends on the answer. ■

### → By invitation: Bill Gates

The co-founder of Microsoft and co-chair of the Bill & Melinda Gates Foundation has written about the need to feed children properly in order to transform global health, and why he is optimistic that this can happen. His article can be read at: [economist.com/gates-health](http://economist.com/gates-health)



### America's economy

## Noise cancelling

WASHINGTON, DC

### Why Jerome Powell has gambled on a big interest-rate cut

THE FEDERAL RESERVE’S decision on September 18th to lower interest rates by half a percentage point, to between 4.75% and 5%, breaks the mould. As the first cut by America’s central bank since it lifted rates to quell inflation, the shift marks the start of a monetary-easing cycle. It also represents a bet that inflation will soon be yesterday’s problem and that action is required to support the labour market. For the first time since 2005, one of the Fed’s governors in Washington dissented from the decision. Michelle Bowman preferred to cut rates by a quarter-point.

When the Fed raised rates between early 2022 and mid-2023, it telegraphed the size of each rise in advance. This time there was uncertainty about how big the reduction would be. A week earlier, market pricing implied roughly 65% odds that the Fed would cut rates by a quarter-point and 35% odds of a half-point. By the day before the decision, pricing had flipped, indicating a 65% probability of a half-point cut. That some investors, albeit a minority, were still positioned for a smaller move helps explain why stocks rallied at first after the Fed opted for a bigger cut.

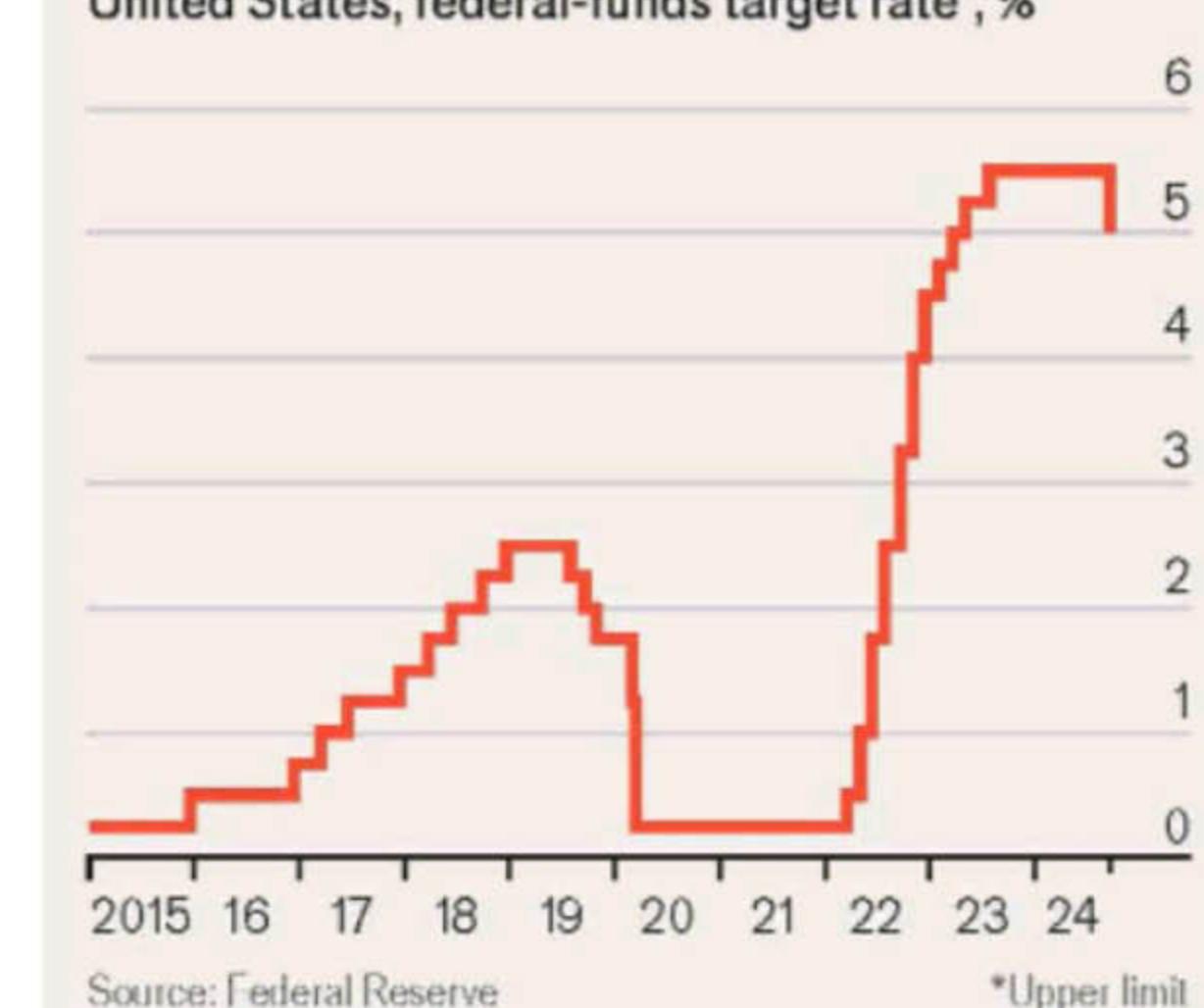
The argument for a half-point cut rests on several pillars. Crucially, the Fed is confident that it is on track to bring inflation under control. Price rises have slowed to an annual pace of 2.5%, not far from its target of 2%. With oil prices sagging and rents rising more slowly, there is a good chance that inflation will soon ease further. So the

Fed’s worries have shifted to the job market. The unemployment rate of 4.2% is low, but nearly a full percentage point higher than early last year. And companies have pared back their hiring. Jerome Powell, the Fed’s chair, portrayed the rate cut as a recalibration of monetary policy in line with a lessening of inflation risks and an increase in unemployment risks.

Mr Powell’s cut is also a form of insurance. It takes months for rate reductions to filter through the economy. Given this lag, and given the expectation that the economy will continue to slow, it makes sense for the Fed to make a bigger move now in order to get ahead of the coming weakness. The central bank was late in raising rates in 2022. This time, it hopes that start- ➤

### Begin with a bang

United States, federal-funds target rate\*, %



Source: Federal Reserve

ing with a bigger cut will steer the economy towards a soft landing, avoiding the recession which many analysts once thought inevitable. "We don't think we're behind," said Mr Powell. "We think this is timely. But I think you can take this as sign of our commitment not to get behind."

The Fed's big cut nevertheless poses some dangers. Despite the cracks in the labour market, the economy as a whole appears to be holding up well. Resilient consumption has put it on track for annualised

growth of 3% in the current quarter, well ahead of most forecasts just a month ago. A hefty rate cut against a strong economic backdrop risks sending the wrong signal to financial markets. The central bank judged that this risk was manageable. According to projections released on September 18th, the median forecast of Fed officials is that they will reduce rates by another 1.5 percentage points by the end of next year. They could easily make fewer cuts if inflation proves to be more stubborn.

Another danger is politics. Coming just before the presidential election, the big rate cut may attract criticism from Donald Trump as a sign that the Fed, a frequent target of his ire, is trying to help Kamala Harris. Yet a quarter-point cut could just as easily have invited a charge from Democrats that Mr Powell had been intimidated by Mr Trump. Mr Powell has long said that he tunes out the political din. He may well need a hefty pair of noise-cancelling headphones in the coming weeks. ■

## BUTTONWOOD *Party pooped*

*The Federal Reserve's monetary easing may ultimately disappoint investors*

THE LONGED-FOR moment has at last arrived. For two and a half years, ever since America's Federal Reserve embarked on its fastest series of interest-rate rises since the 1980s, investors had been desperate for any hint of when it would reverse course. But by the time Jerome Powell, the central bank's chair, announced the first such reduction on September 18th, the debate among traders was no longer "whether" but "how much". Weeks beforehand, at an annual gathering of central bankers in Jackson Hole, Wyoming, Mr Powell had already more or less confirmed that a cut was imminent. In the event officials plumped for a jumbo-sized chop, of 0.5 percentage points, to between 4.75% and 5%.

After an initial bounce, share prices finished the day slightly below where they started it. That might seem odd given how investors have reacted to Mr Powell's pronouncements over the past couple of years. After all, America's stockmarket has spent much of the time cratering whenever it looked like interest rates would stay higher for longer, and soaring on any suggestion that borrowing costs might soon come down. It is not for nothing, though, that "buy the rumour, sell the fact" is such an enduring mantra in financial markets. For all that the prospect of rate cuts sets investors' pulses racing, their actual arrival has often proved disappointing—and not just on the day they are announced.

Consider how share prices have responded to previous loosening cycles. Although the three episodes in the 1990s, when Alan Greenspan was at the Fed's helm, did give the stockmarket successive boosts, this century's record has been a little drearier. Rate reductions in the early 2000s took place during the bursting of the dotcom bubble; those

starting in 2007 coincided with the market crash that accompanied the global financial crisis. The doveish turn that got under way in 2019 buoyed share prices at first, but the effect was then swamped by the onset of the covid-19 pandemic.

Like so much in finance, rate cuts have a small effect on share prices (in this case a positive one) that is easily obscured by other factors. The fillip comes from a reduction in borrowing costs, which allows companies to keep more of their profits and encourages customers to spend more on their products. If bond yields also fall, prospective returns on shares become that much more attractive by comparison, providing another boost.

What, then, might be the swamping factors this time? One is perennial: that money never gets cheaper in isolation, but because central bankers fear economic weakness and want to stave it off. Just now, that seems like less of a concern than normally is the case. True, America's labour market has cooled, which prompted a brief growth scare among shareholders over the summer. However, unusually for

the end of a tightening cycle, the economy appears to be merely slowing down rather than entering a recession. Company profits should therefore be safer than usual as the Fed reduces rates—and so should share prices.

More worrying are the infamous "long and variable lags", as named by Milton Friedman, between changes in monetary policy and their impact on companies and consumers. Counter-intuitively, even as the Fed loosens, many borrowers will face steeper interest bills. Any firm that issued fixed-rate debt while money was nearly free, which is plenty of them, will eventually need to refinance. Since there is little prospect of the Fed returning interest rates close to zero any time soon, debt-servicing costs for such companies will be rising for some time yet. Homeowners on fixed-rate mortgages who need to refinance (after moving house, for instance) will be in a similar position. As such, rate cuts may energise the economy, and hence the stockmarket, less today than they would have done in the past.

The biggest hint that the Fed's largesse will disappoint investors in the coming months, though, is the extent to which the market has been anticipating it. Before the rate-setting committee met, traders' central expectation was already for 1.25 percentage points' worth of cuts before the year is out, followed by another 1.25 next year. Such rapid moves have only occurred in the past amid recessions or crises. There is plenty of room, in other words, for Mr Powell to surprise on the hawkish side even as he continues to slash rates, which would raise bond yields and make stocks less attractive. Rate cuts ought to be good for the stockmarket. But not if investors have already pocketed their benefits.



**State assets**

# Smashing pots, selling iron

SHANGHAI

## How China's communists fell in love with privatisation

**O**N A RECENT visit to his hometown of Laixi, in eastern China, Guo Ping received a shock: the local government had sold off a number of state-owned assets, including two reservoirs. The small city's finances, as well as those in the neighbouring port of Qingdao, were under strain, forcing officials to come up with new sources of revenue. This meant hawking even large bits of regional infrastructure. The sales seemed to be part of what Mr Guo, who asked to use a pseudonym, views as a gradual economic deterioration.

Cities and towns across China are struggling to pay their bills. As policymakers labour to revive the economy, tax revenues continue to fall. A property crisis makes matters worse, hurting the ability of local authorities to sell land-use rights to property developers, usually one of their main sources of income. Land revenues fell to 26% of total local-authority revenues last year, down from 36% in 2020. Thus cadres have had to come up with ways to raise money—no matter how awkward.

Bus operators in small cities are suspending services. Low-level civil servants gripe about salaries being delayed or slashed. Tax collectors have been looking back decades for unpaid bills. And cities are raising fines for infractions such as traffic violations. In Wuzhou, southern China, these now provide almost 50% as much income as taxes, compared with less than 8% in most cities. After waiving tolls on highways for over a decade, provinces such as



Anhui, Gansu and Shandong have started to collect them again.

So why not sell some assets? Local financial analysts insist that cities are sitting upon incredible wealth. They control the sale of land and are in possession of varied portfolios, which include holdings in state-owned firms, parks, utilities, train lines and even Buddhist temples. If officials can monetise just a small share of these by renting or selling them to the private sector, the thinking goes, they may be able to plug some of the holes in their budgets.

Although there were some asset sales before, the central government first began promoting privatisation in 2022, when it called on local governments to "revitalise" assets as a way to reduce debt. Then last

year a document circulated by the State Council, China's cabinet, instructed the 12 most-indebted provinces to "smash the pots and sell the iron", an idiom signifying a last-ditch effort to raise funds.

