The Economist

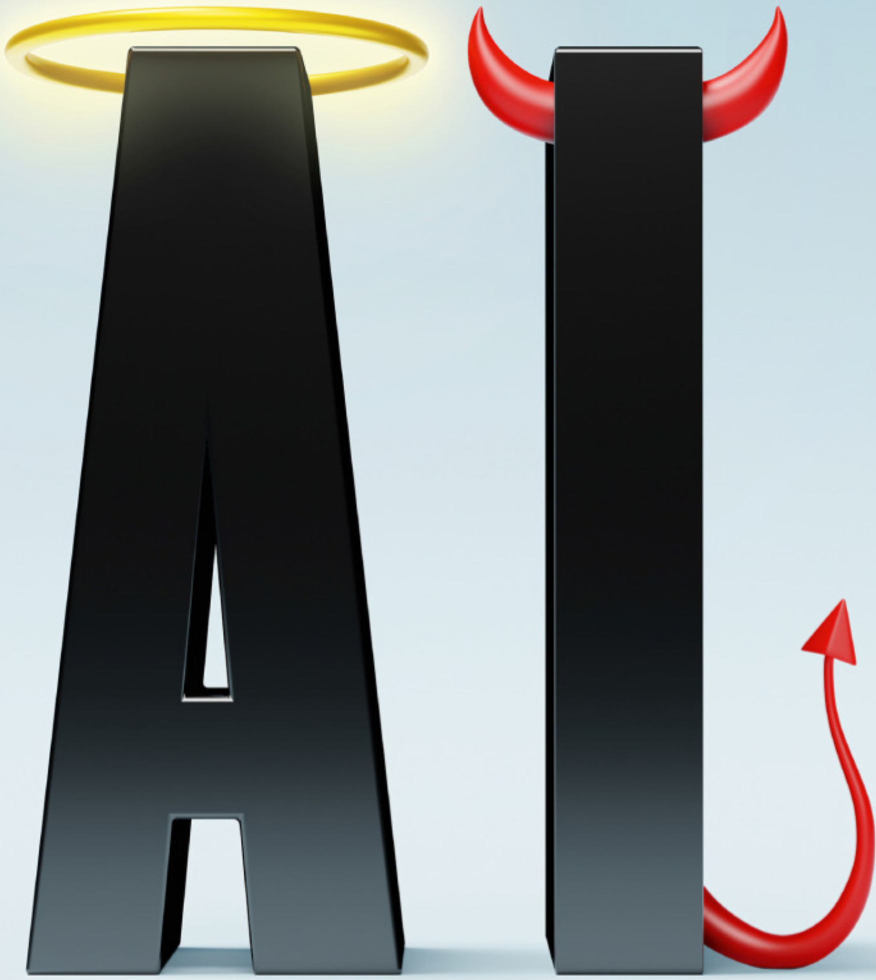
Ukraine's game plan

Why civil wars are lasting longer

The myth of English identity

A special report on the car industry

APRIL 22ND–28TH 2023



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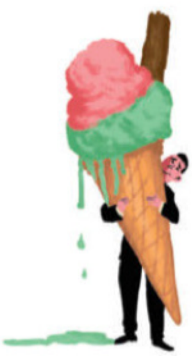

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to take part in *"a severe contest between intelligence, which presses forward, and an unworthy, timid ignorance obstructing our progress."*

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War broke out in **Sudan** between the national army, led by General Abdel Fattah al-Burhan, Sudan's de facto leader, who seized power in a coup in 2021, and the Rapid Support Forces, a paramilitary commanded by Muhammad Hamdan Dagalo. Some 300 people, most of them civilians, were killed and at least 2,600 injured in the first few days of fighting, which has seen tanks and air strikes in Khartoum, the capital. Hospitals and aid agencies have been looted and diplomats attacked.

Burkina Faso's military government declared a general mobilisation (claiming the power to requisition people, goods and services and to impose a state of emergency) to fight jihadists who control around half the country. Western military sources worry that jihadists moving south may be able to encircle Ouagadougou, the capital, having already cut off road links in the north.

Rachid Ghannouchi, the long-serving leader of Ennahda, **Tunisia's** main Islamist party, was arrested, according to the party. This marks a drastic step against the opposition by Kais Saied, the increasingly repressive president.

In a sign that the two sides in **Yemen's** civil war may be getting closer to a peace deal, almost 900 people were released in a prisoner swap between the Houthis, a Shia rebel group that controls large parts of the country, and the Saudi-led coalition that has been fighting them since 2015. Meanwhile at least 80 people died in a crush as aid was being distributed in Sana'a, the capital.

Sergei Lavrov, **Russia's** foreign minister, visited **Brazil** and **Venezuela**. Luiz Inácio Lula da Silva, Brazil's president, met Mr Lavrov, after stirring up trouble by suggesting that America was prolonging the fighting in Ukraine by sending weapons to Kiev. Lula clarified later that he condemned the invasion of Ukraine, but American officials remained unimpressed. Mr Lavrov is also visiting Cuba and Nicaragua.

Mexico's Supreme Court annulled a contentious reform backed by Andrés Manuel López Obrador, the president, which would have put the National Guard, ostensibly a civilian police force, under the control of the armed forces. Mr López Obrador meanwhile accused the Pentagon of spying on Mexico, and promised to safeguard classified information about the army.

A Russian court sentenced a prominent critic of the Putin regime to 25 years in prison for criticising the war in Ukraine, which the prosecution considered to be tantamount to treason. **Vladimir Kara-Murza**, who holds dual British-Russian citizenship, told the court he stood by "every word" and did not want to be acquitted. The judge took just minutes to rule on the case.

A separate Russian court upheld the detention of **Evan Gershkovich**, a journalist with the *Wall Street Journal*, on allegations of spying and refused to grant him bail. The American government again called for his release.

Poland, Hungary and Slovakia banned some **Ukrainian food imports**. The governments in all three countries are under pressure from farmers, who claim that cheaper Ukrainian surpluses undercut their bottom line. Officials in the EU said the bans were possibly illegal and counter-productive, undermining Europe's support for Ukraine. One diplomat accused the Polish government of engaging in "gesture politics". The government said it would allow Ukrainian grain to transit through Poland.

Carry on, Emmanuel

Emmanuel Macron tried to regain control of the political agenda in **France** after months of sometimes violent protests against his pension reforms. He promised new measures to improve working conditions, among other things, by July 14th, Bastille Day. The French president said now was a time for "unity". His comments came shortly after he signed the reform, which increases the state retirement age from 62 to 64, into law.

The disarray within the **Scottish National Party** following the abrupt departure of Nicola Sturgeon as leader continued with the arrest of the party's treasurer, who then stepped back from the role. The police are investigating claims that donations for a second independence referendum were misused. The scrutiny is an embarrassment for the SNP as it attempts a reset under its new leader, Humza Yousaf. He has said he only recently learnt that the party has been without auditors since October.

A 24-year-old man threw a smoke bomb at **Japan's** prime minister, Kishida Fumio. The bomb-thrower was reportedly aggrieved at having been barred from running for an election. The incident rekindled fears of attacks on politicians, nine months after the assassination of Abe Shinzo, a former prime minister.

Separatist rebels in the **Indonesian** province of Papua attacked government troops searching for a pilot from New Zealand whom the rebels are holding hostage. Officials said one soldier was killed; the rebels claimed they shot dead nine troops.

The UN's annual population report listed India as having a bigger **population** than China for the first time. India's population will reach 1.429bn by the middle of this year against China's 1.426bn.

India's Supreme Court heard arguments in the biggest test yet of the country's ban on gay marriage. The court is focusing on secular laws that regulate marriage. The government wants to keep the ban, arguing that only the legislature can change the law.

The FBI arrested two men accused of working as **Chinese agents** and operating an "illegal overseas police station" in New York that liaised with China's national police to intimidate Chinese dissidents in the United States. The authorities in New York also charged 34 police officers in China with harassing Chinese dissidents in America via social media.

Ron DeSantis, Florida's governor and putative Republican presidential contender, hurriedly signed a bill into law that bans abortion in the state after the sixth week of pregnancy. Mr DeSantis is veering further to the right to appeal to the supporters of Donald Trump he must win over in the primaries.

Never on a Sunday

The Supreme Court heard arguments in a case brought by a **religious postal worker** who says he should not be forced to work on the Sabbath. Gerald Groff worked for the postal service, which wanted him to deliver Amazon packages on Sundays. He claims he was discriminated against on religious grounds. A ruling in his favour may force companies to honour employees' religious observances.

Elon Musk said he would launch a new **artificial-intelligence** platform called TruthGPT as a rival to ChatGPT and other generative-AI bots, somewhat contradicting his recent call for a moratorium on developing such technology. But Mr Musk reiterated his concerns about AI's potential to cause harm, even claiming it could cause the destruction of civilisation. It has emerged that Mr Musk has created a new company, X.AI, incorporated in Nevada.

The X files

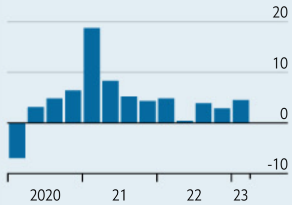
Mr Musk's fascination with the letter X extends to **Twitter**, which has now changed its official company name to X Corp and moved its incorporation location from Delaware to Nevada. Mr Musk has a long-stated goal of creating X, "an everything app".

Sundar Pichai, **Google's** boss, warned that the world was not ready for the rapid changes that new AI will bring, saying it would "impact every product across every company" (though that isn't stopping Google from racing ahead to integrate generative AI into its advertising, according to a report). Mr Pichai said the problem of **fake imagery** would become much worse. In one recent example an image of Pope Francis in a white puffer coat went viral on social media before it was revealed to have been generated by AI.

Fox News reached a settlement with **Dominion Voting Systems** over the broadcaster's fake claims that Dominion's machines helped "steal" the election in 2020 from Donald Trump. The $787.5m settlement is the biggest ever in a media defamation case. The deal was reached just ahead of a trial that would have called Rupert Murdoch, who controls Fox, as a witness. In pre-trial hearings the judge had dismissed Fox's claim that it was merely reporting allegations, and said the jury's task would be to determine if it had acted maliciously.

Britain's annual rate of **inflation** dipped in March to 10.1%, still stubbornly high and now twice America's rate of 5%. Food prices rose the most in 45 years. Rishi Sunak, the prime minister, promises to cut inflation by half this year.

China's GDP
% change on a year earlier



Source: Haver Analytics

China's economy grew by 4.5% in the first quarter, year on year, beating the expectations of most economists. The government lifted its zero-covid restrictions in December, reopening the country to pent-up demand. The statistics bureau warned, however, that the recovery is not yet solid.

The collapse of Silicon Valley Bank in March didn't harm business at most of **America's big banks** in the first quarter. Net profit was up by around 50% at JPMorgan Chase, year on year, 32% at Wells Fargo, 15% at Bank of America and 7% at Citigroup. Profit plummeted by 18% at Goldman Sachs, however, because of poor revenue from fixed income, currencies and commodities trading. Profit was also down at Morgan Stanley, by 19%.

Credit Suisse can't get a break. After collapsing in March, the bank faced claims this week from American senators that it had hampered an investigation into the "historical servicing of Nazi" accounts, which in some cases continued until 2020. The claims relate to an investigation by the Simon Wiesenthal Centre. Credit Suisse released the results of an independent inquiry that refutes the allegations.

HSBC's biggest shareholder increased pressure on the bank to hive off its Asian business. Ping An, a giant Chinese insurer, which owns around 8% of HSBC, presented its plan in public for the first time, and said that HSBC was "exaggerating" the risks of the proposal.

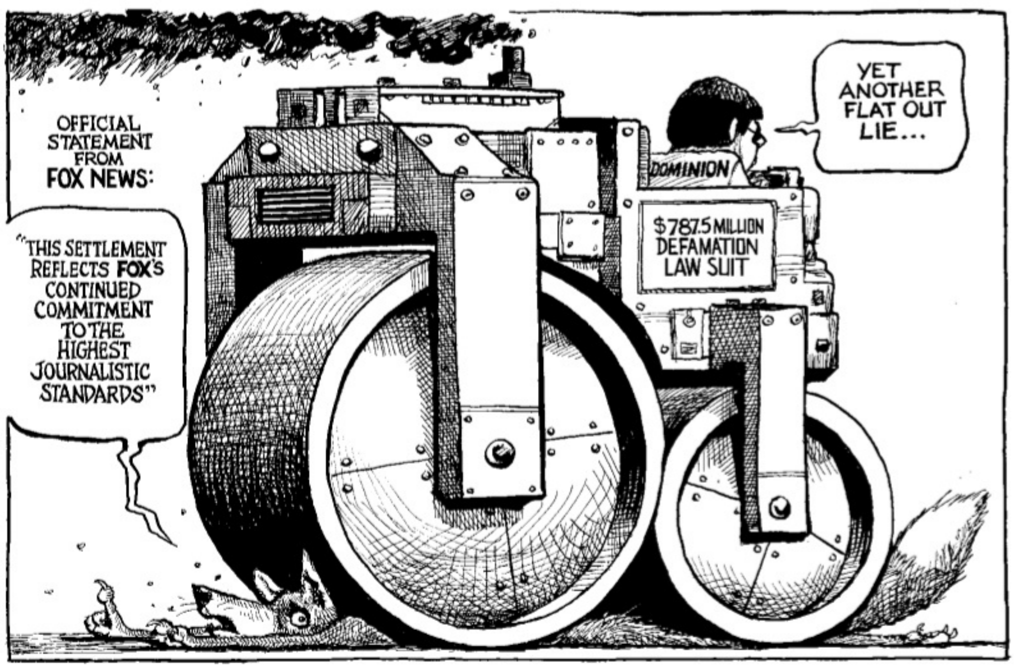
A $6.9bn charge related to up to 70,000 claims that its talcum powder causes cancer drove **Johnson & Johnson** to a small quarterly loss. The proposed settlement totals $8.9bn, making it one of the largest-ever liability payouts at an American company.

Tesla's aggressive price cuts of its cars drove a 24% rise in revenue in the latest quarter, year on year. But the lower prices hit net profit, which fell, also by 24%.

Film adaptation

Netflix netted another 1.75m subscribers in the first quarter, taking its global users to 232.5m. That was a 4.9% increase, year on year, better than in the previous two quarters but a far cry from the 20%-plus it racked up during the pandemic. The streaming giant is delaying a crackdown on sharing passwords, after pilot schemes caused people to cancel their subscriptions. The company also said it would end its DVD-mailing service, which started off the business in 1997, in September.

Apple opened its first stores in India, in Mumbai and Delhi. Tim Cook, Apple's boss, attended the grand openings. He also met Narendra Modi, the prime minister; Apple is expanding manufacturing in the country. Costly iPhones are out of reach for most Indians and are a small share of the market. Still, Apple is tapping into steady growth in the premium-phone sector, as India's middle class gets richer.



How to worry wisely about AI

Rapid progress in AI is arousing fear as well as excitement. How concerned should you be?

"Should we automate away all the jobs, including the fulfilling ones? Should we develop non-human minds that might eventually outnumber, outsmart...and replace us? Should we risk loss of control of our civilisation?" These questions were asked last month in an open letter from the Future of Life Institute, an NGO. It called for a six-month "pause" in the creation of the most advanced forms of artificial intelligence (AI), and was signed by tech luminaries including Elon Musk. It is the most prominent example yet of how rapid progress in AI has sparked anxiety about the potential dangers of the technology.

In particular, new "large language models" (LLMs)—the sort that powers ChatGPT, a chatbot made by OpenAI, a startup—have surprised even their creators with their unexpected talents as they have been scaled up. Such "emergent" abilities include everything from solving logic puzzles and writing computer code to identifying films from plot summaries written in emoji.

These models stand to transform humans' relationship with computers, knowledge and even with themselves (see Essay). Proponents of AI argue for its potential to solve big problems by developing new drugs, designing new materials to help fight climate change, or untangling the complexities of fusion power. To others, the fact that AIs' capabilities are already outrunning their creators' understanding risks bringing to life the science-fiction disaster scenario of the machine that outsmarts its inventor, often with fatal consequences.

This bubbling mixture of excitement and fear makes it hard to weigh the opportunities and risks. But lessons can be learned from other industries, and from past technological shifts. So what has changed to make AI so much more capable? How scared should you be? And what should governments do?

In a special Science section, we explore the workings of LLMs and their future direction. The first wave of modern AI systems, which emerged a decade ago, relied on carefully labelled training data. Once exposed to a sufficient number of labelled examples, they could learn to do things like recognise images or transcribe speech. Today's systems do not require pre-labelling, and as a result can be trained using much larger data sets taken from online sources. LLMs can, in effect, be trained on the entire internet—which explains their capabilities, good and bad.

Those capabilities became apparent to a wider public when ChatGPT was released in November. A million people had used it within a week; 100m within two months. It was soon being used to generate school essays and wedding speeches. ChatGPT's popularity, and Microsoft's move to incorporate it into Bing, its search engine, prompted rival firms to release chatbots too.

Some of these produced strange results. Bing Chat suggested to a journalist that he should leave his wife. ChatGPT has been accused of defamation by a law professor. LLMs produce answers that have the patina of truth, but often contain factual errors or outright fabrications. Even so, Microsoft, Google and other tech firms have begun to incorporate LLMs into their products, to help users create documents and perform other tasks.

The recent acceleration in both the power and visibility of AI systems, and growing awareness of their abilities and defects, have raised fears that the technology is now advancing so quickly that it cannot be safely controlled. Hence the call for a pause, and growing concern that AI could threaten not just jobs, factual accuracy and reputations, but the existence of humanity itself.

Extinction? Rebellion?

The fear that machines will steal jobs is centuries old. But so far new technology has created new jobs to replace the ones it has destroyed. Machines tend to be able to perform some tasks, not others, increasing demand for people who can do the jobs machines cannot. Could this time be different? A sudden dislocation in job markets cannot be ruled out, even if so far there is no sign of one (see Schumpeter). Previous technology has tended to replace unskilled tasks, but LLMs can perform some white-collar tasks, such as summarising documents and writing code.

The degree of existential risk posed by AI has been hotly debated. Experts are divided. In a survey of AI researchers carried out in 2022, 48% thought there was at least a 10% chance that AI's impact would be "extremely bad (eg, human extinction)". But 25% said the risk was 0%; the median researcher put the risk at 5%. The nightmare is that an advanced AI causes harm on a massive scale, by making poisons or viruses, or persuading humans to commit terrorist acts. It need not have evil intent: researchers worry that future AIs may have goals that do not align with those of their human creators.

Such scenarios should not be dismissed. But all involve a huge amount of guesswork, and a leap from today's technology. And many imagine that future AIs will have unfettered access to energy, money and computing power, which are real constraints today, and could be denied to a rogue AI in future. Moreover, experts tend to overstate the risks in their area, compared with other forecasters. (And Mr Musk, who is launching his own AI startup, has an interest in his rivals downing tools.) Imposing heavy regulation, or indeed a pause, today seems an over-reaction. A pause would also be unenforceable.

Regulation is needed, but for more mundane reasons than saving humanity. Existing AI systems raise real concerns about bias, privacy and intellectual-property rights. As the technology advances, other problems could become apparent. The key is to balance the promise of AI with an assessment of the risks, and to be ready to adapt.

So far governments are taking three different approaches. At one end of the spectrum is Britain, which has proposed a "light-touch" approach with no new rules or regulatory bodies, but applies existing regulations to AI systems. The aim is to boost investment and turn Britain into an "AI superpower". America has taken a similar approach, though the Biden administration is now seeking public views on what a rulebook might look like.

The EU is taking a tougher line. Its proposed law categorises different uses of AI by the degree of risk, and requires increasingly stringent monitoring and disclosure as the degree of risk rises from, say, music-recommendation to self-driving cars. ▸▸

Some uses of AI are banned altogether, such as subliminal advertising and remote biometrics. Firms that break the rules will be fined. For some critics, these regulations are too stifling.

But others say an even sterner approach is needed. Governments should treat AI like medicines, with a dedicated regulator, strict testing and pre-approval before public release. China is doing some of this, requiring firms to register AI products and undergo a security review before release. But safety may be less of a motive than politics: a key requirement is that AIs' output reflects the "core value of socialism" (see China section).

What to do? The light-touch approach is unlikely to be enough. If AI is as important a technology as cars, planes and medicines—and there is good reason to believe that it is—then, like them, it will need new rules. Accordingly, the EU's model is closest to the mark, though its classification system is overwrought and a principles-based approach would be more flexible. Compelling disclosure about how systems are trained, how they operate and how they are monitored, and requiring inspections, would be comparable to similar rules in other industries.

This could allow for tighter regulation over time, if needed. A dedicated regulator may then seem appropriate; so too may intergovernmental treaties, similar to those that govern nuclear weapons, should plausible evidence emerge of existential risk. To monitor that risk, governments could form a body modelled on CERN, a particle-physics laboratory, that could also study AI safety and ethics—areas where companies lack incentives to invest as much as society might wish.

This powerful technology poses new risks, but also offers extraordinary opportunities. Balancing the two means treading carefully. A measured approach today can provide the foundations on which further rules can be added in future. But the time to start building those foundations is now. ■

Ukraine's counteroffensive

Waiting for the order

The next few weeks may shape Ukraine's future—and Europe's

Tens of thousands of Ukrainian soldiers are readying for action; checking their kit, writing what might be their last letters. We do not know when or where, but soon Ukraine will launch its long-planned counteroffensive against the invaders who squat, illegally and murderously, in almost a fifth of the country. The fate of Ukraine and the shape of the West's alliances may depend on what happens in the next few weeks.

Ukraine may never have a better chance than this. The occupiers are weakened; during the past two months, Russia has marched into a killing zone around Bakhmut, in the Donbas region, and it has so far failed to replace the tens of thousands of men it has lost there. Vladimir Putin has passed new laws that will make it easier to draft more cannon fodder, but it will be months before his unlucky new recruits are available for action.

Ukraine has received a bonanza of NATO-standard weapons (see Europe section): tanks, precision missile systems, powerful artillery; and millions of rounds of ammunition. Fighter planes are on the way, though only from Poland and Slovakia. America and the main European powers are still holding back, as they did for too long over supplying tanks.

What should Ukraine do with the advantage it currently enjoys? It should try to break, or at least disrupt, the land bridge that connects Crimea to Russia, via Donbas. Creating this bridge is the only achievement Mr Putin can boast of for all the Russian blood and treasure he has poured into his war; but it is a considerable one. Without it, Crimea, a Ukrainian peninsula which he seized and annexed in 2014, is vulnerable, reachable only by sea or via the Kerch road-and-rail bridge, which someone (presumably Ukraine) partly blew up last October.

The battlefield has been remarkably static for the past five months, since Ukraine drove the Russians back across the Dnieper in Kherson province in November. This is bad news, because it suggests that the conflict is in danger of freezing along a new "contact line" that would leave Ukraine challenged along most of its south and east, and shorn of most of its sea access; a big problem for a country that depends on exporting commodities. Far better for Ukraine to go into any future talks holding more of an advantage, and with Russia facing a genuine challenge to its occupation of Crimea. That might convince Mr Putin that if he does not settle, he could lose what he has gained.

The risks are high, though. Ukraine has a limited supply of the surface-to-air missiles needed to deter Russian bombers. Russia is well dug in along most of the front line, with multiple layers of trenches and dragons-teeth anti-tank obstacles. When attacking, Ukraine will need its troops to outnumber the defenders, and it can only muster such numbers in limited areas. Even if it punches through Russia's defences, it will need to exploit such breakthroughs carefully, or risk its troops being encircled.

So Ukraine, and its Western backers, should prepare for the possibility that the counteroffensive will yield only marginal gains, or worse. And even if it does break the land bridge, there is no guarantee that Mr Putin will come to the negotiating table. He no doubt hopes that if he drags the war on long enough, Western support for Ukraine will start to wobble.