Many areas are picking up their hammers. By May the government of Ganzhou, in south-east China, had brought in 370m yuan (\$50m) by allowing municipal water and bus firms to sell plots of land. A district in Chongqing, a south-western megalopolis, announced in August that it would "smash the pots" in order to relieve a debt crisis. Some local governments have bundled more sought-after government projects with assets they want to dump, pushing buyers to take unwanted office buildings or industrial parks off their hands.

These types of asset sales are now picking up momentum. In Jiangsu and Shandong, two coastal provinces, non-tax revenues, which include proceeds from asset disposals, rose by 15% in the first half of the year. In Qingdao, which includes Laixi, the price of state assets sold on a local exchange hit 5.9bn yuan last year, more than double the year before. This includes sales of use-rights for seven reservoirs with contracts that last for up to 40 years.

Just how much can be flogged? The first obstacle is ascertaining which bit of the state owns an asset. For those more than two decades old, documentation is poor. As cities have grown, many have been joined together or emerged from local districts. Huang Wenjin of S&P Global Ratings, a rating agency, says that the building in which she grew up in Beijing was owned by a state firm, even as employees of another state firm lived in it as part of an informal arrangement. A third state firm may have also had claims on the building. As decades passed, a lack of documentation meant that the building was never demolished. A potentially lucrative plot of land therefore remains undeveloped.

There are also risks for purchasers interested in taking on state assets, since they have a quasi-sacred status. Unlike Russia, which sold many of its assets following the collapse of the Soviet Union, China has never experienced a "big bang". Instead it has slowly privatised since the early 1980s, when little private property existed. Questions remain about how assets have been sold and whether fair prices were paid many years ago. Peking University, for instance, launched a lawsuit in 2019 against the shareholders of a firm called Founder Group, averring that its sale of a stake in the company 15 years ago had happened on fraudulent grounds.



We're hiring interns to write about business, economics or finance. The positions are supported by the Marjorie Deane Foundation. Interns will be paid, the start date is flexible and no experience is required. For more information, visit [economist.com/marjoriedeaneintern](http://economist.com/marjoriedeaneintern)

Bosses worry that deals may attract attention and later be probed for corruption. Meanwhile, those at state-owned companies fear making losses. Chinese law does not allow deals to be agreed on such terms and the central government has warned that it will punish managers who break the rules. Public opprobrium is never far away. Mr Guo was unhappy to hear about the reservoir sales in Laixi. Some social-media users question the legality of the deals, while online articles also criticise them.

Perhaps the main challenge is to create a true market for state treasures. Private buyers risk being accused of insider dealing and snaffling assets on the cheap. At

the same time, they fear ending up with a lemon—an asset that appears nice to outsiders but has little value to those in the know. This might explain why many of the assets are simply being passed between state companies. Such transactions do not involve the private sector and therefore cannot be accused of creating losses for the state. Although documents for the sale of two of Laixi's reservoirs note that the deal attracted "social capital", or private-sector money, the true buyer was another state firm in the same city. Perhaps the sale will help alleviate short-term liquidity problems for the city government. It will, though, hardly stop its debt build-up. ■

On another front, Mr Draghi proposes a broader, dedicated "innovation defence" that companies could use to justify a merger. Together, the measures would produce a more complex approach to competition policy, and one that places less emphasis on consumer welfare.

Next is how to incorporate geopolitical goals into regulation. The commission wants European firms to develop more robust supply chains, as well as business models that are less dependent on the goodwill of other governments. If that means joint efforts to, say, buy critical minerals or develop common tech standards, then so be it, reckons Mr Draghi. The difficulty is that joint actions do not necessarily increase resilience if they mean that lots of firms are reliant on the same single source. Mr Draghi also wants a new body to advise on security-sensitive areas. Taking such concerns into consideration in competition decisions could give EU policy a more "Buy European" flavour.

Then there is the issue of government spending. The EU is keen to bolster its own industrial policy, while seeking to protect the continent's industries from being swayed by such policy elsewhere. New provisions to ensure that foreign subsidies do not tilt the playing field against European firms should be enforced vigorously, Mrs von der Leyen demands. When EU countries themselves want to spend money in support of green industries and others deemed strategic, Ms Ribera will probably be faster to make decisions and more lenient in her verdicts, so long as spending is co-ordinated with other countries. This builds upon the more laid-back approach that emerged during the covid-19 pandemic and Europe's energy crisis.

The final potential changes concern new areas for competition policy. American technology firms are feeling the brunt of the Digital Markets Act, which is the EU's attempt to intervene when it decides that anti-competitive behaviour may, in the future, damage the market. Mr Draghi also suggests new competition tools to address tacit collusion, as well as in markets where consumers are reluctant to change suppliers, such as in energy provision.

Most economists, including Mr Draghi, agree that Europe's competition policy, though occasionally overbearing, is one of the continent's success stories. In the years to come, however, there is a danger that it will be forced to serve too many masters. Ambitions to catch up on digital innovation, for instance, may be better pursued by encouraging deeper European capital markets or a less fragmented services market. It is far from clear that competition policy should concern itself with supply chains. Ms Ribera has a big job on her hands—probably too big a job. ■

## Competition policy

# Silicon Valley trembles

BRUSSELS

## European regulators are about to become more political

EUROPE'S TOUGH competition policy is something of a historical accident. After the second world war Germany wanted to contain cartels, which it viewed as a threat to its young democracy and market economy. France, meanwhile, saw cracking down on big firms as a way to promote its economic interests. Messy negotiations ended up handing lots of power to the European Commission, where it resides to this day—much to the dismay of many in Silicon Valley. In recent years Brussels has launched a series of regulatory investigations into America's tech giants, including Apple, Google and Meta.

How should the commission wield its power? The question is increasingly fraught. On the one hand, Europe's markets appear to be less competitive than in the past. At the turn of the millennium the four largest firms in the average European industry claimed a market share of less than 26%. By 2019 that figure has risen to 31%, with some smaller national markets, including Finland and Hungary, much more concentrated. There is also less change in the composition of the market leaders. On top of this, mark-ups appear to be growing, especially in services and the most digitised industries, where they are up by about 10% in the past two decades.

On the other hand, Europe is nervous about its global stature, which some officials believe would be enhanced by having more corporate behemoths. Europe's economy is growing slowly, its industry faces Chinese competition and innovation in things like artificial intelligence is happening elsewhere. Mario Draghi, a former governor of the European Central Bank, re-

cently published a 400-odd-page report on these issues, recommending tweaks to competition policy. Teresa Ribera, appointed competition commissioner on September 17th (and pictured), has been instructed by Ursula von der Leyen, the European Commission's president, to use the report to forge "a new approach".

The first issue is innovation. So-called killer acquisitions, where a bigger, dominant firm buys a smaller, more innovative competitor, are a hot topic in Europe, with its many small- and medium-sized companies. Ms Ribera has been told to look in particular at such takeovers by foreign firms, even though European competition rules until now have tended to be neutral when it comes to the nationality of owner-

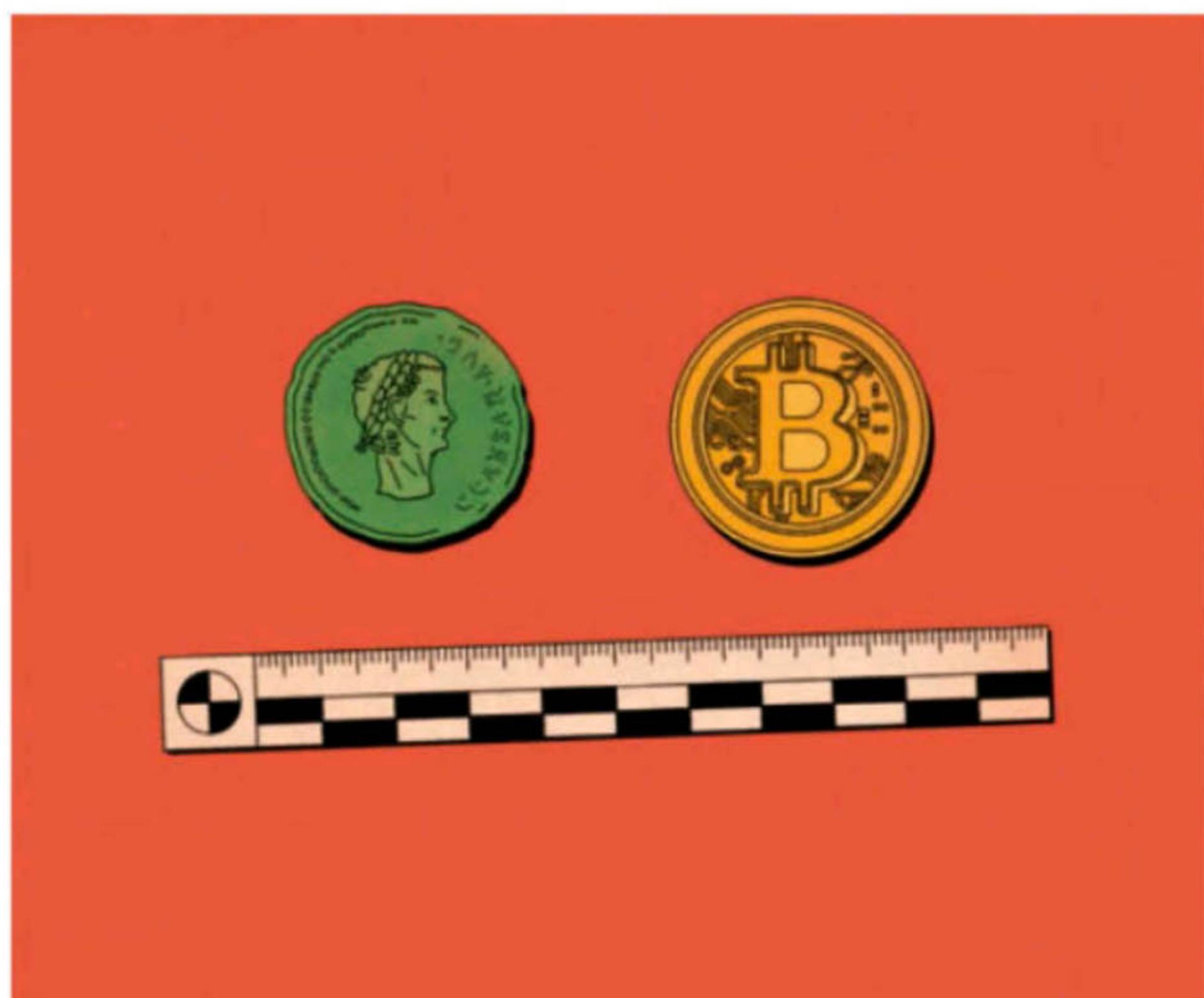


The everything commissioner

## FREE EXCHANGE

### *Deep in the vaults*

*What the history of money tells you about crypto's future*



**T**HIS MONTH China's central bank revealed that its digital currency, the e-CNY, had been used for 7trn-yuan-worth of transactions in its short life—an amount equivalent to almost \$1trn. China is not alone. Over 130 countries are exploring digital currencies, according to the Atlantic Council, a think-tank. Proponents of official digital currencies believe that a combination of ubiquitous smartphones, innovative cryptography and vast computing power means it is possible to remake the financial system.

The future of money, in other words, is attracting attention. What of its past? In a new paper, Adam Brzezinski of the London School of Economics, Nuno Palma of the University of Manchester and François Velde of the Chicago branch of the Federal Reserve urge readers also to pay close attention to money's long history. It is capable of "delightful surprises", they point out. It also contains some parallels to the supposed novelties of today.

Central-bank digital currencies, for example, could give members of the public an account at the central bank. That sounds new. But as several economists have noted, it is also a return to the past. The Bank of England used to take deposits from the public: in 1855 a Regent Street hatter is recorded to have opened an account at the bank's handsome new branch in Mayfair. And in 1900 the Bank of Spain held over half the country's current accounts.

The study of history may also disappoint crypto enthusiasts who wish to liberate money from government control. Monetary policy—the manipulation of money by the state—is almost as old as money itself. Even when coins were made out of gold or silver, governments fiddled with their weight and purity. The value of coins often departed from the preciousness of their materials. Indeed, governments sometimes diluted the silver content of smaller, more practical coins to prevent shortages.

Until the 19th century, the value of coins was rarely inscribed on their face. They had no "face value" in this literal sense, as Mr Brzezinski and co-authors point out. This allowed for a separation between two functions of money that are now seamlessly joined. Coins served as a medium of exchange, the thing people swapped for the stuff they bought. Yet they did not serve as the unit of account, the thing in which everything else is priced. Often the unit

of account was an old coin that had since disappeared from circulation; "ghost money", in the words of Carlo Cipolla, a historian.