Ukraine's backers should not assume that the coming battle will be the last one. It is almost certainly not. Once the dust settles, Ukraine will still need to secure whatever gains it has made, and stiffen its defences to make future Russian land grabs more difficult. The fact that Russia's renewed offensive around Bakhmut has gone so poorly does not mean that all such attacks will be bungled. America and Europe must make clear that they will support further military pushes by Ukraine.

And to deter Mr Putin, they should also make plain that they will back Ukraine for many years to come. The sooner the West starts spelling out the details of the security guarantees it will offer to Ukraine, the better. America and Britain (as well as Russia) underwrote Ukraine's territorial integrity in 1994, and then did nothing as Mr Putin brazenly violated it in 2014. The next guarantees must be genuine. ■

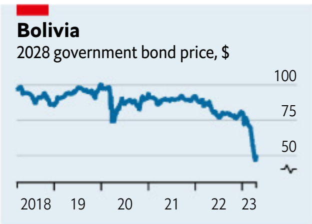
Financial bedlam in Bolivia

On the brink

The country's populist economic model is bust. It should serve as a warning to Latin America

For several weeks extraordinary scenes have been taking place in Bolivia. As we report (see Americas section), last month the central bank started selling dollars directly to the public after it appeared that exchange houses had run out of greenbacks. The queues to buy them stretched along the streets of La Paz, the capital. The central bank has stopped publishing data on its foreign-currency reserves, suggesting that it has perilously little hard cash left. The price of government bonds has collapsed as investors flee: a bond due in 2028 is now trading at just 48 cents on the dollar.

Bolivia's nightmare reflects several short-term problems, such as a rise in interest rates around the world and higher fuel prices because of the war in Ukraine. These have made it more expensive to borrow and increased the cost of imports. But the real cause of its predicament is a reckless economic model that has been in place ever since left-wing populists took control nearly two decades ago. When Evo Morales, a former coca farmer, was sworn in as president in 2006 he declared an end to "the colonial and neo-liberal era" and hung behind his desk a portrait of Che Guevara, a violent Marxist revolutionary, made out of coca leaves. Today the full cost of economic populism is becoming clear, as are three lessons for the many other Latin American countries tempted by it.



The first lesson is an old one: don't count on commodity booms. Mr Morales hit the jackpot when he arrived in office, as natural-gas prices soared, providing a windfall for the country, which produces 0.4% of global gas even today. Exports rose. Bolivia was able to accumulate the largest foreign reserves in its history: they jumped from the equivalent of 12% of GDP in 2003 to 52% by 2012. Mr Morales and Luis Arce, who is now president but who was the finance minister, used the proceeds to spend profligately, including on fuel subsidies, which were worth almost 4% of GDP in 2022. Unfortunately gas prices and production have been falling and the cash gusher is running dry.

The second lesson is to beware of currency pegs. In 2008 a fixed exchange rate was introduced, which since 2011 has been set at 6.96 bolivianos per dollar. For a while this kept inflation low and provided an anchor for an economy with a history of turbulence. But over time the peg has proved exorbitantly costly. Instead of providing stability it has bottled up problems.

Finally, hostility towards private capital eventually comes back to bite you. Bolivia went on a nationalisation spree that included the gasfields and electricity grid. Its government has treated business with contempt. Unsurprisingly, investment has shrivelled. The flow of long-term investment by multinational companies has dropped from a peak of 12% of GDP in 1999 to an average of just 0.1% in the past five years. Total investment is likely to be just 14% of GDP this year, the lowest rate in South America. There are no big listed companies.

Mr Arce's talk of attracting entrepreneurs is too little, too late. He has only bad options left. His government could impose austerity, try to borrow even more from multilateral lenders, default or sell some of its ample lithium deposits to China, whose government-backed firms are relaxed about flaky property rights but will demand fire-sale prices.

Few other Latin American countries have currency pegs. But many depend on commodities of one kind or another. And the region is experiencing a new "pink tide", with left-leaning governments in power, most of which are debating just how much to indulge their instinct for heavy state intervention. The message from Bolivia, a country that is literally running out of money, is that there are limits. ■

Sudan and the curse of civil war

Climate, crime and the conflict trap

Wars are growing longer, reversing a long global trend towards greater peace

In Sudan the laws of war carry no more weight than the rules of Quidditch. As two thuggish generals fight for power, civilians have been murdered, diplomats attacked and patients evicted from a hospital so that soldiers can use it as a fortress. The battle that began on April 15th could be the start of a full-scale civil war (see Middle East & Africa section). But another way of looking at it is even gloomier. Sudan has endured a kaleidoscope of civil wars for most of the time since independence in 1956. The mayhem this week illustrates an under-reported global calamity: the increasing duration of war.

The average ongoing conflict in the mid-1980s had been blazing for about 13 years; by 2021 that figure had risen to 20 (see International section). Since the Arab spring in 2011 a new wave of wars has begun and battle deaths have risen, bucking a long trend towards greater global peace. The total death toll is hard to measure. Most victims die not in battle itself but because war makes them hungrier and less able to resist disease. By one estimate 600,000 people perished during Ethiopia's recent crushing of the breakaway region of Tigray—more than in Ukraine—partly because the government blocked aid to the starving. Globally, the number of people forced to flee from their homes has doubled in a decade, to roughly 100m. And even as the world grows richer, conflict makes unlucky countries swiftly poorer.

One reason why wars are lasting longer is that they are growing more complex. Most are civil wars in poor places. Many have multiple belligerent groups, who must all be satisfied if peace is ▸▸

to stick. Between 2001 and 2010 roughly five countries a year suffered two or more simultaneous conflicts; now 15 do. (Pacifying Myanmar or Congo, with their dozens of armed factions, would be hellishly hard.) And since 1991 there has been a 12-fold increase in the proportion of civil wars involving foreign forces. Foreign meddlers bear fewer costs—their own cities are not flattened—so they have less incentive to make peace.

Another reason is criminality. Nearly all civil wars rage in corrupt countries where power is a quick route to wealth, spurring the unscrupulous to kill for it. (One of Sudan's feuding warlords has reportedly made a fortune peddling gold and mercenaries; the other leads an army with a business empire.) Meanwhile, the globalisation of criminal networks makes it easier for rebel groups to deal drugs or launder looted diamonds.

The most worrying factor, however, is climate change. It does not directly cause war, but it makes it more likely. When farmers are displaced by droughts or floods, they often move onto lands that traditionally belong to other ethnic groups. In just one region of Mali, an NGO counted 70 conflicts, mostly over land and grazing rights. In the Sahel, an arid vastness below the Sahara desert, climate change has disrupted livelihoods so badly that jihadist groups find it easy to recruit. They promise divine justice—and stress that this means getting your pasture or farmland back. Civil wars are already concentrated in hot, poor countries; as the climate grows harsher, the belt of bloodshed around the equator will surely grow wider.

Compounding all these ills is a new atmosphere of impunity. If Russia can behead prisoners and China can commit crimes against humanity in Xinjiang, smaller bullies may conclude that international law can safely be ignored. Certainly, many are flouting it, from the bloodstained scrub of Burkina Faso to the torture dungeons of Syria. America is distracted by superpower rivalry, and the UN is hogtied by vetoes from Moscow and Beijing. The vast resources rightly deployed to defend Ukraine will never be deployed to unscramble Sudan, even if outsiders could devise a plausible way to do so.

Peacemaking is hard, but not impossible. In the short term, it is often wise to start unofficial talks long before the belligerents are ready to talk openly. (It worked in South Africa and Northern Ireland.) Including more women and civil-society groups in a peace process seems to make settlements more durable, and videoconferencing means they no longer have to make hazardous journeys to be in the room. Including awful people is often necessary, too, otherwise they may go back to fighting. There is a painful tension between justice and peace. The former demands that war criminals be jailed; the latter may require giving them cabinet posts. Finally, because all conflicts are different and no peacemaking template works everywhere, it is helpful to experiment. Donors hoping to rebuild war-ravaged Liberia backed a variety of projects. Training the police to be less predatory turned out to make locals less likely to rebel.

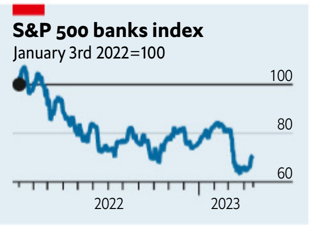
In the long run, the most important ways to promote peace are to build better institutions in fragile states, and to curb (and help people adapt to) climate change. Those tasks are vast, and could take decades. But the alternative is a world where life is short in poor, hot countries—and war is long. ■

Banks

The prize of size

Why America will soon see a wave of bank mergers

THE TROUBLE facing many of America's banks is coming into sharp relief. After the failures of Silicon Valley Bank (SVB) and Signature Bank in March, behemoths such as JPMorgan Chase and Bank of America attracted deposits despite paying minimal interest, according to earnings reports released since April 14th. Many small and medium-sized banks, by contrast, face increasing competition for customers and rising funding costs. On April 18th Western Alliance, a lender with $71bn of assets, reported that it had lost 11% of its deposits this year. To tempt deposits back, banks will have to pay more for them; in the meantime many have turned to temporary loans, including from the Federal Reserve, that incur today's high rates of interest. Yet lots of banks' assets are low-yielding and cannot be sold without crystallising losses. A big profits squeeze is coming (see Finance & economics section).



More banks were due to report earnings after we published this leader. But the market has already made a judgment: America's banks are worth only about their combined book value, having traded at nearly a 40% premium at the start of the year. The likely result of their low valuations, combined with a landscape in which size matters, is a tried-and-tested response to banking crises over the past four decades: consolidation.

America has 4,700 banks and savings institutions, or one for every 71,000 residents. To observers in the EU, which has only one bank for every 85,000 people, that seems excessive. Yet it is a historical low: in 1984, when comparable data begin and the population was much smaller, there were nearly four times as many institutions. Since then the industry has seen almost continuous consolidation. The biggest wave of mergers came after a long-running crisis among savings and loan associations (S&Ls), lenders specialising in mortgages, reached its apex in the late 1980s. It left many carcasses over which stronger banks could pick. Rule changes, such as the lifting of restrictions on banking across state lines, also encouraged banks to grow in size.

There are several parallels between then and now. Many S&Ls went bust because their funding costs rose as interest rates surged, while their mortgage-loan books brought in low, fixed rates of interest. At one point nearly two-thirds of S&Ls would have been insolvent had their assets been marked to market. Although the balance-sheet problems of today's banks are less severe, they are similar in nature. At the end of 2022 more than 400 banks with nearly $4trn in combined assets had unrealised losses on their securities portfolios worth at least half of their core equity capital. Include their fixed-rate loan books, and possible losses to come on lending against commercial property, and the hole would be greater still.

At the same time, smaller banks are at risk of losing the regulatory advantages they now enjoy. When calculating their regulatory capital, banks with less than $700bn in assets typically do not have to mark to market even the securities that they class as "available for sale" and which are meant to be a source of quick cash in an emergency. Those smaller than $250bn are exempted from the strictest liquidity rules, stress tests and failure planning. This light-touch regulatory regime is now being reviewed by domestic and international regulators. The Basel Committee on Banking Supervision, which writes the global rulebook, is studying the lessons to be learned from the failure of SVB, whose depositors were bailed out even though it was too small and domestically focused to be subject to the strictest rules. In Washington, an easing of the rules for midsized banks by Congress and the Fed in 2018 and 2019 is under fresh scrutiny.

The most important changes to the market's structure are likely to be among banks which are close to significant regulatory thresholds. There are 20 banks which are between $100bn and $250bn in size. If the penalty for crossing the $250bn threshold is reduced, many may find it advantageous to merge. Doing so would allow them to spread the growing costs of complying with regulation over a bigger business, while making it even more likely that their depositors would be bailed out in a crisis. Regulators would probably look favourably on tie-ups that swallowed up zombie banks which might otherwise "gamble for resurrection" by taking big risks—a tactic that made the S&L crisis in the 1980s much worse. If so, then the latest crisis will provide the latest impetus for banks to get bigger. ■

Carmaking

Great wheels from China

Shutting out Chinese carmakers would be bad for drivers and the planet

If fresh evidence were needed of the importance of China to the global car industry, the Shanghai motor show, which opened on April 18th, provides it. The world's other big jamborees have been permanently cancelled or downgraded, but China's showcase has attracted 1,000 exhibitors from many countries with 100 new models on show.

Only a few years ago Chinese cars were poorly designed and shoddily put together. Today they are mostly as good as foreign ones in both respects, and surpass them in the software-driven digital experience that will define car brands in the future. Yet for the world as a whole, the rise of Chinese cars will be more significant still. To curb global warming, it is essential to replace carbon-spewing petrol-powered vehicles with cleaner battery-powered ones. And China is both the world's biggest market for, and maker of, electric vehicles (EVs).

Vehicles powered by internal combustion have been a great success story over the past century, bringing mobility to the masses and fat profits to shareholders. A handful of giant carmakers have made steady improvements to their products and assembled ever more complex supply chains spread across the globe. This has brought greater comfort and safety to passengers, as well as low prices. Competition from Japanese carmakers (which roared into the fast lane in the 1970s) and South Korean firms (which did so in the 1990s) spurred innovation worldwide.

Today the industry, with nearly $3trn in annual global revenues, is experiencing its most radical upheaval yet (see Special report). Established carmakers are scrambling to electrify, improve their software and prepare for autonomous driving.

The disruption is in part a result of Tesla's success, both as a maker of EVs and as a firm that puts technology at the heart of its business. But it is also caused by greater competition in China, where local firms, supported by state subsidies, are winning market share from Western rivals. BYD and Changan, the country's two biggest homegrown firms, now have a domestic market share of 18%, and sell around 4m cars a year. China's carmakers are especially innovative when it comes to infotainment and the seamless integration of smartphones. A healthy head start and huge scale, meanwhile, have helped BYD become a leader in EVs at the cheap end of the market. All told, the competition is leaving Japanese firms, once leaders, in the dust (see Asia section).

The world's drivers stand to gain from cheaper and greener cars. But can the race for market dominance continue? China's emergence as an EV superpower is taking place just as the geopolitical climate worsens, and protectionism is finding greater favour in the West.

In America, where few Chinese cars roam the roads, tariffs on them are already forbidding. In addition, President Joe Biden's Inflation Reduction Act (IRA) uses incentives and subsidies to try to turn North America into an EV powerhouse, encouraging locals to buy domestically made cars and components. Fears also swirl that sensor-packed Chinese cars might guzzle sensitive data. (China has barred Tesla cars from military bases and cities holding party meetings, presumably out of the same concerns.)

In Europe, where Chinese carmakers are gaining a foothold and planning a big push, some domestic firms are calling for higher tariffs. Politicians want an IRA-like effort to protect the continent's car industry, along with other sorts of manufacturing.

Risks to privacy and national security both warrant vigilance against the misuse of data by carmakers. There is a risk, however, that these also become excuses for crude protectionism. That may preserve some domestic jobs, but only by harming a much larger number of drivers. A sharp jolt of competition from Chinese carmakers would force domestic firms to innovate harder. That should make EVs cheaper, helping the planet, and better, benefiting motorists.

Wheels, not walls

Chinese firms are racing to improve autonomous cars, and to make riding more pleasurable with software-enhanced big screens, mood lighting and other goodies. Just as it was foolish to try to keep out Japanese and South Korean cars, it would be foolish now to erect road blocks against Chinese ones. ■

The business of economics

The Free exchange column on why economics does not understand business stated that "economics likes to see itself as a foundational discipline, like physics, not a practical one, like engineering" (April 8th). In their quest to be physics-like and evidence based, economists are prone to a form of selection bias by focusing on problems where data are relatively abundant. In doing so, they tend not to study problems where data are necessarily scarce.

Often when studying firms that are leaders in adopting technology or innovative business models we can only analyse small samples, or even a sample of one in the case of a pioneer. Studying small samples means obtaining qualitative information and inferring logically causal processes about management decision-making, organisational governance, culture and politics within and across firms as they strive to innovate and remain competitive. Such approaches are well developed in cognate disciplines such as management, sociology and politics, among others. Adopting such approaches by working collaboratively with such disciplines can only strengthen the toolbox of economists and contribute to a better understanding of business.

Economics may still continue to be a foundational discipline, but it has the potential to become as practical as engineering.

CHANDER VELU
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The column concluded that "economics has little of practical use to say about what makes a successful company." I must defend the profession. In the consultancy firm where I was a partner I was, despite being chief economist, also at various times head of strategy and head of international privatisations. We were not there to advise only on GDP trends or interest-rate policy.

If things have changed we need to get our act together to reverse the trend. It is important to encourage the young to study economics as a degree and then apply it in practice, whether in the private or public sector. As I discovered repeatedly during my career, strategies done in a vacuum without proper analysis and understanding of what makes an economy and an industry tick rarely work.

VICKY PRYCE
Former joint head of the UK Government Economic Service
London

Rice and climate change

"The global rice crisis" (April 1st) could be solved with new but proven methods of cultivation. These agroecological approaches require fewer chemicals and less water, but increase yield and reduce greenhouse-gas emissions. Crops are not only more resilient, they draw carbon down from the atmosphere into soil and root systems.

One example is the System of Rice Intensification (SRI), one of the most cost-effective climate solutions identified in 2017 by Project Drawdown, a non-profit organisation. SRI involves the wider spacing of plants and careful management of seedlings and water. Research shows that water consumption and emissions, mainly methane, can be halved. With 80% less seed, farmers' yields consistently increase, often doubling or more. Smallholder farmers across Asia and Africa have already adopted these practices. Innovative farmers in Pakistan and Arkansas have shown that SRI can be mechanised and scaled.

SRI is practised in over 60 countries, but still accounts for only 5-10% of global production. Helping farmers change their practices mainly requires non-financial support such as training, demonstration and access to equipment. The payback to farmers and governments in productivity, food security, water savings and greater resilience to climate stresses will be measured in months. This is the kind of initiative that should be a priority at COP28, to be held in Dubai later this year.

DR ADAM PARR
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Psychological warfare

The commander of Britain's National Cyber Force, James Babbage, revealed that Britain's "doctrine of cognitive effect" has only recently adopted the principles of aiming for long-term results in offensive cyber ("All in the mind", April 8th). That involves targeting elites rather than the masses and emphasising content based on truth rather than intentional falsehood, as being appropriate for a liberal democracy.

These are the same principles identified and practised by Charles Masterman's famous war-propaganda bureau at Wellington House during the start of the first world war. Regrettably, they are so contrary to conventional military thinking and culture that they have had to be rediscovered in every war since.

STEPHEN BADSEY
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Cycling in London

We agree that improving road safety means focusing on road junctions and improving vision for lorry drivers ("Zero tolerance" April 1st). Transport for London has indeed made changes at more than 40 junctions, but many of these redesigns retain what are known as "critical issues" that the UK Department for Transport's junction-assessment tool and TfL's own Healthy Streets check for designers highlight as objectively dangerous. For example, some junctions continue to allow heavy flows of left-turning vehicles across the path of cyclists.

Moreover, TfL has routinely weakened or delayed progress on rolling out safety measures, primarily it seems to avoid impacting bus-journey times. The stark reality of dangerous junctions, particularly in urban areas, is that any improvements for safety must come mostly by reducing motor-traffic capacity, which means cities being clear about their priorities to stop serious road collisions. It is possible to cut bus-journey times and collisions, but to do so means reducing private-vehicle traffic significantly. Bank Junction in the City of London is a good example of this.

Unless TfL and London's boroughs tackle dangerous junctions with far more clarity, the mayor's strategy for "Vision Zero"—no road deaths or serious injuries—will remain unachievable.

SIMON MUNK
Campaigns manager
London Cycling Campaign

Let me tell you how it will be

Your article on the mistakes made by Richard Beeching when he reshaped Britain's railways in the 1960s reminded me that not everyone in that decade disapproved of his parsimony ("The great train robbery", April 1st). Beeching also had his admirers. By the late 1960s the Beatles' record label, Apple Corps, was out of control financially and losing so much cash that John Lennon decided that one solution was to meet Beeching in the hope he would take control of the business and apply his famous cost-cutting skills.

The meeting did not go well. Beeching told Lennon to "stick to making records".

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THE AGE OF PSEUDOCOGNITION

BERKELEY AND BERLIN

Looking at the impacts of the computer browser, the printing press and psychoanalysis could help prepare the world for AI

AMONG THE more sombre gifts brought by the Enlightenment was the realisation that humans might one day become extinct. The astronomical revolution of the 17th century had shown that the solar system both operated according to the highest principles of reason and contained comets which might conceivably hit the Earth. The geological record, as interpreted by the Comte de Buffon, showed massive extinctions in which species vanished for ever. That set the scene for Charles Darwin to recognise such extinctions as the motor of evolution, and thus as both the force which had fashioned humans and, by implication, their possible destiny. The nascent science of thermodynamics added a cosmic dimension to the certainty of an ending; Sun, Earth and the whole shebang would eventually run down into a lifeless "heat death".

The 20th century added the idea that extinction might not come about naturally, but through artifice. The spur for this was the discovery, and later exploitation, of the power locked up in atomic nuclei. Celebrated by some of its discoverers as a way of indefinitely deferring heat death, nuclear energy was soon developed into a far more proximate danger. And the tangible threat of imminent catastrophe which it posed rubbed off on other technologies.

None was more tainted than the computer. It may have been guilt by association: the computer played a vital role in the development of the nuclear arsenal. It may have been foreordained. The Enlightenment belief in rationality as humankind's highest achievement and Darwin's theory of evolution made the promise of superhuman rationality the possibility of evolutionary progress at humankind's expense.

Artificial intelligence has come to loom large in the thought of the small but fascinating, and much written about, coterie of academics which has devoted itself to the consideration of existential risk over the past couple of decades. Indeed, it often appeared to be at the core of their concerns. A world which contained entities which think better and act quicker than humans and their institutions, and which had interests that were not aligned with those of humankind, would be a dangerous place.

It became common for people within and around the field to say that there was a "non-zero" chance of the development of superhuman AIs leading to human extinction. The remarkable boom in the capabilities of large language models (LLMs), "foundational" models and related forms of "generative" AI has propelled these discussions of existential risk into the public imagination and the inboxes of ministers.

As the special Science section in this issue makes clear, the field's progress is precipitate and its promise immense. That brings clear and present dangers which need addressing (see Leader). But in the specific context of GPT-4, the LLM *du jour*, and its generative ilk, talk of existential risks seems rather absurd. They produce prose, poetry and code; they generate images, sound and video; they make predictions based on patterns. It is easy to see that those capabilities bring with them a huge capacity for mischief. It is hard to imagine them underpinning "the power to control civilisation", or to "replace us", as hyperbolic critics warn.

Love song

But the lack of any "Minds that are to our minds as ours are to those of the beasts that perish, intellects vast and cool and unsympathetic [drawing] their plans against us", to quote H.G. Wells, does not mean that the scale of the changes that AI may bring with it can be ignored or should be minimised. There is much more to life than the avoidance of extinction. A technology need not be world-ending to be world-changing.

The transition into a world filled with computer programs capable of human levels of conversation and language comprehension and superhuman powers of data assimilation and pattern recognition has just begun. The coming of ubiquitous pseudocognition along these lines could be a turning point in history even if the current pace of AI progress slackens (which it might) or fundamental developments have been tapped out (which feels unlikely). It can be expected to have implications not just for how people earn their livings and organise their lives, but also for how they think about their humanity.

For a sense of what may be on the way, consider three possible analogues, or precursors: the browser, the printing press and practice of psychoanalysis. One changed computers and the economy, one changed how people gained access and related to knowledge, and one changed how people understood themselves.

The humble web browser, introduced in the early 1990s as a way to share files across networks, changed the ways in which computers are used, the way in which the computer industry works and the way information is organised. Combined with the ability to link computers into networks, the browser became a window through which first files and then applications could be accessed wherever they might be located. The interface through which a user interacted with an application was separated from the application itself.