Such separation allowed the French court to carry out a grand monetary-policy experiment in the 1720s. In an effort to lower prices—what you might call an Inflation Reduction Act—the king's council decided, without warning, that coins would be worth less than before. From 1723 to 1724, it cut their value by 45%. The policy resembles the kind of thought experiment beloved of economic theorists. David Hume, for example, once imagined what would happen if £5 was "slipped" into the pockets of every man in Britain, doubling the money in the kingdom. Would this miracle make everyone twice as rich? He assumed that it would only increase the price of everything "without further consequence". The French in 1724 likewise expected prices to fall quickly.

They were wrong. "Everyone is so accustomed to sell dearly that no one can bring themselves to lower their prices," one observer reported. "By a barely conceivable madness it seems that everyone in concert insists on doing the opposite of what common sense and reason dictate." It took almost four years for prices to fall back into line. In the interim, France suffered an industrial recession: the number of looms in operation fell by about 30%.

The French decision was reckless, rather than random. It was imposed on an economy that suffered from inflation. It was not therefore a clean test of the effects of monetary shocks. Unfortunately, it is hard to conduct randomised trials of monetary policy.

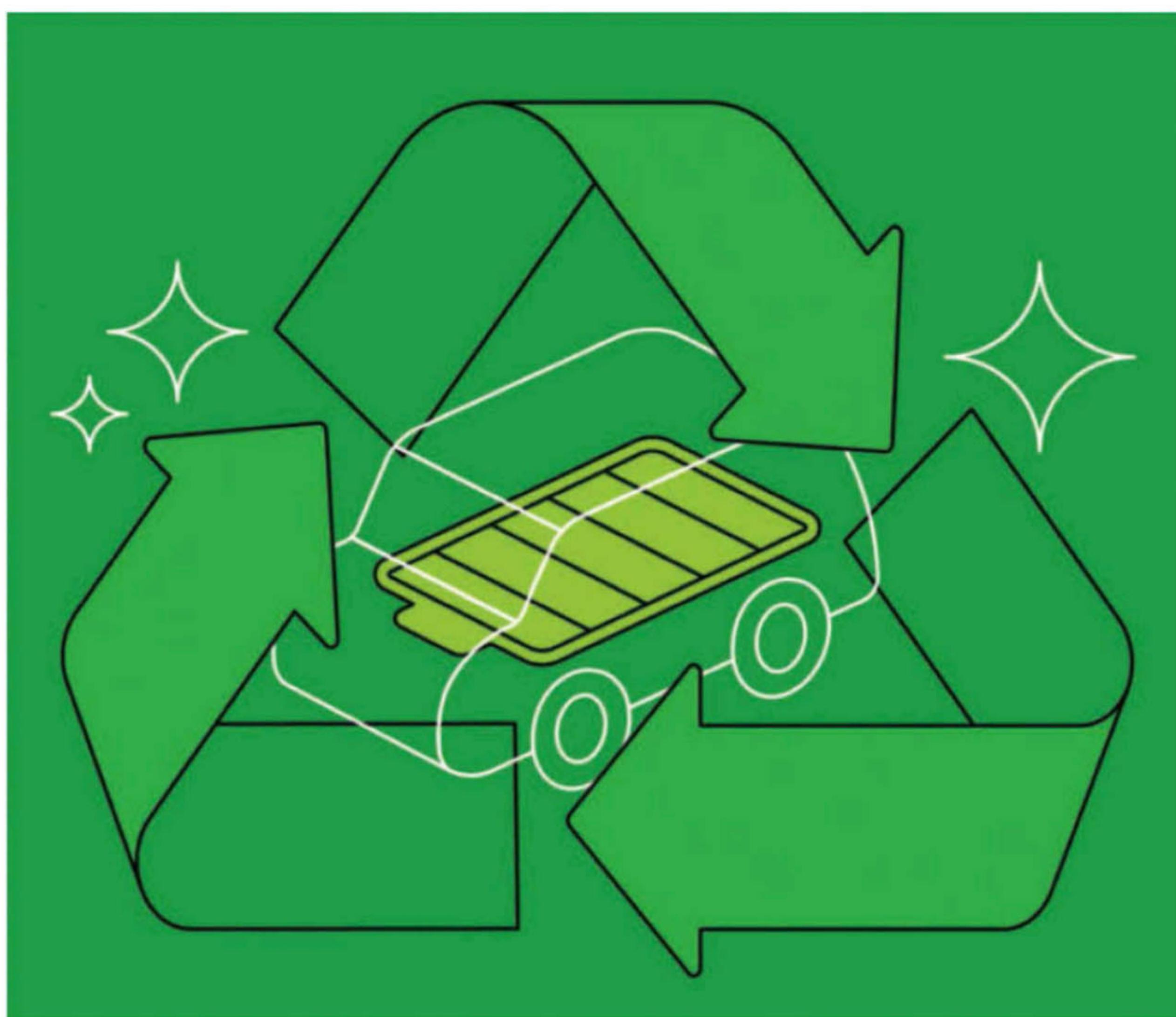
History does nevertheless throw up "natural" experiments. In an earlier paper, Mr Brzezinski, Mr Palma and two co-authors exploited one source of variation in the money supply of early modern Spain: disasters at sea. Ships carrying treasure to Spain from the Americas would sometimes encounter hurricanes, privateers or the British navy. In 42 incidents from 1531 to 1810, they lost some or all of the precious metals that Spanish merchants had expected to receive. The losses averaged 4% of Spain's money stock. Drawing on a variety of sources, including tax records and tallies of sheep, the authors showed the damage these losses inflicted on Spain's economy. Credit became scarce, making it hard for merchants to buy supplies for weavers, and consumer prices were slow to adjust. A loss of 1% of the money stock could reduce real output by about 1% in the subsequent year. Sheep-flock sizes fell by 7%.

#### Paper, the barbarous relic

To the modern eye it seems strange to allow the money supply to be such a hostage to fortune. Why should it shrink when ships sink? Why should it expand when fresh deposits of silver are discovered? Even in the 18th century, some visionaries thought money should break its link to metals. The most prominent example is John Law, a Scottish banker and chancer who somehow persuaded France to shake up its monetary arrangements in 1716.

Law was ahead of his time—his experiment with fiat paper currency ended in disastrous inflation. In the future, money may need to change form again. It may shed all physical manifestations, as coins and notes become obsolete; the bank deposit may be replaced by a claim on the monetary authority itself. But some economists worry that such a transition also poses risks, making bank runs, or even runs out of currency into physical assets, easier. Although the forms money takes may be new, its effects will rarely be neutral. And as Mr Brzezinski and co-authors point out, it is cheaper to learn from the mistakes of the past than to make instructive mistakes in the present. ■

## Science & technology



### Battery recycling

## Waste not, want not

**Within a decade, most electric-car batteries could be made with recycled materials**

DESPITE A SLOWDOWN in electric-vehicle (EV) sales in some countries, demand for batteries was up by around 40% globally last year, and seems likely to continue at a similar pace. Consequently, the world's appetite for lithium, the vital ingredient in the lithium-ion (Li-ion) batteries that dominate the EV market, is expected to exceed 2.4m tonnes in 2030, more than twice its present level.

Where all this lithium will come from is a thorny question. Although 70% of the world's reserves of lithium carbonate (from which it is mined) are in Argentina, Australia and Chile, processing it into a form suitable for use in batteries is a business currently dominated by China. As China also commands the processing of other important battery materials, including manganese, cobalt and nearly all battery-grade graphite, there is concern about the vulnerability of supply chains should China begin restricting supplies of certain raw materials, as it has done in the past. As a result, legislators and carmakers in Europe

and North America have been trying to establish local supplies for batteries.

These efforts are about to be given a big boost. Recent breakthroughs in recycling, together with a spate of technological improvements, mean that within a decade or so most of the global demand for raw materials to build new batteries could be met by recycling old ones.

Lithium, manganese and cobalt are widely used to make electrodes called cathodes, the most expensive part of a Li-ion battery. When the battery is recharging, electrons are stripped from lithium atoms on the cathode to create charged particles called ions. The ions then migrate

#### → ALSO IN THIS SECTION

**70 Rethinking battery components**

**71 Did Earth once have a planetary ring?**

**71 How China's model-makers make do**

**72 Madagascar's unlikely baobabs**

through an electrolyte, typically a liquid medium, to a second electrode called an anode. This is made from graphite, a pure form of carbon. Meanwhile, the electrons created at the cathode travel along the wires of the charging circuit towards the anode, where they reunite with the ions and are stored there. When the battery discharges, the process reverses, with electrons in the circuit powering a device—which in the case of an EV is its electric motor. Although different chemistries can be employed, manganese and cobalt are particularly good at stabilising and boosting the performance of a Li-ion battery.

At present battery recycling is mostly confined to recovering raw materials from the scrap produced by gigafactories. A much richer vein will soon present itself, however, as the first wave of EVs reach the end of their lives. By 2040, according to PwC, a professional-services firm, up to 60% of the materials used to make batteries in Europe could come from recycling old ones, helped along by innovations in recovery processes.

Other analysts take a similar view. Globally, the mining of raw ingredients for battery manufacturing could peak by the mid 2030s, reckons RMI, an American think-tank. This will be caused by a combination of better recycling and continuing advances in battery chemistry, which boosts the energy density of cells so that batteries can be made with fewer raw materials. This, RMI believes, might see mineral extraction for batteries being avoided altogether by 2050.

The ways in which batteries are recycled today pose many problems. Some are labour-intensive, whereas others need lots of energy or are environmentally harmful. But each hurdle is a spur to innovation. Stripping cells apart by physical means to remove their components, for example, takes a lot of effort. A process called pyrometallurgy can simplify the harvesting of metals like nickel and cobalt by roasting batteries at temperatures of up to 1,600°C, but this is no good for getting at the lithium. That metal instead requires a process called hydrometallurgy in which old batteries are crushed and the resulting "black mass" is treated with harsh chemicals known as lixivants.

Some lixivants use concentrated acids which can carry environmental and health risks. This means they have to be treated carefully before disposal, driving up recycling costs. More benign alternatives exist, such as the deep eutectic solvents (DES) developed by researchers at Rice University in Houston, Texas, which are biodegradable and non-toxic. But these solvents come with problems of their own. Because

they generally require heating for a long period at around 200°C, during which time they can degrade and lose effectiveness, DES have so far not been proved to be commercially viable.

The Rice group has found a simple solution to the problem of heat-induced degradation: popping them into a microwave oven. It turns out that choline chloride, a DES ingredient which specifically leaches out lithium, is an excellent absorber of microwaves. This means the DES can rapidly heat up to the temperatures necessary to extract lithium from a black mass, says Sohini Bhattacharyya, one of the Rice team.

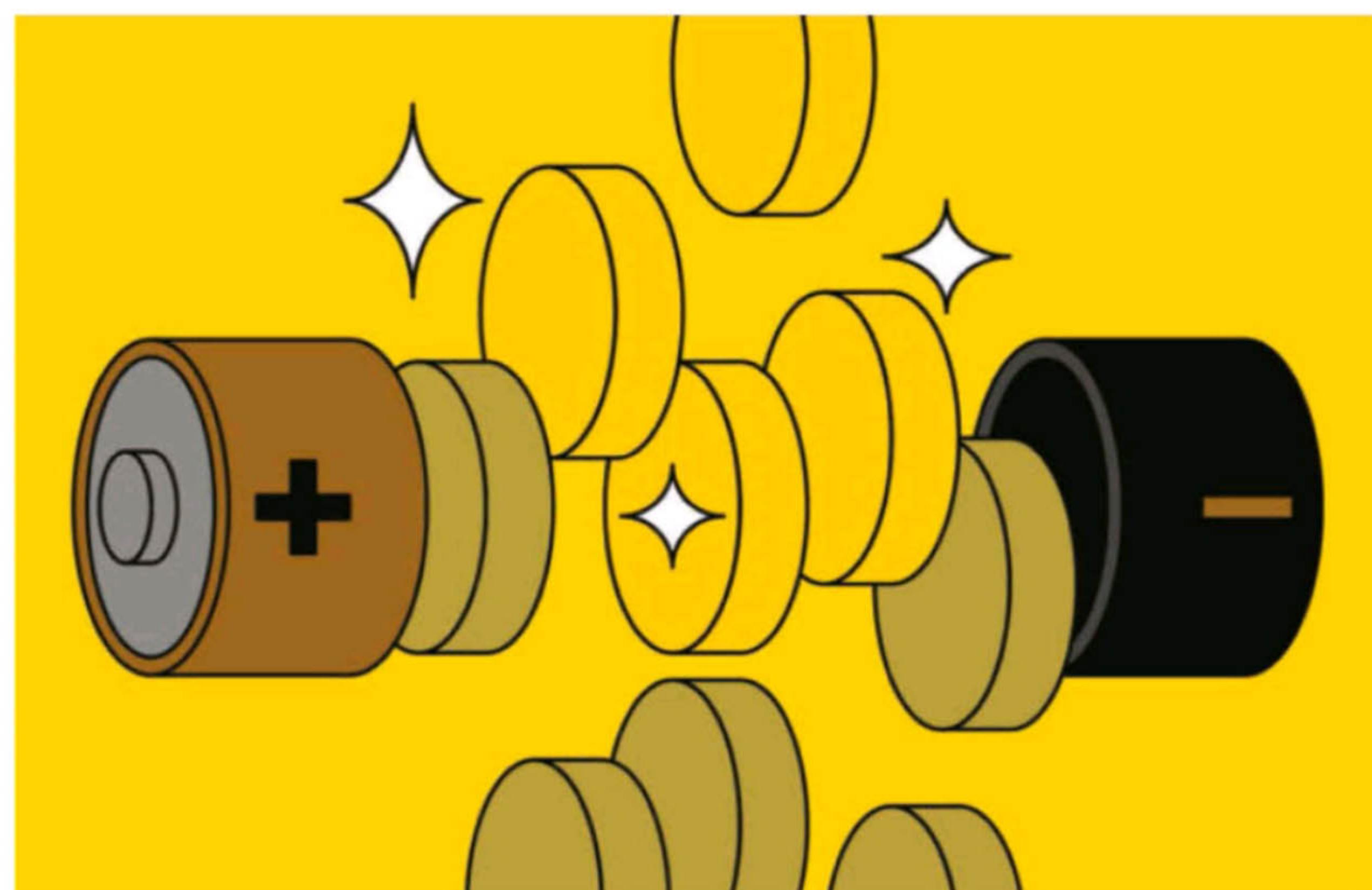
In a recent study published in *Advanced Functional Materials*, a journal, the group reports that by using microwaves a DES was able to recover some 50% of the lithium in a spent cathode in as little as 30 seconds. Recovering 87% took 15 minutes, an improvement on the 12 hours necessary to collect the same amount using a conventional electrically powered oil-bath. This discovery promises to make lithium recovery faster, cheaper and more effective (some conventional recycling processes extract as little as 5%). It should also be possible to tune DES solutions to speedily extract other metals, too.