The power of the browser was immediately obvious. Fights over how hard users could be pushed towards a particular browser became a matter of high commercial drama. Almost any business with a web address could get funding, no matter what absurdity it promised. When boom turned to bust at the turn of the

A technology need not be world-ending to be world-changing

century there was a predictable backlash. But the fundamental separation of interface and application continued. Amazon, Meta (*née* Facebook) and Alphabet (*née* Google) rose to giddy heights by making the browser a conduit for goods, information and human connections. Who made the browsers became incidental; their role as a platform became fundamental.

The months since the release of OpenAI's ChatGPT, a conversational interface now powered by GPT-4, have seen an entrepreneurial explosion that makes the dotcom boom look sedate. For users, apps based on LLMs and similar software can be ludicrously easy to use; type a prompt and see a result. For developers it is not that much harder. "You can just open your laptop and write a few lines of code that interact with the model," explains Ben Tossell, a British entrepreneur who publishes a newsletter about AI services.

And the LLMs are increasingly capable of helping with that coding, too. Having been "trained" not just on reams of text, but lots of code, they contain the building blocks of many possible programs; that lets them act as "co-pilots" for coders. Programmers on GitHub. an open-source coding site, are now using a GPT-4-based co-pilot to produce nearly half their code.

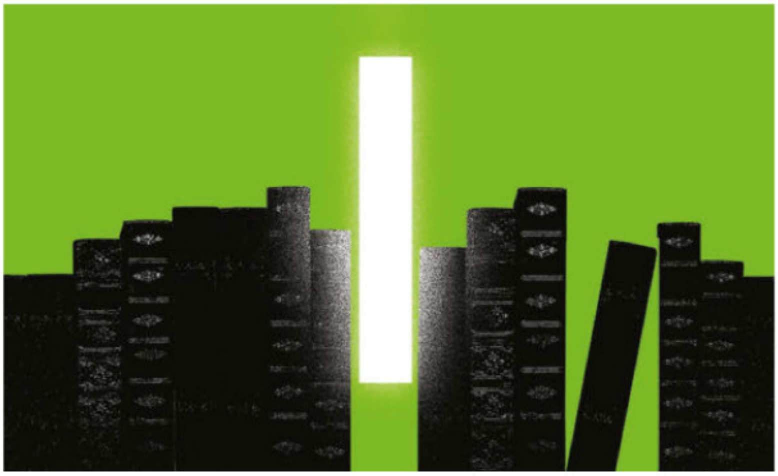
There is no reason why this ability should not eventually allow LLMs to put code together on the fly, explains Kevin Scott, Microsoft's chief technology officer. The capacity to translate from one language to another includes, in principle and increasingly in practice, the ability to translate from language to code. A prompt written in English can in principle spur the production of a program that fulfils its requirements. Where browsers detached the user interface from the software application, LLMs are likely to dissolve both categories. This could mark a fundamental shift in both the way people use computers and the business models within which they do so.

Every day I write the book

Code-as-a-service sounds like a game-changing plus. A similarly creative approach to accounts of the world is a minus. While browsers mainly provided a window on content and code produced by humans, LLMs generate their content themselves. When doing so they "hallucinate" (or as some prefer "confabulate") in various ways. Some hallucinations are simply nonsense. Some, such as the incorporation of fictitious misdeeds to biographical sketches of living people, are both plausible and harmful. The hallucinations can be generated by contradictions in training sets and by LLMs being designed to produce coherence rather than truth. They create things which look like things in their training sets; they have no sense of a world beyond the texts and images on which they are trained.

In many applications a tendency to spout plausible lies is a bug. For some it may prove a feature. Deep fakes and fabricated videos which traduce politicians are only the beginning. Expect the models to be used to set up malicious influence networks on demand, complete with fake websites, Twitter bots, Facebook pages, TikTok feeds and much more. The supply of disinformation, Renée DiResta of the Stanford Internet Observatory has warned, "will soon be infinite".

This threat to the very possibility of public debate may not be an existential one; but it is deeply troubling. It brings to mind the "Library of Babel", a short story by Jorge Luis Borges. The library contains all the



books that have ever been written, but also all the books which were never written, books that are wrong, books that are nonsense. Everything that matters is there, but it cannot be found because of everything else; the librarians are driven to madness and despair.

This fantasy has an obvious technological substrate. It takes the printing press's ability to recombine a fixed set of symbols in an unlimited number of ways to its ultimate limit. And that provides another way of thinking about LLMs.

Dreams never end

The degree to which the modern world is unimaginable without printing makes any guidance its history might provide for speculation about LLMs at best partial, at worst misleading. Johannes Gutenberg's development of movable type has been awarded responsibility, at some time or other, for almost every facet of life that grew up in the centuries which followed. It changed relations between God and man, man and woman, past and present. It allowed the mass distribution of opinions, the systematisation of bureaucracy, the accumulation of knowledge. It brought into being the notion of intellectual property and the possibility of its piracy. But that very breadth makes comparison almost unavoidable. As Bradford DeLong, an economic historian at the University of California, Berkeley puts it, "It's the one real thing we have in which the price of creating information falls by an order of magnitude."

Printed books made it possible for scholars to roam larger fields of knowledge than had ever before been possible. In that there is an obvious analogy for LLMs, which trained on a given corpus of knowledge can derive all manner of things from it. But there was more to the acquisition of books than mere knowledge.

Just over a century after Gutenberg's press began its clattering Michel de Montaigne, a French aristocrat, had been able to amass a personal library of some 1,500 books—something unimaginable for an individual of any earlier European generation. The library gave him more than knowledge. It gave him friends. "When I am attacked by gloomy thoughts," he wrote, "nothing helps me so much as running to my books. They quickly absorb me and banish the clouds from my mind."

And the idea of the book gave him a way of being himself no one had previously explored: to put himself between covers. "Reader," he warned in the preface to his *Essays*, "I myself am the matter of my book." The mass production of books allowed them to become peculiarly personal; it was possible to write a book about nothing more, or less, than yourself, and the person that your reading of other books had made you. Books produced authors.

If some chatbots become their user's inner voice, that voice will persist after death

As a way of presenting knowledge, LLMs promise to take both the practical and personal side of books further, in some cases abolishing them altogether. An obvious application of the technology is to turn bodies of knowledge into subject matter for chatbots. Rather than reading a corpus of text, you will question an entity trained on it and get responses based on what the text says. Why turn pages when you can interrogate a work as a whole?

Everyone and everything now seems to be pursuing such fine-tuned models as ways of providing access to knowledge. Bloomberg, a media company, is working on BloombergGPT, a model for financial information. There are early versions of a QuranGPT and a BibleGPT; can a puffer-jacketed PontiffGPT be far behind? Meanwhile several startups are offering services that turn all the documents on a user's hard disk, or in their bit of the cloud, into a resource for conversational consultation. Many early adopters are already using chatbots as sounding boards. "It's like a knowledgeable colleague you can always talk to," explains Jack Clark of Anthropic, an LLM-making startup.

It is easy to imagine such intermediaries having what would seem like personalities—not just generic ones, such as "avuncular tutor", but specific ones which grow with time. They might come to be like their users: an externalised version of their inner voice. Or they might be like any other person whose online output is sufficient for a model to train on (intellectual-property concerns permitting). Researchers at the Australian Institute for Machine Learning have built an early version of such an assistant for Laurie Anderson, a composer and musician. It is trained in part on her work, and in part on that of her late husband Lou Reed.

Without you

Ms Anderson says she does not consider using the system as a way of collaborating with her dead partner. Others might succumb more readily to such an illusion. If some chatbots do become, to some extent, their user's inner voice, then that voice will persist after death, should others wish to converse with it. That some people will leave chatbots of themselves behind when they die seems all but certain.

Such applications and implications call to mind Sigmund Freud's classic essay on the *Unheimliche*, or uncanny. Freud takes as his starting point the idea that uncanniness stems from "doubts [as to] whether an apparently animate being is really alive; or conversely, whether a lifeless object might not be in fact animate". They are the sort of doubts that those thinking about LLMs are hard put to avoid.

Though AI researchers can explain the mechanics of their creations, they are persistently unable to say what actually happens within them. "There's no 'ultimate theoretical reason' why anything like this should work," Stephen Wolfram, a computer scientist and the creator of Wolfram Alpha, a mathematical search engine, recently concluded in a remarkable (and lengthy) blog post trying to explain the models' inner workings. ▸▸

This raises two linked but mutually exclusive concerns: that AI's have some sort of internal working which scientists cannot yet perceive; or that it is possible to pass as human in the social world without any sort of inner understanding.

"These models are just representations of the distributions of words in texts that can be used to produce more words," says Emily Bender, a professor at the University of Washington in Seattle. She is one of the authors of "On the Dangers of Stochastic Parrots: Can Language Models Be Too Big?" a critique of LLM triumphalism. The models, she argues, have no real understanding. With no experience of real life or human communication they offer nothing more than the ability to parrot things they have heard in training, an ability which huge amounts of number crunching makes frequently appropriate and sometimes surprising, but which is nothing like thought. It is a view which is often pronounced in those who have come into the field through linguistics, as Dr Bender has.

For some in the LLM-building trade things are not that simple. Their models are hard to dismiss as "mere babblers", in the words of Blaise Agüera y Arcas, the leader of a group at Alphabet which works on AI-powered products. He thinks the models have attributes which cannot really be distinguished from an ability to know what things actually mean. It can be seen, he suggests, in their ability reliably to choose the right meaning when translating phrases which are grammatically ambiguous, or to explain jokes.

If Dr Bender is right, then it can be argued that a broad range of behaviour that humans have come to think of as essentially human is not necessarily so. Uncanny "doubts [as to] whether an apparently animate being is really alive" are fully justified.

To accept that human-seeming LLMs are calculation, statistics and nothing more could influence how people think about themselves. Freud portrayed himself as continuing the trend begun by Copernicus—who removed humans from the centre of the universe—and Darwin—who removed them from a special and God-given status among the animals. Psychology's contribution, as Freud saw it, lay in "endeavouring to prove to the 'ego' of each one of us that he is not even master in his own house". LLMs could be argued to take the idea further still. At least one wing of Freud's house becomes an unoccupied "smart home"; the lights go on and off automatically, the smart thermostat opens windows and lowers blinds, the roomba roombas around. No master needed at all.

There might be something below the AI surface which needs understanding

Uncanny as that may all be, though, it would be wrong to think that many people will take this latest decentring to heart. As far as everyday life is concerned, humankind has proved pretty resilient to Copernicus, Darwin and Freud. People still believe in gods and souls and specialness with little obvious concern for countervailing science. They could well adapt quite easily to the pseudocognitive world, at least as far as philosophical qualms are concerned.

You do not have to buy Freud's explanation of the unsettling effect of the uncanny in terms of the effort the mind expends on repressing childish animism to think that not worrying and going with the animistic flow will make a world populated with communicative pseudo-people a surprisingly comfortable one. People may simultaneously recognise that something is not alive and treat it as if it were. Some will take this too far, forming problematic attachments that Freud would have dubbed fetishistic. But only a few sensitive souls will find themselves left behind staring into an existential—but personal—abyss opened up by the possibility that their seeming thought is all for naught.

New gold dream

What if Mr Agüera y Arcas is right, though, and that which science deems lifeless is, in some cryptic, partial and emergent way, effectively animate? Then it will be time to do for AI some of what Freud thought he was doing for humans. Having realised that the conscious mind was not the whole show, Freud looked elsewhere for sources of desire that for good or ill drove behaviour. Very few people now subscribe to the specific Freudian explanations of human behaviour which followed. But the idea that there are reasons why people do things of which they are not conscious is part of the world's mental furniture. The unconscious is probably not a great model for whatever it is that provides LLMs with an apparent sense of meaning or an approximation of agency. But the sense that there might be something below the AI surface which needs understanding may prove powerful.

Dr Bender and those who agree with her may take issue with such notions. But they might find that they lead to useful actions in the field of "AI ethics". Winkling out non-conscious biases acquired in the preverbal infancy of training; dealing with the contradictions behind hallucinations; regularising rogue desires: ideas from psychotherapy might be seen as helpful analogies for dealing with the pseudocognitive AI transition even by those who reject all notion of an AI mind. A concentration on the relationship between parents, or programmers, and their children could be welcome, too. What is it to bring up an AI well? What sort of upbringing should be forbidden? To what extent should the creators of AIs be held responsible for the harms done by their creation?

And human desires may need some inspection, too. Why are so many people eager for the sort of intimacy an LLM might provide? Why do many influential humans seem to think that, because evolution shows species can go extinct, theirs is quite likely to do so at its own hand, or that of its successor? And where is the determination to turn a superhuman rationality into something which does not merely stir up the economy, but changes history for the better? ■

Ukraine's counter-offensive

Waiting for D-Day

Its Western allies want success—but not too much

"BREAK THE spine!" shouts the man in Russian, chiding his colleague. "What, you've never cut a head off before?" The video shows what appears to be a knife-wielding Russian soldier beheading a Ukrainian one, alive. "Put it in a fucking bag," demands another voice, "and send it to his commander." The footage, posted by a popular Russian far-right account on Telegram, a social-media site, on April 11th, provoked outrage in Ukraine. "Everyone must react," said Volodymyr Zelensky, the country's president. "We are not going to forget anything." Mr Zelensky's army will soon have a shot at revenge.

A Ukrainian counter-offensive is due in the coming days or weeks. Almost no one knows precisely where or when it will come. Only five officials have all the details, noted Oleksiy Danilov, Ukraine's security chief, on April 6th. But Russian troops are braced. On April 12th British defence intelligence said that Russia had finished building three layers of defensive lines along 120km (75 miles) of the front line in Zaporizhia province in anticipation of a Ukrainian assault towards Melitopol, including dragon's teeth anti-tank obstacles stretching south-east along the P37 highway from Shyroke. Conquering Melitopol would help Ukraine sever Russia's land bridge between the occupied regions of Donbas and Crimea.

Ukraine's offensive force consists of at least a dozen brigades (some sources say up to 18), nine of which have been armed and supplied by Western allies (a brigade tends to be several thousand men). Those nine are due to have more than 200 tanks, 800 other armoured vehicles and 150 pieces of field artillery in total, according to American intelligence documents which leaked onto the internet in early March and widely circulated in April. It is a large force, but with some glaring weaknesses.

The majority of its vehicles are unarmoured. The amount of artillery is relatively modest—the 21st brigade appears to have just ten guns allocated to it. Notably, the newest equipment is spread thinly across units rather than concentrated in a few. Ukraine might make changes to its order of battle in response to the leaks, but it cannot dismantle and reconstitute brigades that might have been training and preparing together for weeks or months.

One problem for Ukraine is how to achieve surprise. If it masses its forces at a particular spot, Russia might detect those preparations and shore up its lines accordingly. That puts a premium on deception, notes Mick Ryan, a retired Australian major-general. Ukraine will have to conceal troop concentrations, artillery positions, headquarters and logistics hubs. "It could also mean we will see lots of smaller mini-offensives rather than a couple of large ones," says Mr Ryan, "just to confuse the Russian targeting cycle and to deceive them about Ukraine's main effort."

If Ukraine can achieve surprise, the next question is whether it can punch through Russian defences and send more forces quickly through the gap. It will need mobile air defences to keep Russian planes at bay; it is not clear if it has enough. It will have to cross rivers and minefields—obstacles that have consumed entire Russian brigades in the east—as well as a formida- ▸▸

→ Also in this section

ble network of Russian trenches and fortifications (see map). "There is no military endeavour that is more difficult to plan, orchestrate and execute than combined-arms obstacle breaching," says Mr Ryan.

In theory, precision artillery can quickly take out prepared defences, says Ben Barry of IISS, a think-tank in London, pointing to Britain's use of such systems to destroy bunkers in Afghanistan. But that requires expert synchronisation of artillery, infantry and armour so that troops advance neither too early, while the defences are intact, nor too late, when Russia's rear echelon has reinforced a barrage's site.

To date, Ukraine's army has largely conducted sequential operations—first artillery fire, then a ground advance—rather than these more demanding co-ordinated ones, says Franz-Stefan Gady, a military analyst. That is in part because of rigid Soviet-style commanders and a lack of combined-arms training at scale, he says. Improving Ukraine's command and control has been a priority for Western officials helping to train and advise Ukrainian generals in Germany over recent weeks.

The timing of an offensive is also uncertain. Weather is one factor. American intelligence analysts reckon that the ground in eastern Ukraine will remain muddy until early May. Kit is another. A third of the Western-supplied brigades are not due to be fully equipped and trained until the end of April. Ukraine's general staff could launch a staged attack, with some brigades thrown in later as they arrive, but might choose to "save it all up for a big bang", says Mr Barry. This could maximise the pressure on Russian defences. Waiting for too long could also let Russia dig in further and replenish ammunition.

A question of calibration

Western officials familiar with Ukraine's preparations are unsure how everything will pan out. It is vital, they say, that Ukrainian forces have the confidence to keep moving forward. Russia's layered defences are designed to lure advancing columns into "kill zones" covered by pre-sighted artillery. If troops panic and freeze up, they could be decimated. But there are also concerns about the opposite: an unexpected collapse of Russian forces that puts Ukraine's army at the edge of Crimea, in a position to seal off the peninsula, attack Russian ports and bases there and deny the Sea of Azov to Russian ships. Large pockets of Russian troops could also be trapped in Kherson and Zaporizhia oblasts.

Such a humiliation is deemed unlikely—a leaked American assessment predicts only "marginal" gains for either side this year—but not impossible. Many Ukrainian officials would welcome it. But some Western ones are concerned that a rout would destabilise Russia to a dangerous

*Russia operated in or attacked, but does not control
†Feb 24th 2022-Apr 9th 2023 Sources: Institute for the Study of War; AEI's Critical Threats Project; Brady Africk

degree, making it harder for the Kremlin to swallow any negotiations that might follow. Far preferable, they say, for Vladimir Putin to order a semi-voluntary retreat, as he did from the western bank of the Dnieper river in Kherson province in November. The aim is not to defeat Mr Putin militarily but to persuade him that recovering the lost territory would require wave after wave of politically risky mobilisation.

But that will not be easy. Mr Putin is thought to remain convinced that time is on his side. He has reinforced failure at every turn, frittering away tens of thousands of mobilised recruits on a futile offensive around the town of Bakhmut since January. The DIA assessment, first published by the *Washington Post*, says that even if Ukraine were to inflict "unsustainable losses on Russian forces", Russia would prefer to conduct a fresh mobilisation rather than enter negotiations. On April 12th Russia's parliament passed a new law allowing the defence ministry to issue electronic rather than physical summons for military service, making it easier to dragoon recruits. On April 18th Mr Putin visited Kherson province personally. Another round seems inevitable.

Ukraine can sustain a counteroffensive through the spring and perhaps into the summer, says Michael Kofman of CNA, a think-tank. But it will burn through ammunition and men in the process, he warns, and this could be the "high-water mark" of Western aid. The coming months could be the decisive period of the war. ■

Ukraine's inflatable weapons

Enter the dummies

KYIV

How Ukraine is confusing the Russians with fake tanks and guns

From the Trojan horse to the stuffed sackcloth paratroopers known as "Ruperts" dropped to confuse the Germans on D-Day, deception in war is as old as war itself. As weapons technologies evolve, so must the ruses to blunt their advantage. Drones have rendered the battlefield in Ukraine highly visible; enter the dummies.

The Russians claim to have taken out several HIMARS rocket launchers first supplied by America last June; the Ukrainians say none has been lost on the battlefield. Somewhere in the discrepancy is a small fleet of replica HIMARS, wooden models mounted on heavy trucks, trundling along muddy tracks behind the front line.

In the past Ukrainian efforts at military decoys have been somewhat ad hoc, with amateurs nailing bits of scrap together. "Let's call it handicrafts," says Andrii Rymaruk, Director of Military Affairs for Come Back Alive, an NGO that has been at the forefront of supplying Ukrainian soldiers with materiel since the war in the Donbas began in 2014. Since 2018, Come Back Alive has been working on designing inflatable prototypes, of the kind usually used by armies in training exercises. Before the invasion, the top brass were unimpressed. "The army said, 'We don't need it'," says Mr Rymaruk.

Inflatable dummies have several advantages. Wooden models are heavy and awkward, made of several parts. They need a vehicle to transport them and a team to assemble and disassemble a folding wooden frame. An inflatable is sewn together from nylon fabric, cheaper to manufacture, potentially light enough to be carried in a backpack and "very fast to deploy", says an engineer with Inflatech, a Czech company that specializes in inflatable Soviet and Chinese armaments. "Plug in the blower and in ten minutes it's a tank."

The dummies are becoming more lifelike. Collapsible wooden replica tanks are so detailed and realistic, says Anton Gerashchenko, an adviser to the Ukrainian government, that "you can't tell it's fake, even from five metres". Lorries can be driven across fields to make tracks, while comms radio traffic creates the impression of a military position. Inflatech uses flexible reflectors to simulate the heat of a gun that has just been fired, to fool the thermal imaging cameras on drones. Dummies also have to be able to produce a valid radar signal, despite being full of air. Mr Rymaruk is ▸▸

unsurprisingly coy about how that is done.

Dummies could be effective at countering the menace of the Russian Lancet drones, which are decimating Ukrainian artillery. "The Lancet drone is the most dangerous drone for us," says Mr Gerashchenko. "It has a 40km range and carries 3kg of explosive. Very useful for destroying artillery." A Lancet, produced in Russia, probably costs under $50,000; an American M777 howitzer, now in use by the Ukrainians, can cost nearer $4m. "If your enemy sees you on the battlefield, you're not only dead," says Mr Gerashchenko, "it is also very expensive." If, on the other hand, you can convince the Russians that they should waste resources shooting at fakes, says Mr Rymaruk, "you are economically depleting the enemy". ■

Italy struggles with EU cash

Financial indigestion

FLORENCE

Spending the EU's billions is hard

PAOLO GENTILONI, the EU commissioner overseeing its €750bn ($820bn) post-pandemic recovery fund, said last month that if it failed because of his fellow Italians, "that would really be a disaster".

Indeed. Italy is by far the biggest beneficiary of a vast facility that, for the first time, is financed with debt jointly underwritten by the member states. It stands to receive €191.5bn in grants and soft loans. If it does not spend the money fully and productively, economists will need to trim, if not eliminate, the annual 1-1.5 percentage points they have tentatively added to forecasts of Italian GDP growth over the next ten years. And it would impair the commission's aim of using the fund to close the gaps between Europe's—and Italy's—richer norths and poorer souths. It would also have serious implications for EU financial integration. "If Italy fails to spend this money, its dream of persuading its European partners to jointly underwrite future EU debt will be just a chimera," says Eleonora Poli, head of economic analysis for the Centre for European Policy, a think-tank.

Yet failure is starting to look alarmingly possible. Brussels is refusing to release Italy's latest tranche, of €19bn, because of doubts over the eligibility of some of the projects in which it plans to invest. These include the refurbishment of Florence's Serie A football stadium and the construction of a sports complex on a site outside Venice. Neither exactly fits the commission's requirement for projects that revitalise "degraded urban areas". Fiorentina's stadium is in a comfortable middle-class area of the club's home city. The other project is on a greenfield site. It scarcely helps that it would include a basketball arena and that the mayor of Venice is the owner of the local basketball club.

The inability of Italian officials to initiate and manage suitable projects presents a more fundamental challenge. By March 13th, more than a third of the way through the scheme's implementation, Italy had managed to spend less than half what was originally intended by then. Raffaele Fitto, the European affairs minister in Giorgia Meloni's conservative government, has since acknowledged that some of the projects that the plan originally envisaged cannot be completed by the end of 2026, when the last euro is due to be paid.