Other researchers are taking an interest in non-metallic compounds. The graphite in an anode, for example, can represent about half of a battery by volume. Although graphite can also be mined, most of it is currently produced in a synthetic form by roasting needle coke, a by-product of some coal-processing and petrochemical plants. As graphite must be purified to above 99.95% in order to make anodes, recovering it from contaminated battery waste is extremely difficult.

#### Pure and simple

Talga, an Australian materials firm, has come up with a solution to that problem. It recently signed deals with two recyclers, Altium, a British company, and Aurubis, a German one, to purify graphite recovered from scrap and end-of-life batteries so that it can be used again to make new anodes. Talga will use a chemical purification process, the details of which are being kept under wraps while patents are pending. It is, however, known to be based on a technique used at Europe's first anode-production facility. This was set up by Talga in northern Sweden, where the company also operates a graphite mine.

As recycling technology continues to evolve, a circular supply chain may emerge. That should allow more localised battery production and avoid supply-chain vulnerabilities. It would also reduce the overall lifetime carbon emissions involved in the mining and refining of battery raw materials—allowing the drivers of EVs to more rightfully claim to be green. ■



#### Batterymaking

## All change

New designs for batteries' unsung components could lead to performance gains

**I**N THEIR QUEST to build a better battery, researchers have blazed a trail through the elements of the periodic table. The earliest prototype cells ran on nickel and cadmium; successors have used everything from zinc and iron to sodium and lead.

All have had what it takes to serve as a cathode for a battery: namely, an ability to have electrons ripped away from their atoms to be turned into electric current, leaving positively charged ions behind. For the past four decades, though, it is lithium that has beaten all comers. Lightweight and reactive, it serves as an ideal cathode component; lithium-ion (Li-ion) batteries are widely used in electricity grids and can be found in most of the world's electric vehicles. So effective are lithium-based cathodes that scientists hoping to make batteries better and more powerful are turning their attention instead to the other, long-overshadowed components of cells. Those efforts are starting to pay off.

As important as a cell's cathode, but much less studied, is the anode, the electrode where electrons reunite with their host atoms while a battery charges (during discharge, the electrons and ions reunite at the cathode). While electrons flow between the electrodes through a wire, the movement of ions is made possible only by a carefully chosen electrolyte, a conductive medium in which both electrodes sit. Another component is the current collector, which lives up to its name by ensuring any

electricity generated is delivered to the circuit, rather than going to waste.

Each is ripe for improvement. The ideal anode material must, among other things, be able to absorb lithium ions. Graphite has thus far been the ideal candidate, but scientists are now trying to replace it with silicon, which is both cheaper and more absorbent. The amount of energy that it can store by weight is about ten times higher than graphite, too. When silicon anodes charge, though, the incoming lithium ions cause them to swell quickly, eventually leading to cracks.

Several companies are looking for a fix. American battery-component startups such as Sila Nano and Group14 have developed composite materials that embed molecules of silicon into a web of carbon molecules. This would be able to contain the swelling. Sila Nano's product will boost the energy density of Li-ion batteries by between 20% and 40%; Group14's will increase it by as much as 50%.

Amprius Technologies, a company based in Fremont, California, is opting for anodes built from hundreds of nanowires of pure silicon, each surrounded by empty space into which it can expand. Amprius's latest generation of anodes can achieve energy densities of up to 500 watt-hours per kilogram, compared with just under 300 watt-hours per kilogram for typical Li-ion batteries with graphite anodes. NanoGraf, a company based in Chicago, has mean-

▶ while developed a low-cost anode made of silicon oxide which can be filled with lithium ions before being installed in a battery. This pre-swelling, in effect, limits the amount of expansion the anode will subsequently undergo.

Gains may also be found beyond the “active components”, as electrodes are known. Thus far, innovation on inactive components has mostly focused on shrinking them down, so that more electrode material can fit in the cell. But these long overlooked parts are the cool kids now, says one battery-component startup founder.

Electrolytes are the true game-changer, says Shirley Meng, the chief scientist at Argonne National Laboratory’s energy storage unit. This is because they make physical contact with every other component. Given their pivotal role, researchers like Dr Meng believe better electrolytes hold the key to big gains not just in lithium-ion batteries, but in their successors, too.

In June researchers at Asahi Kasei, a Japanese conglomerate, found significant performance gains when they substituted the electrolyte used in a standard Li-ion battery with their proprietary alternative. At -40°C the cells with the Asahi Kasei electrolyte retained charge, though the carbonate-based electrolyte used in standard batteries did not. At 60°C, 15 degrees above the maximum operating temperature for a Li-ion battery, the new electrolyte-filled cell could undergo twice as many charging cycles before seeing a 20% drop in battery health. As the world heats up, such temperature-resistance will be crucial for the stability of electric vehicles and other energy-storage systems.

Perhaps the most promising battery in-

novations affect the least considered component: the current collector. This element, made of thin aluminium sheets that sit atop the cathode and copper sheets that sit atop the anode, conducts electricity from the battery to the circuit. Addionics, an Israeli company, has found that tweaking the geometry of these sheets can boost the batteries’ performance. Unlike the smooth sheets used in today’s batteries, Addionics’s offering has hills and valleys; like a “tiny egg carton”, says Moshiel Biton, the company’s founder. It is also porous. This combination of factors allows active materials such as lithium or graphite from the anode and cathode to seep into the current collectors and thereby improve their conductivity.

When Addionics tested its 3D current collector, it found that the design was less likely to come unstuck from the electrodes than conventional collectors were. Among other things, that increased its capacity and ability to carry current. Tests have also shown that this design of collector could also help the latest generation of Li-ion batteries double the number of charging cycles they can undergo. As Addionics’s 3D current collector is chemistry-agnostic, it will work just as well on a lithium-ion battery as on any successor.

Such advances, though significant, have yet to be manufactured at scale. Big battery companies want “drop-in” products, says Francis Wang, NanoGraf’s boss. In many cases, manufacturers would need to overhaul their production processes to accommodate any single change in design, a risky and expensive proposition. If they can get over their risk aversion, though, then lasting breakthroughs could await. ■

## Artificial intelligence

# Miniature model-building

Chinese AI firms are innovating around hardware bans

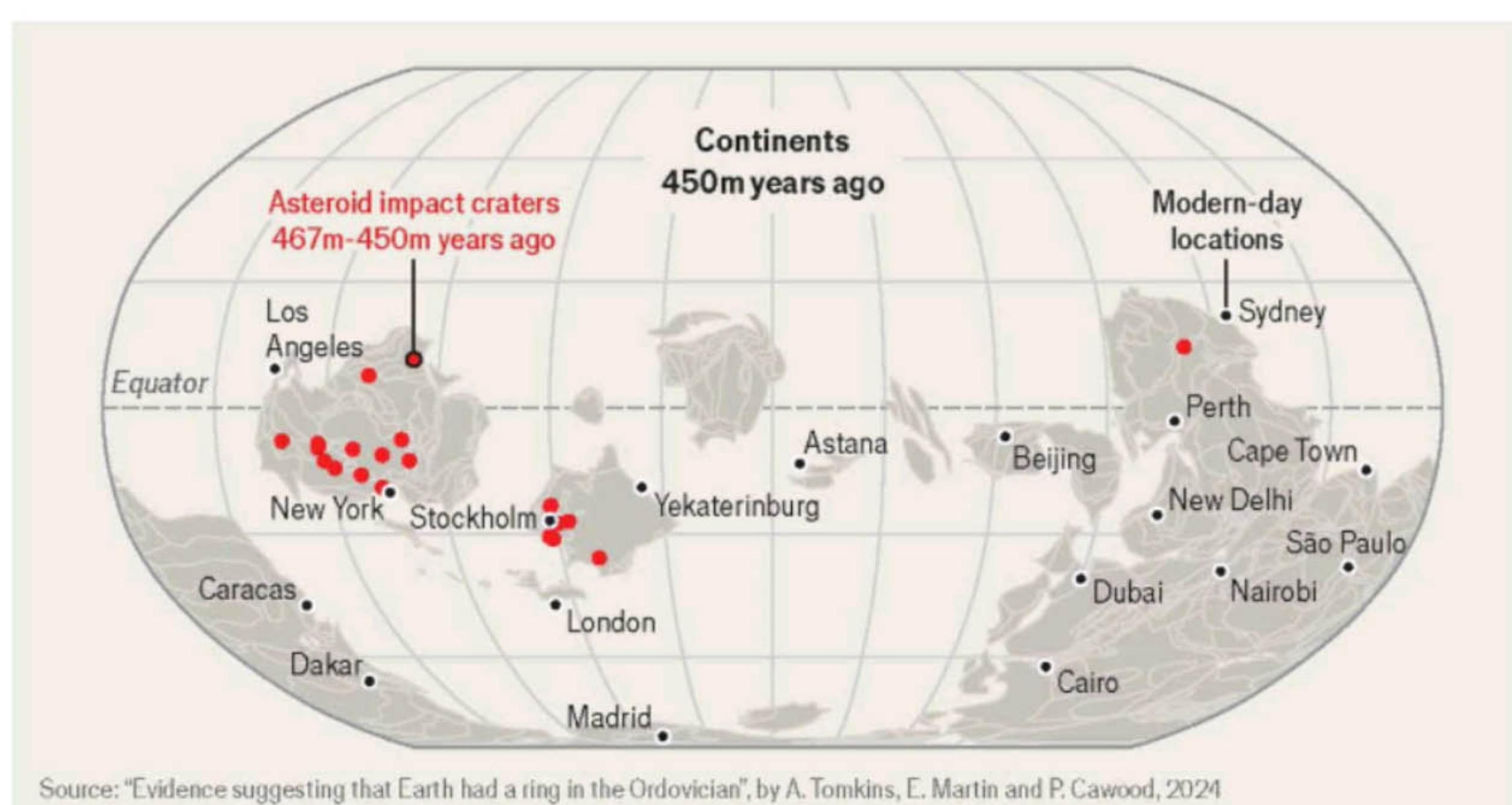
TODAY’S TOP artificial-intelligence (AI) models rely on large numbers of cutting-edge processors known as graphics processing units (GPUs). Most Western companies have no trouble acquiring them. Llama 3, the newest model from Meta, a social-media giant, was trained on 16,000 H100 GPUs from Nvidia, an American chipmaker. Meta plans to stockpile 600,000 more before year’s end. XAI, a startup backed by Elon Musk, has built a data centre in Memphis powered by 100,000 H100s. And though OpenAI, the other big model-maker, is tight-lipped about its GPU stash, it had its latest processors hand-delivered by Jensen Huang, Nvidia’s boss, in April.

This kind of access is a distant dream for most Chinese tech firms. Since October 2022 America has blocked the sale of high-performance processors to China. Some Chinese firms are rumoured to be turning to the black market to get their hands on these coveted chips. But the majority have shifted their focus to making the most of limited resources. Their results are giving Western firms food for thought.

Among the innovators is DeepSeek, a Chinese startup based in Hangzhou. Its latest model, DeepSeek-v2.5, launched in early September, holds its own against leading open-source models on coding challenges as well as tasks in both English and Chinese. These gains are not down to size: DeepSeek is said to have just over 10,000 of Nvidia’s older GPUs—a big number for a Chinese firm, but small by the standards of its American competitors.

DeepSeek makes up for this shortfall in a number of ways. The first is that it consists of a number of different networks, each best suited to a different problem. This “mixture of experts” approach allows the model to delegate each task to the right network, improving speed and reducing processing time. Though DeepSeek has 236bn “parameters”—the virtual connections linking distinct bits of data—it uses less than a tenth at a time for each new chunk of information it processes. The model also compresses new data before they are processed. This helps it handle large inputs more efficiently.

DeepSeek is not alone in finding creative solutions to a GPU shortage. MiniCPM, an open-source model developed by Tsinghua University and ModelBest, an AI startup, comes in varieties with 2.4bn and



Source: "Evidence suggesting that Earth had a ring in the Ordovician", by A. Tomkins, E. Martin and P. Cawood, 2024

## Connecting the dots

Could Earth once have had a planetary ring like the ones around Saturn? Scientists from Monash University in Australia think so. In a recent paper they identify 450m-year-old craters that lie close to Earth’s historical equator. They propose these were caused by the collapse of a ring of debris (possibly the remnants of a large asteroid) that once circled the planet. The ring might have lasted tens of millions of years, cooling Earth with its shadow.



### Introduced species

## In hog heaven

**Madagascar's baobabs may owe their survival to non-native bush pigs**

THE MALAGASY baobab tree, whose thick trunks and tiny branches dot Madagascar's landscape, should not, by rights, have survived to the present day. Scientists believe that its large seeds were once dispersed by the giant tortoises and gorilla-size giant lemurs that roamed the island. When these species went extinct over one thousand years ago owing to human activity, the baobab tree should have vanished too. It did not. Seheno Andriantsaralaza at the University of Antananarivo in Madagascar and Onja Razafindratsima at the University of California, Berkeley, now think they may know the reason why.

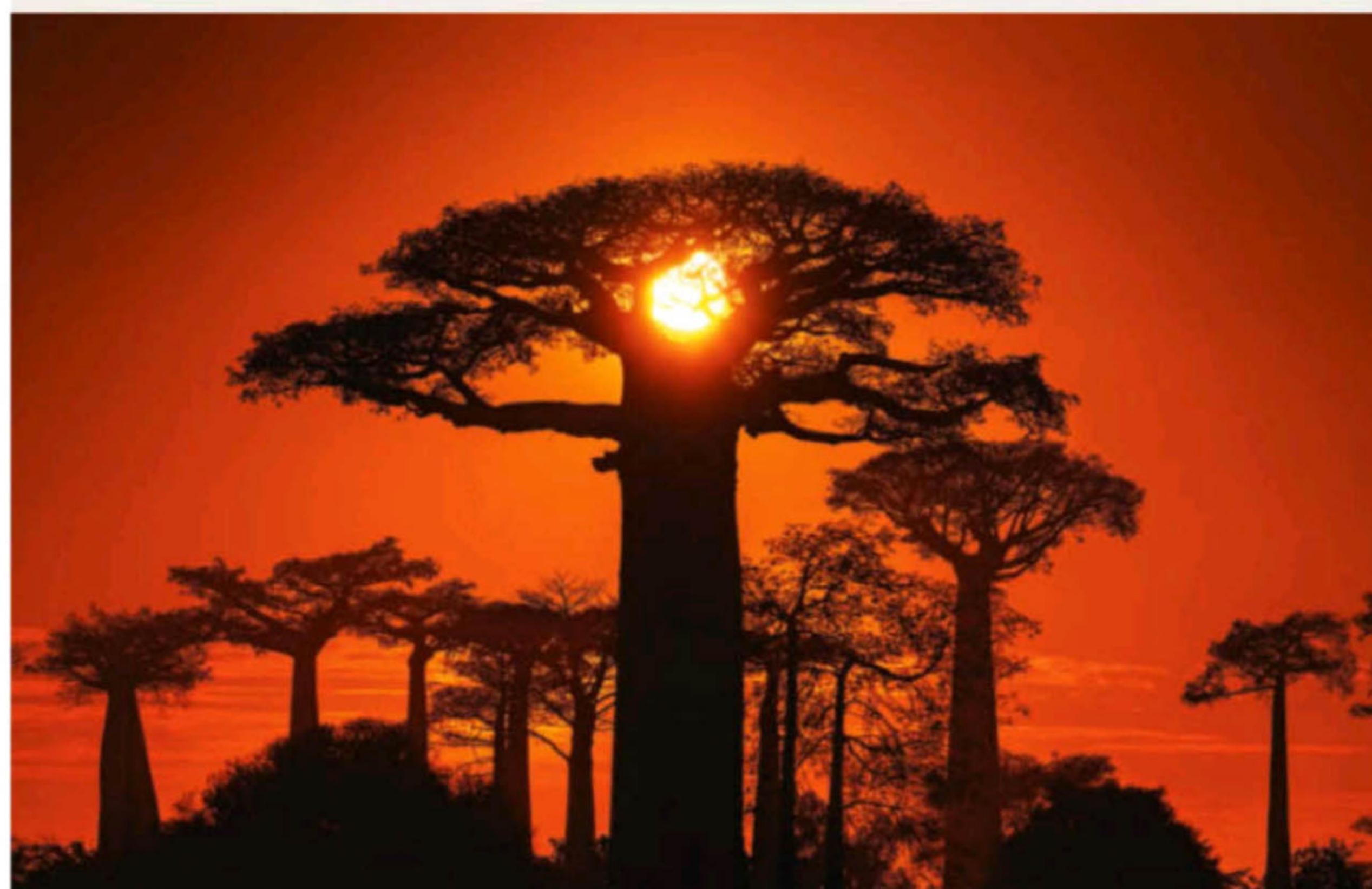
Together with their colleagues, the scientists monitored 15 tree canopies in a western region of Madagascar, to identify any animals that might have claimed the mantle of baobab-seed disperser. The researchers also set up camera traps around seed-containing fruits lying on the ground, and searched any faeces that they encountered along the way for the presence of seeds.

They report in the journal *Biotropica* that a native rodent known as the western tuft-tailed rat was caught on camera handling whole fruits on four occasions. Although there was no footage of the rat breaking the fruits open, the team did stumble upon 13 fruits that had been

chewed into and had their seeds removed. Though the bite marks were not clear enough to identify a culprit, this was clear evidence that a seed-distributing animal was out there. They then found the ecological equivalent of a smoking gun: baobab seeds in seven different piles of bush-pig dung.

The discovery is not without irony. Scientists believe bush pigs were brought to Madagascar by humans sometime between 1,000 and 5,000 years ago, just as the giant lemurs and tortoises were going extinct. Their arrival was a lucky break for the baobabs—especially as scientists have determined that a seed's journey through the porcine digestive system does not hamper its ability to germinate.

While the finding is important in its own right, it also provides valuable evidence that introduced species may not be entirely harmful. Madagascar's pigs, for example, though not native, have made themselves essential to the survival of truly native species. Similar relationships are suspected to hold in South America between rabbits native to Europe and plants with no seed distributors. For Dr Andriantsaralaza, that suggests the full ecological role of introduced species should be considered before talk of extermination begins.



A long-standing mystery

▶ 1.2bn parameters, respectively. Despite its small size, MiniCPM's performance on language-related tasks is comparable to large language models (LLMs) with between 7bn and 13bn parameters. Like DeepSeek's model, it combines a mixture-of-experts approach with input compression. Like other small models with fewer parameters, however, MiniCPM may not be terribly high-performing in areas outside its specific field of training.

MiniCPM's tiny size makes it well-suited for personal devices. In August its creators released a version of the model for mobile phones, which supports multiple languages and works with various types of data, from text and images to audio.

Similar approaches are being tried elsewhere. FlashAttention-3, an algorithm developed by researchers from Together.ai, Meta and Nvidia, speeds up the training and running of LLMs by tailoring its design for Nvidia's H100 GPUs. JEST, another algorithm released in July by Google DeepMind, is fed smaller quantities of high-quality data for its initial training before being let loose on larger, lower-quality data sets. The company claims this approach is 13 times faster and ten times more efficient than other methods. Researchers at Microsoft, which backs OpenAI, have also released a small language model called Phi-3 mini with around 4bn parameters.

For Chinese firms, unlike those in the West, doing more with less is not optional. But this may be no bad thing. After all, says Nathan Benaich of Air Street Capital, an AI investment fund, "The scarcity mindset definitely incentivises efficiency gains." ■

## Culture



**God in the bedroom**

## Christianity's sex addiction

**How odd Christian beliefs about sex shape the world**

THE WORRY was the Virgin Mary's vagina. Early Christians were very clear on some things. They knew that the Holy Spirit had made the Virgin Mary pregnant but that she was still a virgin. What they were not quite sure about was how those two things could both be true. How, in short, had God got in?

Theologians set about solving this riddle with great debate—and a healthy disregard for biology. Almost no orifice was off limits. God had entered Mary through her eyes, suggested one text. Another scholar thought He had come in through her ear. A third suggested that He had impregnated Mary through her nose—which was inventive, if hard to imagine being incorporated into the annual school nativity play.

God is odd about sex. The Bible and Christian writings are odder yet. If all this weirdness affected only believers, it would be important enough. With more than 2bn adherents, Christianity is the world's largest religion and—though it might not always feel like it in the smugly secularising

**Lower than the Angels.** By Diarmaid MacCulloch. Allen Lane; 688 pages; £35. To be published in America by Viking in April 2025; \$40

West—is still growing in many regions.

But Christianity's sexual hang-ups—on everything from celibacy to contraception, homosexuality and more—carry consequences for more than the faithful. In America abortion could sway the election. In Russia Vladimir Putin signed legislation against “non-traditional sexual relations”.

→ ALSO IN THIS SECTION

**74 Grilling the rich**

**75 World in a dish: martinis**

**76 Weight-loss drugs v diet books**

**76 In search of an elusive arms dealer**

**77 How horses made history**

In Britain a fight over ending restrictions on abortion is brewing. This is a good time to try to understand sex and Christianity.

Modern Christians often look to the Bible for clear answers to sexual questions. But clear answers are impossible to find, argues a compendious new book on sex and Christianity. Its author, Diarmaid MacCulloch, is an Oxford academic whose big, fat books on Christianity are almost always a big deal, winning him awards and starring roles in television series.

The problem is that the Bible, which comprises 60-odd books composed over a period of a millennium and more, is less a book than a library—and displays a correspondingly broad range of sexual attitudes. Its pages offer monogamous marriages, polygamous ones, rape, racy poetry, fulminations about homosexuality and tender descriptions of a man's passion for his male lover. There is, Mr MacCulloch writes, “no such thing as a single Christian theology of sex”.

Not that such an inconvenient truth has ever stopped Christians from claiming that there is—or getting cross with those they see as deviating from it. From those who burned “sodomites” at the stake in the 12th century to those who flame “deviants” on social media today, Christians have a habit of getting angry about this stuff. Where once they argued about transubstantiation, now they are far more likely to argue about trans issues, notes Mr MacCulloch.

► He has a point: the entire Anglican Communion, the third-largest club of Christian churches (after Roman Catholic and Eastern Orthodox), has for years been in danger of a schism. Its members are sparring about whether or not to allow gay marriages in churches. Add the horror over the scale of Catholic priests' sexual abuse of children, as well as arguments over contraception, abortion and the ordination of women, and it is possible to see why Mr MacCulloch writes that sex and gender are currently causing more arguments within the church than "at virtually any time over the last two millennia of Christian life".

Any religion is as much almost random accretion as actual doctrine. Christianity's sexual obsessions are no different. Much of what people "know" about Christianity is, to put it mildly, hard to find in the Bible. There was, for example, no apple in Eden (it reputedly grew out of a translator's pun: the words for "apple" and "evil" are almost identical in Latin). As a fiery place of torture, hell is similarly almost entirely absent from the pages of the New Testament. And the word "daily" in the Lord's prayer—often the only Christian prayer that many know—is pure bunkum. (No one has a clue what the Greek word that appears before the word "bread" actually means.)

Christians may have banged on about sex, celibacy and homosexuality for centuries, but, in truth, Jesus had precious little to say about any of them. Though he was fiery in his condemnation of greedy people, he had absolutely nothing to say about gay ones; yet, as one modern theologian pithily pointed out, "No medieval states burned the greedy at the stake." There is, similarly, little in the way of Christian "family values" to be spotted in the life of this man who was rude to his mother and who himself never married.

Christianity's oddness about sex and families can be traced, in part, to Christ's odd start in life. The Mary-Joseph-God *ménage à trois* was unusual enough for Mary—and was not much fun for Joseph either. While all that was going on between his betrothed and God, St Joseph had to sit on the sidelines—sometimes sanguine, occasionally annoyed, eventually sanctified. Rarely has a man deserved his sainthood more. There were, as Mr MacCulloch puts it, "three of them in that marriage, so it was a bit theologically crowded".