What is going wrong? One big snag is a shortage of administrative capacity. The scheme aims a disproportionate share of the money at the Mezzogiorno, Italy's south, where the ability of officials to design suitable projects and guide them to completion is generally weakest. A lot of the investment, moreover, is in the hands of local authorities. Most are tiny (70% of Italian municipalities have fewer than 5,000 inhabitants), with correspondingly puny administrations. By contrast Giuseppe Sala, the mayor of big, prosperous Milan, said he could spend at least double the amount earmarked for his city (not that it needs it). There is a danger that if local authorities in the north spend their quotas while those in the south do not, the recovery plan will end up widening the gap between the two halves of Italy.

Other problems concern the firms whose job it is to build the infrastructure projects that account for a large part of the scheme. As elsewhere in Europe, they face increased prices for raw materials and a workforce depleted by recession, first, and then by the pandemic. But they must also cope with a more specifically Italian difficulty: that of obtaining temporary credit from the banks for projects that have been commissioned, but for which the public financing is not yet available.

The government has attempted to remove at least some of these hurdles. Most notably, and controversially, it has approved legislation to speed up the spending process. Henceforth, officials will be able to place orders for up to €150,000 without tendering for bids. But that highlights a second risk: that shortcuts introduced with the best of intentions could intensify corruption and favouritism in a country where both are widespread and where organised crime is entrenched.

In a bid to ensure that Italy takes full advantage of the cash on offer, Mr Fitto has been trying to get the commission to agree to a revision of its national plan. The idea is that the projects that are most likely to miss the recovery fund's 2026 cut-off point, are instead to be financed by the EU's regional funds, which are part of a current package that will remain open for a further three years.

Some in the Northern League, the feistiest of the three junior partners in Ms Meloni's coalition, have a more radical idea. On April 3rd Riccardo Molinari, the League's chief whip in the lower house of parliament, proposed shrinking the national recovery plan by renouncing some of the low-cost borrowing (not the grants, of course) along with the investment it was intended to finance. The official line, not only of the government but also of the League, is that no such move is even being considered. But if the problems continue to mount, it could start to seem like a sensible way to avert the worst. ■

Meloni is struggling with a surfeit

Greece's election

Only the first round beckons

ATHENS

A European success story faces a bout of turbulence, but with luck it will be only political and not economic

KYRIAKOS MITSOTAKIS, 55 but looking much younger, fizzes with energy and satisfaction as he reviews his four years in the Greek prime minister's office with a rapid-fire list of achievements and successes. It is hard to imagine, as he reels off the sunny statistics, that he might be about to lose his majority and even his job; yet that is what the opinion polls predict.

A polished technocratic type, Mr Mitsotakis is one of Brussels's darlings. After the pandemonium of his predecessor's administration, when under the radical left Syriza party Greece came close to ejection from the euro, the past four years have been a huge relief. Mr Mitsotakis has steadily calmed tension with his neighbour Turkey: rushing aid to the victims of February's earthquake there was shrewd as well as humanitarian.

He has revolutionised the way citizens interact with the state, thanks to an impressive digitalisation programme. He has trimmed corporate taxes, raised the minimum wage and pensions, yet still managed to reduce Greece's sky-high debt-to-GDP ratio, though that is mostly due to the effects of inflation, which has raised nominal revenues faster than nominal outgoings.

On his watch, last year Greece grew almost twice as fast as the euro zone's average, and is projected to be well ahead of it this year too. A steady stream of inward investment, including from such notables as Microsoft and Pfizer, shows that Greece is no longer regarded as one of Europe's sickest men. A year ago Greece even produced its first "unicorn" startup, an online-only bank called Viva Wallet.

All this means that last August Greece was allowed by its creditors to leave the surveillance mechanisms that had been imposed for the previous 12 years, after the country had to beg for a series of huge bailouts, which are being repaid early. Greece can now borrow from the markets in the regular way, paying a spread of less than two points over the German government's rate, about the same as Italy's. The Greek spread peaked in 2015 at about ten times its current level. "We've done a pretty good job in very taxing times," says Mr Mitsotakis—immodest, perhaps, but accurate.

So why are dark clouds now hovering around the prime minister? Greece goes to the polls on May 21st, and on current numbers his New Democracy party is still set to win the most seats, but only a dozen or so more than Alexis Tsipras's Syriza. That will leave him well short of a majority, and he has no obvious coalition partners. A bonus system, unique to Greece and San Marino within Europe, used to give 50 seats to the largest party in order to make majorities easier to reach, but that system has now been abolished.

Mr Mitsotakis has suffered from two big problems. The first is a murky scandal revolving around the phone-tapping of dozens of politicians, journalists, businessmen and others by the Greek security service. Among those targeted (though unsuccessfully) was Nikos Androulakis, the leader of Pasok-Kinal, the third-biggest party. Mr Mitsotakis has admitted that abuses occurred, but denies knowing anything about them. Yet they happened on his watch. Many Greeks view it as highly suspicious that, as the scandal broke last summer, his own nephew, who served as his chief of staff, quit the government.

A wreck too many

An even bigger problem was a dreadful train crash on February 28th in northern Greece in which 57 people were killed, many of them in their 20s. Greece was convulsed not just by mourning but with anger, as details emerged of the incredibly lax procedures and outmoded equipment that had led to the disaster. Though Greece's railways have suffered from decades of neglect, the crash seemed to many people to give the lie to Mr Mitsotakis's claims about modernisation. "They have given us a lot of new apps, but underneath nothing at all has changed," says one Athens businesswoman. "Public services in this country are still just as terrible as ever."

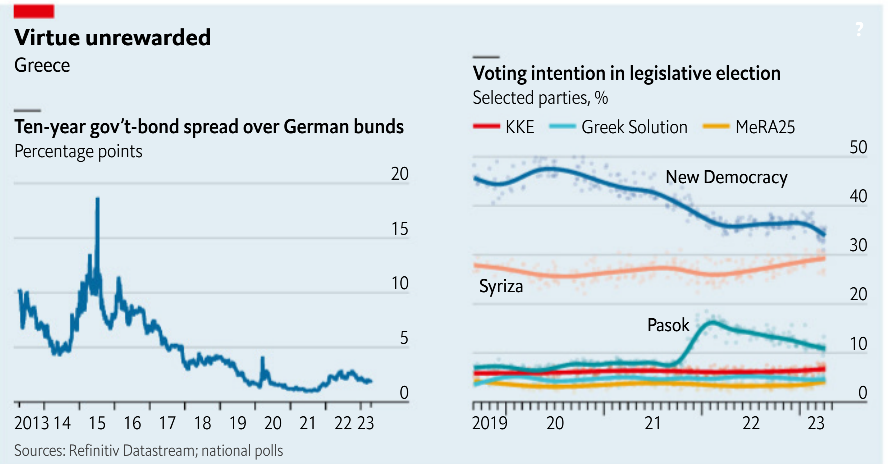
The civil service and, even more tellingly, the justice system remain Byzantine and creaking, and Mr Mitsotakis has done nothing to take either of them on. "He has dealt with the surface, not the deep state," says a senior banker. One of Greece's richest businessman is blunter. "All this bullshit about modernisation," he says. "It's not the case."

The prime minister rejects this criticism, pointing to improvements, for instance in Greece's main electricity generator, which he has privatised, or to the fact that this year for the first time recruits to the civil service have had to sit a competitive exam. But he admits he needs a second term to complete his work. The train crash serves as an obligation to do more, he says.

He may not get the chance. The current near-certainty is that no one will be able to form a majority after the next election, and that the president will appoint a caretaker prime minister (probably a senior judge) until fresh elections can be held, most likely in July, which is when the real battle will be fought. At that point, a revised but less generous version of the bonus-seat system will be reintroduced.

Under it, Mr Mitsotakis would still need around 38% of the vote. Most opinion polls suggest he will get only 34-35%. What then? He will try to form a coalition with the angry Mr Androulakis of Pasok, who at the moment says that the price of his support would be another leader to head Mr Mitsotakis's New Democracy. Pasok may instead try to team up with Syriza, but they would need support from a gaggle of other left-wing parties. "It would be a madhouse," says the businessman.

So a third election might even be required this year: a prospect that fills everyone with gloom. Everyone, that is, except the markets, which remain calm. And that is a remarkable testament to progress made in the second part of Mr Tsipras's term—and by Mr Mitsotakis himself. ■



Sources: Refinitiv Datastream; national polls

Charlemagne | Germany's turbocharged minister

Annalena Baerbock's trip to China shows her talent and her limitations

It was an idyllic scene in Karuizawa, a mountain resort not far from Tokyo. Surrounded by snow-capped mountains and cherry trees still in blossom, a group of children struck up jolly tunes on their violins for the foreign ministers of the G7 group of industrialised countries who had just got off the *shinkansen*, Japan's famous high-speed train. Holding a bouquet of yellow flowers, Annalena Baerbock was beaming. Germany's foreign minister seemed relieved to be surrounded by Antony Blinken and her other counterparts from friendly countries. Behind her was the most difficult trip of her 16 months in the job: a visit to China.

Considered in Germany to be a hawk on China, Ms Baerbock has had to strike a balance. She wants to stay true to her principles, yet also to defend the interests of German business and rebut criticism of her supposedly anti-China strategy from the conservative wing of the Social Democratic Party (SPD), her Green party's coalition partner. She has managed best to stick to her first instinct. Even as a candidate for chancellor last year she had advocated "dialogue and toughness" in relations with China. At her joint press conference on April 14th with Qin Gang, her Chinese counterpart, her tone certainly made her sound more of a hawk. She warned that a unilateral or violent change in the status of Taiwan would be "unacceptable", she insisted on respect for the rights of the Uyghurs, a repressed Muslim minority, and called on the Chinese to use their influence on Russia to end the war in Ukraine.

Her penchant for calling a spade a spade is admired by those who are exasperated by the tendency of Olaf Scholz, the chancellor, to talk like a robot ("the Scholzomat") and to tread hesitantly in foreign affairs. She scores well in popularity rankings, though not quite as well as a few months ago, thanks to various if minor gaffes and to a general waning of enthusiasm among the more pacifist of Green voters, because of her party's strong support for Ukraine and its relative neglect of its core environmental agenda. Her most ardent admirers see her as Germany's next chancellor. That would require her party to rebuild its strength and to nominate her rather than Robert Habeck, the economy minister, as its candidate for chancellor at the next election in 2025. Both are big ifs.

There is little doubt that Ms Baerbock would like the top job, in spite of her dismal experience in 2021. Her campaign then was plagued by accusations of plagiarism in her book, that she had embellished her CV and that she had only belatedly reported some extra income. And she knows she is still prone to gaffes. For instance, she said on French television in January that she saw no problem with Poland sending German-made Leopard tanks to Ukraine: this was before Mr Scholz had given the green light, thus greatly annoying the chancellor and his entourage.

Yet Ms Baerbock's slips are also part of what makes a lot of ordinary people feel they can relate to her. In stark contrast with Mr Scholz, who clams up as soon as a reporter is in sight, she delights in speaking at high speed (occasionally mangling her words) in off-the-record chats with gaggles of journalists. She connects easily with people from all walks of life. She tries to retain a semblance of normality with her family, going on bike rides with her two young daughters (plus bodyguards) around Potsdam, the historic townlet where she lives just south-west of Berlin. Though she was born in Hanover, she sometimes slips into *Berlinerisch*, the city's idiosyncratic slang.

In her time in office, and even as a candidate to be chancellor, she has become closer to German business than many expected for an idealistic Green. This should serve her well in her ambition for the top prize. On her China trip she visited Flender, a maker of wind turbines, Vitesco, a car-parts supplier, and Volkswagen (VW). This, she says, should give her a better understanding of what it is like to operate in a country that offers foreign investors a skewed playing field. Despite the legal risks, international tension and the constant surveillance of their staff by the Chinese state, German companies such as the big carmakers VW, Daimler and BMW, as well as BASF, a chemicals giant, are still investing in China with undiminished enthusiasm. Last year German direct investment there totted up to a record €11.5bn ($12.6bn). BASF is ploughing €10bn into a new production site in southern China. VW wants to invest €2.4bn in a joint venture for self-driving cars.