To understand where the various Christian sexual hang-ups come from, Mr MacCulloch goes on a quick tour of the heroes and villains of two millennia of Christian theology, from St Paul (whose angry epistles inspired centuries of homophobia), via St Jerome (who championed celibacy), and on to St Augustine (who, having screwed around in the fleshpots of Carthage, then helped screw up the ensuing 16 centuries of Christians with his doctrine of

original sin). Things finally brighten up a bit with the humanist scholar Erasmus, who in 1518 published a pamphlet championing the pleasures of marriage, dedicated to a patron with the improbable if unimprovable name of "Lord Mountjoy".

Mr MacCulloch offers other similarly pleasing titbits. It is, for example, interesting to learn that the word "buggery" is a corruption of the word "Bulgarian", because medieval Christians accused heretics who were thought to come from Bulgaria of it. But far too much of this book is heavy going. Mr MacCulloch's great strength is that he knows a vast amount. His great weakness is that he has written it all down, over 497 pages, in a tiny font. Doubtless there are some who will thrill to discover that in 451AD, at the Council of Chalcedon, a non-Chalcedonian church "proudly adhered to the 'Dyo-

physite' theology of the displaced Patriarch of Constantinople Nestorios". Many more will be left scratching their heads.

Does it matter that many will buy Mr MacCulloch's book, but perhaps not finish it? Christian attitudes to sex are so important in world politics at the moment. But it feels like a mistake to take this oddness towards sex too much on its own terms. Why are American conservatives currently crushing women's reproductive rights? Why is the Russian Orthodox church inveighing against homosexuality? The writings of St Augustine and St Paul offer one answer. Perhaps a simpler answer is provided by the old saying that everything in the world is about sex, except for sex, which is about power. The Christian church, which has been described as the most powerful persecuting force that the world has ever seen, knows this well. ■

### The British elite

## Rich people's problems

An engrossing but flawed takedown of Britain's most privileged class

**Born to Rule.** By Aaron Reeves and Sam Friedman. Belknap Press; 328 pages; \$29.95 and £20

SIR PETER DANIELL went to Eton College, a grand private school favoured by royals and the rich. He was not a strong pupil but was admitted to the University of Oxford in 1927 after his cousin had a quiet word with a college. Daniell had a "wonderful" time there, doing almost no work, then took a job in his father's financial firm. Did he feel at all guilty about his gilded upbringing? Certainly not. Meritocratic ideas were "damned stupid", he later said, and nepotism was harmless.

Anybody expressing such views today would be laughed out of the room, including by other privileged people. In "Born to Rule", Aaron Reeves and Sam Friedman, two British academics, describe how their country's elites have changed since the 19th century, becoming cleverer and better at presenting themselves as ordinary. The book, flush with research, including more than 200 interviews, is superb—although like Daniell, the authors make the mistake of expressing their views too frankly.

The elite can be defined in many different ways. Mr Reeves and Mr Friedman adopt an extremely narrow measure. Their elite consists of the people who have been listed in "Who's Who", a guide to the powerful first published in 1849 and updated

annually. At the moment, this group has around 33,000 members. The authors are especially interested in a subgroup, the wealthy elite, with only 6,000 members—0.01% of the British population.

The great advantage of using "Who's Who" as a yardstick is that you can see how the top dogs have changed. Much of "Born to Rule" is about this transformation, which is startling. The elite used to be thick with clerics and military men. These ►



The fat cats in the hats

► days there are lots of lawyers and media figures. Women, who were excluded from "Who's Who" until 1897, make up one-third of new entrants.

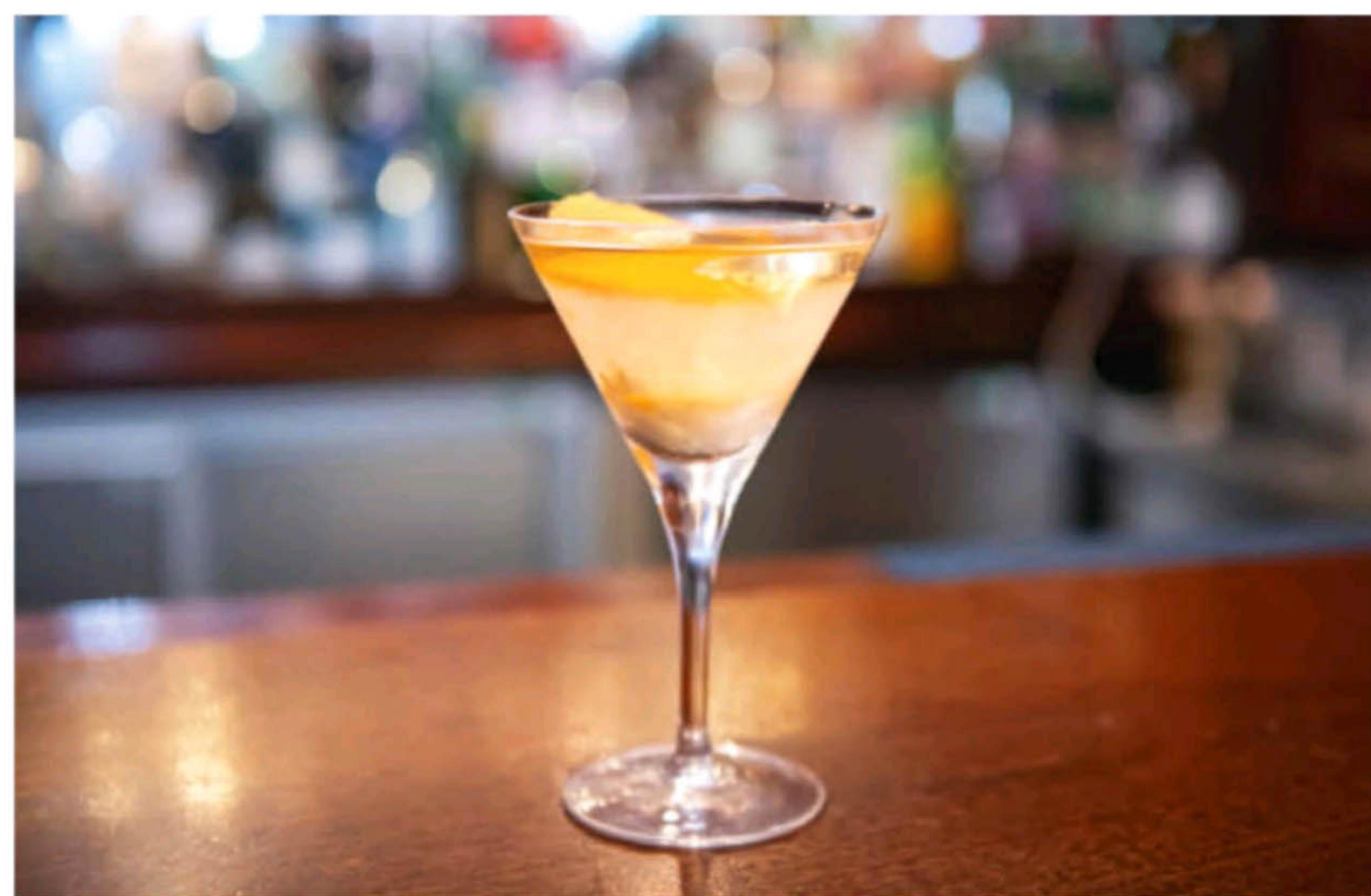
Elites are also increasingly well educated. More than a third went to Oxford or Cambridge—a share that has changed little since the 19th century, despite the rapid growth of other universities. Attending Oxbridge means something quite different these days. Elites used to slide into universities on the strength of their connections, chuck a few bread rolls about, then ease into good jobs. These days they work hard to get in and often work hard while they are there. Top private schools, which supply the elite with an alarmingly large share of members (though less than in the past), are academically excellent.

Above all, elites now present themselves differently. They claim to be working-class even when they are not. Their hobbies are now more like everyone else's. In the 19th century the elite favoured golf, hunting and riding; in the 20th century they took a serious interest in art and literature. More recently they have mixed high culture with popular pursuits: Anthony Giddens, an influential sociologist, listed his interests as "theatre, cinema, playing tennis, supporting Tottenham Hotspur".

The authors believe that this is a pose intended to make powerful and privileged people appear normal. They seem not to like their subject much, arguing that elites oppress working people. After all, they write, elites have cut welfare and undermined trade unions, among other sins. This is true, yet meaningless. Such things are done by senior politicians, who are members of the elite simply by virtue of their jobs. It would be equally true to say that the elite created the post-war welfare state and introduced the minimum wage.

In their conclusion Mr Friedman and Mr Reeves suggest some ways of disrupting the British elite. They argue that Cambridge and Oxford should be obliged to recruit at random from regional pools of top students, and that the House of Lords ought to be replaced with a randomly appointed senate. Those sound like excellent ways of diminishing two of Britain's shrinking number of world-class institutions and enhancing the already huge power of the House of Commons.

And for what? The elites described in "Born to Rule" are too posh and too good at replicating themselves, but hardly toxic. The authors surveyed members of "Who's Who", and discovered that they tend to hold rather sensible, centrist views. Their attitudes to taxing and spending are about average, and they are more likely than others to believe that feminism is necessary. They also seem to be growing more left-wing. Perhaps they are not just pretending to be normal. ■



### World in a dish

## Glamour shots

### How the martini became the world's most iconic cocktail

**A**T DUKES BAR in London there is a limit of two martinis per person. Enrico Chiappini, the head bartender, says that in his 16 years he has made almost no exceptions. That is because the bar's martinis, made with chilled gin or vodka and vermouth, are famously dangerous: each contains 120ml of booze. Two hold ten shots.

As James Thurber, an American humorist, warned, two martinis may be too many—but three are not enough. That thrill has attracted drinkers for more than a century. Ian Fleming, a British novelist and frequent patron of Dukes, invented the Vesper martini for James Bond, who ordered his "shaken not stirred". Ernest Hemingway, also a committed drinker, extolled the macho tipple in his novels, including "A Farewell to Arms".

A "boozy cultural prism" is what Alice Lascelles, who writes a column in the *Financial Times*, calls the drink in a new book, "The Martini". It is resilient and adaptable. As distilling improved in the 20th century, drinkers started to request dry cocktails. In the 1980s tastes swung the other way, with fruity froths and coffee liqueur filling the Y-shaped glasses.

Yet the martini's basic recipe has always been simple. It requires no specialised equipment. That makes it "a kind of perfection that's well within one's grasp", writes Ms Lascelles. During Prohibition in the 1920s in America, martini-making moved from bars to homes. A century later,

covid lockdowns once again enticed many to experiment with mixology at home.

A basic formula can be endlessly personalised. That taps into the trend across lifestyle industries, from fragrances to fashion, of tweaking a product to express something about yourself. You may have a rotating repertoire of spirits. (In your correspondent's case, it is a potato vodka from Poland.) Or it may be the garnish: citrus rind or olives? Franklin D. Roosevelt would add both, along with a splash of the olive brine. Hemingway had a fetish for adding onions: both frozen and raw.

A study by Claire Warner and Tristan Stephenson, two mixologists, identifies at least 21 variables yielding 6.9 quadrillion possible martini combinations. Meanwhile, bartenders use the drink to show off their skills. Tayēr + Elementary in London, one of the world's best bars, riffs on its form by serving a green olive stuffed with blue cheese in a bite-sized vodka martini.

As people drink less, they want to drink better. That is especially true among young drinkers; last year a survey of millennials in America and Britain showed that 30% opted for homemade cocktails to start the night—almost double the share five years ago. They might even drop £25 (\$33) on a martini at Dukes, which is made tableside to their specifications and poured theatrically into an ice-cold glass. It is a ritual rich with history—and potential for sharing on Instagram. #Cheers. ■

Ozempic odysseys

## Here's the skinny

How weight-loss drugs have changed demand for diet books

**F**ROM LOS ANGELES to London, weight-loss drugs such as Ozempic are reshaping culture as much as waistlines. Some Ozempic-takers have tiny appetites and dine at unusual hours to avoid spells of nausea. Others have lost their taste for alcohol. Many have given up on the gym, either because they are tired or because the drugs keep them svelte. #MyOzempicJourney posts have racked up millions of views on TikTok, as people share how they are adjusting to their new lifestyles.

These drugs have also slimmed people's demand for diet books. Since June 2021, when Wegovy, the first blockbuster slimming jab, was approved by America's Food and Drug Administration, sales of "health and fitness" print books in America have fallen by 15%, according to Circana, a research firm. (Sales of print books overall fell by 4%.) The category shifted fewer than 10m hard copies in the years ending June 2023 and June 2024, the lowest in a decade. Diet, exercise and weight-loss titles are among the worst sellers.

Publishers are trying to fight back by expanding beyond books that promise fast results from calorie-counting and new dieting fads; they are focusing more on longevity and vitality. Living longer is the most exciting topic for readers today, says Olivia Morris, publishing director of Ebury Self, which released "Outlive" by Peter Attia, a doctor, in Britain last year. (It has sold more than 2m copies globally.) Sales of

books about longevity rose by 50% in the past year, according to Circana. Another pocket of growth is women's health. "The Cortisol Reset Plan", to be published next year, investigates how the stress hormone causes female fatigue and weight gain.

Diet books that have achieved brisk sales, including Davinia Taylor's "It's Not A Diet" and Ben Carpenter's "Everything Fat Loss", tell readers to forget fads and make simple lifestyle changes. By promising low effort and high reward, they offer an easy, cheap alternative to drugs (which have a list price of more than \$1,000 a month in America). There is also growing demand for "natural alternatives" to jabs, according to Victory Belt, a health publisher. On TikTok "nature's Ozempic"—berberine, a plant extract claimed to promote weight loss—has gone viral.

Publishers are not entirely pessimistic about injectable medicines. "Health and fitness" remains the ninth-largest adult non-fiction print book category in America. They are also faring better than others in the diet industry. The market value of WW (formerly Weight Watchers) has fallen by more than 90% since June 2021, with investors worried about growth prospects.

In time the drugs may even lure new readers. Books are being written for those with suppressed appetites: "The Mayo Clinic Diet", first published in 1949, has released a "weight-loss medications edition". Some publishers predict greater demand for titles about diabetes and blood sugar, as people try to learn more about the science behind the drugs. (They mimic the hormones that the body produces after a meal to suppress appetite.) But as even cheaper and more convenient weight-loss drugs emerge and spread, publishers will probably need to change tack. Nobody in publishing is entirely sure what the next chapter will bring. ■



Meet the world's most elusive arms dealer

## Rocket man

**T**HE CHINESE PHANTOM. By Christoph Giesen, Philipp Grüll, Frederik Obermaier and Bastian Obermayer. Translated by Simon Pare. Scribe; 288 pages; £20

IRANIAN MISSILES are lodged in the centre of Middle Eastern conflict today. In April Iran conducted the largest-ever missile barrage, firing more than 300 drones and rockets at Israel. Hamas in Gaza and Hezbollah in Lebanon have fired them at Israel; the Houthis in Yemen have fired them at ships in the Red Sea. Iran-backed militias in Syria and Iraq have used them to target American troops. How did Iran become a missile superpower?

It is all down to one man, argues "The Chinese Phantom", a book by four German journalists, published last year in German and recently translated into English. Karl Lee, a shady Chinese arms dealer, supplies the bulk of material and equipment for Iran's ballistic-missile programme, America's State Department avers. Mr Lee has a long and eye-popping rap sheet. Having built up contacts as a Chinese government official, he then set up an innocuous-sounding company in Dalian, a port on the Yellow Sea, in 1998. It was the first of many. For the past quarter-century he is believed to have provided aluminium, carbon fibre, gyroscopes and more to help Iran build lighter missiles that can fly farther and stay on course.

"The Chinese Phantom" weaves together the story of that illicit arms network, America's frustrated efforts to put pressure on China to shut it down and the geopolitics of Iranian missile technology and Sino-American competition. The authors hunt for Mr Lee in parts of China where few foreign reporters are likely to have set foot. Two of the authors won the Pulitzer prize for their reporting on the Panama papers, a series of leaks of corporate and financial records published in 2016; they draw on that work to unravel parts of Mr Lee's byzantine shell companies.

However, what might have been a riveting true-crime tale has two problems. One is the authors' flabby, undisciplined writing. Descriptions of undramatic meetings with sources are preceded by paragraphs of flowery prose. "Lee ranks so highly on the CIA's wanted list", the authors implausibly argue at one point, "that special forces...etch his face into their memories the moment they start their training."

The bigger issue is that it is a who-

► dunnit without a satisfying ending. Mr Lee, apparently protected by the Chinese state, is a spectral presence throughout the book. The authors do an admirable job of chasing every lead, however slender. They speak to Mr Lee's family and a wide array of spooks and even visit Mr Lee's factories, which have graphite (well suited to rocket-motor nozzles) piled up in the courtyard. But by the end the authors cannot even tell for sure whether he is in prison or not.

Still, the book is an accomplished piece of investigative journalism that sheds light

on the inner workings of the global arms trade. The subject is urgent and timely. Iranian officials have hinted that an old *fatwa*, or religious prohibition, on nuclear weapons might be abrogated. Recently American and British officials have grown concerned that Russia, in exchange for drones and missiles, has provided Iran with nuclear secrets. Should Iran develop a nuclear weapon in the coming years it would be mounted on the ballistic missiles that the elusive Mr Lee has so assiduously, and profitably, helped spread. ■

### An equine alliance

## Unbridled

### How the horse has moulded empires, wars and human affairs

**The Horse.** By Timothy Winegard.

Dutton; 544 pages; \$35

**Hoof Beats.** By William Taylor. University of California Press; 360 pages; \$28.95 and £25

**Raiders, Rulers and Traders.**

By David Chaffetz. W.W. Norton; 448 pages; \$32.50 and £25

THERE WAS nearly a world without horses. At the end of the last ice age warming temperatures turned the grasslands where horses roamed into swamps and forests. Humans hunted them heavily for meat. Wild horses did, in fact, go extinct in North America around 7,600–12,000 years ago. You could say that by stopping hunting and starting to domesticate and harness them, humans saved horses. Or you could say that horses decided to bet on people.

Humans were forever changed by their equine alliance. Able to gallop at more than 40mph (64kph) and to convey heavy objects, horses altered the arc of empires and determined victors and losers in battle. Timothy Winegard, a historian, calls horses "humanity's longest-serving weapon system". They also transformed the way people could hunt, communicate, trade and even dress. Trousers spread only after horses were domesticated, as an innovation for riding. The oldest surviving pairs, dating to 1300BC, belonged to horsemen.

A herd of new books has come out looking at the horse's impact on human history, though their approaches are very different. David Chaffetz, a scholar of Asian history, focuses his deeply researched, elegantly written "Raiders, Rulers and Traders" on the interplay between horse-borne nomads and settled peoples, a defining aspect of Chinese, Indian and Persian civilisations.

He argues that "What we now call the Silk Road should more accurately be called the Horse Road, for it was the horse, and not silk, that drew buyers and sellers together...to form the first large-scale international trading routes."

The broadest and most accessible view comes from Mr Winegard. Ranging from horse anatomy to the role of horses in both world wars, his book is packed with fascinating detail. For example, by weight, Britain shipped more horse feed than ammunition to the western front in the first world war; 20 years later Hitler enlisted some 2.7m horses in the second. In contrast, "Hoof Beats" by William Taylor, an academic and curator at the University of Colorado Museum of Natural History, is based primarily on archaeology; unfortunately it



Don't put the cart before the horse

reads like a competent textbook.

All three books consider how mastery of the horse empowered the people who first achieved it in the third millennium BC. Their homeland was the Pontic-Caspian steppe, the vast grasslands north of the Black and Caspian seas. Using horses for food, transport and warfare provided mobility and an edge over others. One result is that their language, Proto-Indo-European, forms the root of tongues spoken by 46% of people today, such as Bengali and Portuguese. Their genetic imprint stamps 40–50% of Europeans. Some 60–90% of men on the Indian subcontinent can trace patrilineal DNA back to these early horsemen.

Superior horses and horsemanship continued to determine sweeping population movements. By around 2000BC horses had trampled older civilisations across Europe and India, such as those that built Stonehenge in England and Mohenjodaro in the Indus Valley. Mastery of mounts brought the Huns into Europe (around 370AD), the Arabs into Spain (711AD) and the Turks into India (1020AD) and Anatolia (1071AD). Horses also spread the vast Mongol armies under Genghis Khan across nearly the whole of the Eurasian land mass, including China (around 1200AD).

In Europe feudalism and chivalry arrived on horseback, as did Napoleon's troops. According to Mr Winegard, in the French army's disastrous retreat from Moscow in 1812 it was the loss of 200,000 horses, which could not be quickly replaced, rather than of half a million soldiers who could, that sealed the emperor's fate.

A look at the "biotechnology" of the horse explains its usefulness. In terms of power a horse packs more than ten times that of a human. (People still use "horse-power" as a way to quantify might.) Horses hardly need sleep, run fast for long stretches and have temperaments that make them easy to herd and train. Their teeth snip grass with front incisors and crush it with back molars, leaving a useful gap for a bit. Their milk has five times more vitamin C, and their flesh more protein, than cows'. Handy "hardware" like stirrups and saddles, as well as the innovation of hitching horses to wheeled vehicles (from around 2000BC), have given people more control.

Horses' utility translated into muscular pricing. An ordinary mount in ancient Athens cost upwards of 500 drachmas, compared with 140 for an unskilled slave. In Brazil in the 17th century a fine steed could fetch as much as 20 slaves. It is only in the past 100 years, since the invention and spread of automobiles, that horses became less integral to human civilisation and people's daily lives. However, as these books make clear, it would be unwise to put horses out to pasture in people's memories. They deserve enduring respect, for their hoof beats changed the world. ■

## Economic & financial indicators

	Gross domestic product			Consumer prices		Unemployment rate	Current-account balance	Budget balance	Interest rates	Currency units		
	% change on year ago latest	quarter*	2024†	% change on year ago latest	2024†	%	% of GDP, 2024‡	% of GDP, 2024†	10-yr govt bonds latest, %	change on year ago, bp	per \$ Sep 18th	% change on year ago
United States	3.1	Q2	2.9	2.4	2.5	Aug	3.0	4.2 Aug	-3.3	-6.9	3.7	-62.0
China	4.7	Q2	2.8	4.7	0.6	Aug	0.4	5.3 Aug‡	1.2	4.4	1.7 §§	-80.0
Japan	-1.0	Q2	2.9	0.5	2.7	Jul	2.5	2.7 Jul	3.8	4.7	0.9	14.0
Britain	0.9	Q2	2.3	1.1	2.2	Aug	2.9	4.1 Jun††	-3.0	-4.1	3.8	-61.0
Canada	0.9	Q2	2.1	1.3	2.0	Aug	2.4	6.6 Aug	-1.2	-1.3	2.9	-82.0
Euro area	0.6	Q2	0.8	1.0	2.2	Aug	2.5	6.4 Jul	3.1	3.1	2.2	-50.0
Austria	-0.6	Q2	-1.7†	-0.3	2.4	Aug	2.9	5.0 Jul	2.4	-2.4	2.7	-60.0
Belgium	1.1	Q2	0.8	1.2	4.3	Aug	3.8	5.4 Jul	-0.6	-4.6	2.8	-57.0
France	1.0	Q2	0.7	1.2	2.2	Aug	2.6	7.5 Jul	-0.4	-5.2	3.3	45.0
Germany	nil	Q2	-0.3	0.2	2.0	Aug	2.6	3.4 Jul	6.2	-1.6	2.2	-50.0
Greece	2.7	Q2	4.4	2.4	3.2	Aug	2.8	9.9 Jul	-5.8	-1.3	3.2	-97.0
Italy	0.9	Q2	0.6	0.9	1.2	Aug	1.2	6.5 Jul	1.5	-5.2	3.6	-98.0
Netherlands	0.8	Q2	4.1	0.6	3.3	Aug	3.5	3.6 Jul	8.7	-1.4	2.5	-57.0
Spain	2.9	Q2	3.3	2.7	2.4	Aug	3.0	11.5 Jul	2.5	-3.2	2.9	-78.0
Czech Republic	0.9	Q2	1.3	1.1	2.2	Aug	2.0	2.7 Jul†	0.2	-2.4	3.7	-77.0
Denmark	3.5	Q2	2.6	1.6	1.4	Aug	1.6	2.9 Jul	10.5	1.8	2.1	-83.0
Norway	4.2	Q2	5.7	1.0	2.6	Aug	3.3	4.0 Jun‡‡	15.9	12.0	3.2	-55.0
Poland	3.2	Q2	6.1	3.2	4.3	Aug	3.8	5.0 Aug§	1.0	-5.7	5.3	-30.0
Russia	4.1	Q2	na	3.6	9.0	Aug	7.5	2.4 Jul§	2.9	-1.2	15.8	414
Sweden	0.6	Q2	-1.0	0.6	1.9	Aug	2.0	7.9 Aug§	6.0	-0.9	1.9	-97.0
Switzerland	1.8	Q2	2.8	1.1	1.1	Aug	1.2	2.5 Aug	6.7	0.6	0.4	-66.0
Turkey	2.5	Q2	0.3	3.1	52.0	Aug	57.7	9.3 Jul§	-2.7	-5.2	27.1	340
Australia	1.0	Q2	0.9	1.3	3.8	Q2	3.5	4.2 Aug	-0.6	-1.5	3.9	-29.0
Hong Kong	3.3	Q2	1.4	3.0	2.5	Jul	1.5	3.0 Jul††	11.9	-2.9	2.7	-144
India	6.7	Q2	4.5	6.9	3.7	Aug	4.7	8.5 Aug	-0.5	-4.9	6.8	-38.0
Indonesia	5.0	Q2	na	5.1	2.1	Aug	2.6	4.8 Q1§	-0.1	-2.4	6.5	-19.0
Malaysia	5.9	Q2	na	5.1	2.0	Jul	2.3	3.3 Jul§	2.6	-4.4	3.7	-16.0
Pakistan	2.8	2024**	na	2.8	9.6	Aug	15.5	6.3 2021	-1.7	-7.4	13.1 †††	-326
Philippines	6.3	Q2	2.0	5.4	3.3	Aug	3.3	4.7 Q3§	-2.8	-5.9	6.0	-48.0
Singapore	2.9	Q2	1.6	2.7	2.4	Jul	2.6	2.0 Q2	19.8	0.1	2.4	-91.0
South Korea	2.3	Q2	-0.9	2.5	2.0	Aug	2.5	1.9 Aug§	3.4	-1.8	2.9	-101
Taiwan	5.1	Q2	1.2	4.2	2.4	Aug	2.0	3.3 Jul	14.0	0.2	1.5	23.0
Thailand	2.3	Q2	3.1	2.5	0.4	Aug	0.9	1.1 Jul§	2.7	-3.7	na	na
Argentina	-1.7	Q2	-6.8	-3.1	237	Aug	221.0	7.7 Q1§	0.3	-0.5	na	962
Brazil	3.3	Q2	5.9	2.5	4.2	Aug	4.3	6.8 Jul‡‡	-1.5	-7.6	11.9	65.0
Chile	1.6	Q2	-2.5	2.3	4.6	Aug	3.9	8.7 Jul‡‡	-2.8	-2.4	5.3	-53.0
Colombia	1.8	Q2	0.4	1.4	6.1	Aug	6.7	9.9 Jul§	-2.6	-5.7	9.6	-110
Mexico	2.1	Q2	0.6	1.6	5.0	Aug	4.9	2.7 Jul	-0.3	-5.0	9.2	-46.0
Peru	3.6	Q2	9.8	2.8	2.0	Aug	2.5	6.5 Aug§	-0.3	-4.1	6.4	-43.0
Egypt	2.2	Q1	na	2.4	26.2	Aug	28.4	6.5 Q2§	-4.7	-5.2	na	48.5
Israel	-2.1	Q2	0.7	0.7	3.6	Aug	3.0	2.6 Aug	5.7	-7.3	5.0	99.0
Saudi Arabia	-0.8	2023	na	1.5	1.6	Aug	1.8	3.5 Q1	-0.5	-2.2	na	3.75
South Africa	0.3	Q2	1.8	1.1	4.4	Aug	4.8	33.5 Q2§	-2.0	-5.3	8.8	-166

Source: Haver Analytics. \*% change on previous quarter, annual rate. †The Economist Intelligence Unit estimate/forecast. §Not seasonally adjusted. ‡New series. \*\*Year ending June. ††Latest 3 months. †††3-month moving average. §§5-year yield. †††Dollar-denominated bonds. Note: Euro area consumer prices are harmonised.

### Markets

In local currency	Index	% change on:			Index	% change on:		
		Sep 18th	one week	Dec 29th		Sep 18th	one week	Dec 29th
United States S&P 500	5,618.3	1.2	17.8		Pakistan KSE	80,461.3	2.3	28.8
United States NAS Comp	17,573.3	1.0	17.1		Singapore STI	3,592.4	1.7	10.9
China Shanghai Comp	2,717.3	-0.2	-8.7		South Korea KOSPI	2,575.4	2.5	-3.0
China Shenzhen Comp	1,473.7	-1.7	-19.8		Taiwan TWI	21,678.8	3.1	20.9
Japan Nikkei 225	36,380.2	2.1	8.7		Thailand SET	1,435.8	1.4	1.4
Japan Topix	2,565.4	1.4	8.4		Argentina MERV	1,815,099.0	2.9	95.2
Britain FTSE 100	8,253.7	0.7	6.7		Brazil Bovespa	133,747.7	-0.7	-0.3
Canada S&P/TSX	23,592.6	1.6	12.6		Mexico IPC	52,582.9	2.7	-8.4
Euro area EURO STOXX 50	4,835.3	1.5	6.9		Egypt EGX 30	30,342.5	-0.5	21.9
France CAC 40	7,444.9	0.6	-1.3		Israel TA 125	1,997.2	-1.8	5.8
Germany DAX*	18,711.5	2.1	11.7		Saudi Arabia Tadawul	11,920.9	1.3	-0.4
Italy FTSE/MIB	33,655.5	1.5	10.9		South Africa JSE AS	82,718.6	2.3	7.6
Netherlands AEX	892.6	0.9	13.4		World, dev'd MSCI	3,629.7	1.4	14.5
Spain IBEX 35	11,684.7	3.6	15.7		Emerging markets MSCI	1,087.8	2.7	6.3
Poland WIG	82,705.2	3.5	5.4					
Russia RTS, \$ terms	1,137.5	nil	5.0					
Switzerland SMI	11,982.3	0.5	7.6					
Turkey BIST	9,774.5	3.8	30.8					
Australia All Ord.	8,364.3	2.1	6.8					
Hong Kong Hang Seng	17,660.0	3.2	3.6					
India BSE	82,948.3	1.7	14.8					
Indonesia IDX	7,829.1	0.9	7.6					
Malaysia KLCI	1,660.6	1.3	14.2					

## Calling Europe's innovation leaders to join the EIT Governing Board



European Institute of Innovation & Technology

A body of the European Union



Do you want to strengthen Europe's competitiveness and accelerate the green and digital transition? You can contribute to this as one of the EIT's four new Governing Board members.

The Call for Expression of Interest is now open to leaders with a strong track record of bridging the worlds of business, education and research. Apply on the EIT website ([eit.europa.eu](http://eit.europa.eu)) by 28 October 2024, 23.59 CET.

### About the Governing Board

The EIT Governing Board consists of 15 European innovation leaders and an observer from the European Commission. The Board provides the EIT's strategic leadership and is independent in its decision-making. It is also responsible for the selection, designation, funding, and evaluation of the EIT's Knowledge and Innovation Communities.

### EIT: Europe's largest innovation ecosystem

The EIT strengthens Europe's ability to innovate by powering solutions to pressing global challenges and by nurturing entrepreneurial talent to create sustainable growth and skilled jobs in Europe. The Institute is an EU body and an integral part of Horizon Europe, the EU Framework Programme for Research and Innovation, with a budget of EUR 3 billion for 2021-2027.

The Institute supports dynamic pan-European partnerships, EIT Knowledge and Innovation Communities, among leading companies, research labs and universities. Together with their leading partners, the EIT Community offers a wide range of innovation and entrepreneurship activities across Europe: entrepreneurial education courses, business creation and acceleration services and innovation driven research projects.

## Planning a New Career Challenge?



### Unique Access to Confidential Opportunities

InterExec is the global leader in assisting Top Executives earning \$250k and above with their next career move.

We have almost 50 years of experience in discreetly leveraging our relationships with 15,000 Search Executives across the world to maximise our clients' career prospects.

Whatever your next challenge may be, we offer you a free of charge, mutually exploratory initial meeting to see if we can be of assistance.

ESTABLISHED 1976  
**Inter Exec**

UNIQUE NETWORK • OUTSTANDING TALENT

[london@interexec.net](mailto:london@interexec.net) [www.interexec.net](http://www.interexec.net) +44 (0)20 7256 5085

## COURSES



1884

**"MAKE AN INVESTMENT IN YOURSELF THAT WILL BE PROFITABLE"**

Fareda Sands, CBMBA Graduate  
President, Initium Novum Enterprises Ltd,  
Bahamas



PRIFYSGOL  
**BANGOR**  
UNIVERSITY

## EXECUTIVE EDUCATION

*Cutting edge & innovative learning for the global financial services sector*

Chartered Banker MBA

Financial Crime & Compliance MBA

[bangor.ac.uk/Executive-Education](http://bangor.ac.uk/Executive-Education)

## OBITUARY

### Francisco Lopera

*The intrepid Colombian researcher into Alzheimer's disease died on September 10th, aged 73*



HIS FATHER'S tears persuaded him. Francisco Lopera, then in his first year of medical training, had gone with him to see his grandmother in Medellín. His father had not wanted him to study medicine; he thought he was not intelligent enough. But that was not why he wept. He wept because the old lady, in the last stages of Alzheimer's, stared blankly at them, not knowing who they were. Then and there, Francisco made a vow: when he became a doctor, that was not going to happen to any granny.

Every ounce of his energy went into that promise. But it was hard to keep. Alzheimer's was incurable. By his count, more than 800 drugs had been tried on it, to no effect. It was a sly disease, asymptomatic for as much as 30 years, but all that time sticky plaques of amyloid protein, rubbish as he thought of it, were being laid down in the brain, and neurons were dying. Silently, the patient—his grandmother—was being destroyed. First she forgot small things, then how to cook, then who she was. When dementia set in, she would not even know she had it. But her family would be exhausted and devastated.

In the northern Colombian province of Antioquia, in the poor mountain villages where he had grown up, people had many theories about what caused *la bobera*, "the foolishness". He had heard them all. You could catch it by having sex with a mad woman, or touching the bark of a rare tree. Or a priest had left a curse, after he found people stealing from the collection box. The prevalence of the disease in Antioquia was certainly strange. But that was a mystery he solved himself.

In 1982 a farm labourer came to the hospital. At 47 he had abandoned work, and his speech was a crazed laugh. Nor was he alone. His father, his grandfather and several aunts had had Alzheimer's too, not in old age but in their 40s and 50s. This was early-onset, and it was hereditary. At that point, Dr Lopera saw his life's work mapped out: he would go, with a team of helpers, into the villages, not only to treat the patients but to forage through wills and parish records, tracing the disease both back to the source and forward, to those who were likely to suffer it in future.

This meant weeks and years of travelling on horseback, or in a complaining car, up steep, rocky roads in a country that was

locked in a civil war between right-wing paramilitaries and Marxist FARC rebels. He had been kidnapped by the FARC a few years before, when he was working in the jungly Darién Gap on bat-bites and snake-bites, and was forced to treat a shot guerrilla; later, a nurse working for him was abducted. The more serious effect of the war, for him, was that well-funded medical-research teams in the United States did not want to go to Colombia. Until the 2000s, those essential collaborations were mostly at arm's length.

Inside the village houses he would comfort the families and engage with the victims. Some were already almost gone, vanishing into themselves and staring at infinity. He could not look away, though. He had to help. Many other patients were lively, combative, denying there was anything wrong. But if he asked them to hop, draw an object, or remember simple sentences, they no longer could. Younger family members lived in dread of going the same way in middle age. His hand-drawn genealogical chart, going back to one Basque family in the 18th century, grew to contain 6,000 family members, a fifth of them carriers. It took 40 years of work by 100 people, most of them members of the University of Antioquia's Neurosciences Group, which he had founded and led. The whole of Antioquia was an Alzheimer's laboratory.

His journeys to villages also included asking for the brains of patients who had died. This was difficult. Generally the families wanted to help him, because he was kind, reassuring, wise, and a great dancer. They eagerly took part in a decade-long trial, from 2012, of a new drug, crenezumab, which he hoped (sadly, mistakenly) might delay the onset. Donating brains was harder. Sometimes he had to go to the funeral and join in the prayers to persuade them. But on the evidence of those brains, more than 300 stored in a special bank on campus, he and his colleagues found that hereditary Alzheimer's was linked to a single mutation of the presenilin 1 gene in chromosome 14. Now what he needed to find was another genetic mutation that would hamper the first. If the cause lay in Nature, so would the cure.

This meant investigating the rare individuals who carried the mutation for early-onset Alzheimer's, but had avoided it until old age. His work there paved the way to identifying two candidate genes, AP0E3 Christchurch and Reelin-COLBOS, which seemed to have protected the neurons. If a molecule could now be found to inoculate younger adults, it could delay the disease for decades: a cure, or almost so.

For that was still elusive. Prevention was his best hope. Besides, hereditary Alzheimer's was a tiny fraction of all cases. In the rest, the cause was unknown. However, his genetic discoveries might also prove useful there. The human brain continued to hold mysteries, and he still burned to solve them. As a boy he had wanted to be an astronomer, imagining all the greatest secrets lay out in the cosmos. Now he knew they were inside human heads.

So was terror. Could anything be done, he was asked, to stop the fear of Alzheimer's that now possessed people as they aged? Yes, he said. First, they should not see it as a tragedy. It was a serious illness, certainly, but one largely without pain to the patient. It should not be over-dramatised, but if possible treated kindly within the family in an atmosphere of happiness. It should be seen as a new form of life. ■