The second fiddle is the only one she can play

Ms Baerbock's biggest frustration is that she is not chancellor. Since the days of Konrad Adenauer after the war, Germany's chancellor has called the shots in the most important decisions in foreign policy. Lately, that has included the supply of tanks to Ukraine and whether to approve a Chinese investment in the port of Hamburg. Tensions between the chancellery and the foreign ministry are the main reasons for delays in agreeing on Germany's national security strategy and its China strategy. In both cases the foreign ministry is drafting the document, taking soundings from others involved; but the final decisions are the chancellor's. The idea of creating an American-style national security council has already been swatted because of disagreements over whether it should come within Mr Scholz's fief or Ms Baerbock's.

The 42-year-old Ms Baerbock has surprised many with her generally strong performance as foreign minister. "When I think about what makes me optimistic in these times, it's having a partner who so seamlessly blends principle and pragmatism," Mr Blinken recently wrote about her in a short profile in *Time*, an American weekly. Mr Scholz was part of the previous government of Angela Merkel, who treated China with kid gloves throughout her years as chancellor. These days he has been starting to sound a bit more like Ms Baerbock on China. That makes it easier for her to stick to her "dialogue and toughness" course. But ultimately the biggest decisions on how Germany deals with China will still be decided in the chancellery. ■

Education

Empty chairs, quieter playgrounds

Persistent absence from schools is the new epidemic

Before the covid-19 pandemic, Liz Marsh's daughter seemed to be coping better with debilitating anxieties. Diagnosed as autistic when she was six, she appeared to have found a school that worked reasonably well for her. Over the past two years, however, her problems have resurged. These days the ten-year-old rarely travels to her school in Leeds willingly; some days she simply lies down in their driveway. The problem is not that she doesn't want to go to school, says her worried mother: "She just can't."

Though covid is no longer closing schools or requiring pupils to self-isolate, many children are still missing from their desks. So far this school year more than one-fifth of pupils in England have been "persistently" absent, a label that applies when a youngster misses at least 10% of their classes. (Other parts of Britain do not track attendance in the same way.)

That is almost twice the rate that was normal before covid. Some teachers had hoped this was a "blip" that would vanish as the pandemic faded, says Rob Williams of the National Association of Head Teachers, a union. But it looks as if lofty absence rates are sticking (see chart on next page).

This would be a problem even if the pandemic had not already hit children's learning. Pupils who miss even 15% of their lessons are half as likely as others to get five passes in the GCSE exams they take at age 16. Youngsters with very poor attendance rates are also vastly more likely to wind up in trouble with the police; perhaps 140,000 children are enrolled in school but actually in class less than half the time.

Pupils miss school for a whole gamut of reasons. The easy assumption, of truanting children unchecked by lax parents, is only part of it. Youngsters with special educational needs have long missed more lessons than others; they comprise only 16% of pupils in England but make up one-quarter of persistent absentees. Bullying and chaotic home lives make it less likely that children will go to school.

So does poverty. In the 2021-22 school year, almost 40% of the poorest children were absent more than 10% of the time, roughly twice the absence rate among richer peers. Even in good times poorer pupils miss school days because they lack uniforms or bus money, notes Beth Prescott of the Centre for Social Justice, a think-tank—and these are not good times.

The pandemic has amplified these problems (though British schools were at least quicker to reopen to pupils than their counterparts in America) and created new ones. Children who were already feeling unhappy at school may now feel they have even less chance of making the grade because of the lost learning. The sports activities and extra-curricular clubs that many pupils liked best are still sometimes squeezed by schemes aiming to accelerate academic "catch-up". ►

→ Also in this section

Mental health has worsened, among children and parents alike. A survey carried out by the National Health Service (NHS) last year concluded that one in six children aged 7-16 had a "probable mental disorder", up from one in nine in 2017. Steve Bladon, a former primary-school head whose own daughter has developed anxieties that prevent her from attending school, says it is not realistic to think that youngsters can all simply "crack on as they used to". He says living through the pandemic has "changed" many children.

Attitudes to schooling have shifted, too. Before the pandemic children generally accepted that school-going was inevitable, even when it was causing considerable stress. Long bouts of remote learning, on adults' orders, have shaken that assumption. Some autistic children found they were much better suited to studying at home than in school, reckons Ms Marsh; for those pupils in particular, going back to the old ways has been a wrench. Parents are more inclined than before to keep children at home if they sneeze or sniffle. A lot of parents now spend time working from home, notes Timo Hannay of SchoolDash, a data provider. That has reduced the inconvenience of a child not being in class.

Improving information about the problem is a government priority. Before the pandemic national absence rates were usually reported only once a term, and with a big lag. Now officials from the Department of Education are pulling data in real time from many schools' own databases; they have started to show teachers how their absence rates compare with those elsewhere. Boosters hope it will also become easier for schools to detect patterns of absence that suggest a child is struggling with more than the odd bug.

Deciding what to do with such information is tricky, in part because persistent absences have such a wide array of causes. Officials are encouraging schools which have very good attendance records to share tips with worse performers. The government has also begun paying "attendance advisers", some of them former head teachers, to spread best practice. That includes obvious but vital things such as setting high expectations for attendance and making school as engaging as possible.

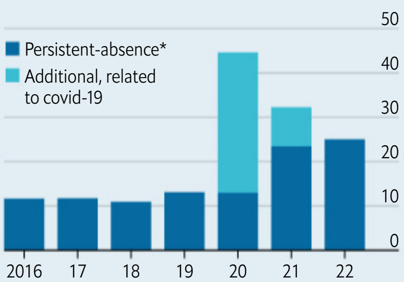
More compelling is a plan to hire and train "attendance mentors", people who work one-to-one with pupils who are frequently absent, in the hope of tackling problems that are keeping them out of class. This idea is sound but present ambitions are weedy, reckons Ms Prescott. The government's pilot programme, launched this year in Middlesbrough, will benefit only about 1,600 children over three years. Ms Prescott's organisation would like to see the government hire around 2,000 mentors nationally at a cost of £80m ($100m).

Making a real dent in the problem means fixing other overloaded systems. Long NHS waiting lists stymie access to children's mental-health services. Getting authorities to recognise a child's special educational needs—which unlocks funds and other help—often requires multiple appeals. While these problems linger, old-fashioned approaches, such as fining parents of absent youngsters, are unlikely to work. The pandemic's woeful impact on children has not run its course. ■

The missing

England, persistent-absence rate* in schools, %

Autumn terms



Source: Department for Education

*Missing 10% or more of possible sessions

The SNP

Thistle hurt

A deepening crisis in Scotland's ruling party

When Nicola Sturgeon suddenly announced her resignation as leader of the Scottish National Party (SNP) and first minister of Scotland on February 15th, she declared she wanted a more private life. If anything, the glare of attention has intensified.

On April 5th police arrested and released without charge Peter Murrell, Ms Sturgeon's husband, who also served as the SNP's former chief executive. Cops are investigating claims that £667,000 ($829,000) raised to support a second referendum on Scottish independence was improperly spent on other things. They confiscated a swanky motorhome from the driveway of Mr Murrell's elderly mother. On April 18th police arrested and released without charge Colin Beattie, the party's treasurer (who stepped back from the role the following day). The men are two of three "registered officers" on the party's accounts. The third is Ms Sturgeon; Holyrood is rife with speculation that she will be questioned, too.

Humza Yousaf, elected by SNP members to replace Ms Sturgeon on March 27th, appears powerless to contain the chaos. Unlike his imperious predecessor, Mr Yousaf cuts a rather passive figure. So far he has acted more like a bemused narrator of the mess rather than the new broom who will clean it all up. "I'll have to speak to Colin Beattie. My understanding is he's still in the police station being questioned," he declared, when first asked whether Mr Beattie could continue to sit on a party committee. "Yes, of course I'm surprised when one of my colleagues has been arrested," he added, in a quote for the ages.

Mr Yousaf was the source of the revelation that the SNP had been without auditors for six months, after the previous firm's resignation in October. He was unaware of that until he became leader, he said. His closest rival for the leadership, Kate Forbes, declares it all "mind-blowing". "We need decisive and quick action or we will be in trouble," she said, in what sounded like a job application.

News of Mr Beattie's arrest broke hours before Mr Yousaf delivered the first major policy address of his term, optimistically titled: "New Leadership, A Fresh Start for Scotland". Mr Yousaf did indeed ditch chunks of Ms Sturgeon's agenda. But that was not so much born of political conviction—he campaigned as her political apprentice—but because it wasn't working. A faltering bottle-deposit scheme will be delayed and plans to restrict alcohol advertising reconsidered. Of the second referendum Ms Sturgeon hankered for, there was not a word.

To the victor, the spoiled

Bagehot | Wot's up wiv Ingerlund?

If English nationalism is on the rise, no one has told the English

Little happens on St George's Day. There is no bank holiday on April 23rd to celebrate England's dragon-slaying patron saint. Traditions are few. Morris dancing, an English folk dance with bells and flailing handkerchiefs, is mercifully rare. A politician may post a message against a backdrop of an England flag. Tedious liberals point out that St George was Turkish and dragons do not exist. Beyond that, England's national day passes with no fanfare. England is absent.

Open a book, read a broadsheet newspaper or head to an academic conference, however, and England is everywhere. Britain is experiencing "a reawakening of English national consciousness", argued Jason Cowley in "Who Are We Now: Stories of Modern England". Englishness is "the motor force behind" ructions in recent British politics, say Alisa Henderson and Richard Wyn Jones, a pair of academics. Another author warns Britain "cannot survive English nationalism". This is a genre fond of quoting G.K. Chesterton's poetry: "Smile at us, pay us, pass us; but do not quite forget/ For we are the people of England, that never have spoken yet." According to the intelligentsia, the people of England are screaming.

If English nationalism is on the march, no one has told the English. Like the life of St George, the rise of English identity is largely myth, argues Sir John Curtice, a political scientist. Even after devolution of power to Scotland and Wales, Britain's departure from the EU, the rise and fall of the UK Independence Party and four straight Conservative general-election victories, the proportion of British people who identify as predominantly or only English has barely budged. If anything, it has fallen. In 1999, 31% of people fell into this bracket, according to the British Social Attitudes survey, the most comprehensive snapshot of opinion. In 2020, 22% did.

Chroniclers of English nationalism leapt on the 2011 census, which showed that a whopping 58% of residents in England identified as English only. Skip forward a decade and this number plunged to 15%. What caused this shift? A botched survey. In 2011 "English" was the first option and "British" was the fifth; in 2021 "Britain" came top of the list. If the patriotism of Englishmen does not extend to the lower box of a census form, it may not run deep.

The new nationalism is just as hard to spot in Britain's politics. It is often taken as a given that English nationalism was the driver of Britain leaving the EU. England makes up 85% of the country's population and, lo, it contributed 87% of the Leave vote. But English votes were not enough to win the referendum in 2016. Leave-supporting Scots (38% of Scottish voters) were needed, too. A majority of voters in Wales voted to depart. The votes of the 44% of Northern Irish residents who plumped for "Leave" were as valid as those cast in Kent. Brexit was British.

England whispers during national elections. The general election of 2015, when the Conservative Party wrapped itself in an England flag, is portrayed as a breakthrough for English nationalism. Adverts showing Ed Miliband, the then Labour leader, in hock to Scottish nationalists were everywhere. But Labour increased both its vote share and the number of seats in England that election. It was collapse in Scotland that broke the party.

By contrast, under Boris Johnson, the Conservatives offered a vision in which England was barely mentioned. In 2019 the Tories duly won their largest majority in four decades. Oddly, one of the few people to notice the switch from English to British patriotism was Donald Trump, an *idiot savant* who remarked: "I asked Boris, 'Where's England? You don't use it too much any more.'"

Resentful Englanders are supposedly jealous of devolved powers enjoyed by Scotland and Wales. It is strange, then, that support for an English parliament is still a minority pursuit. Only a fifth of English voters back one. A system called "English votes for English laws", whereby English MPs vet legislation affecting only England, was passed with much fanfare in 2015. In theory the idea was popular. Yet it was quietly scrapped in 2021. Few noticed; fewer cared.

An obsession with the wants of English voters is understandable. At the last few elections, a minority of flag-waving, Leave-voting, stoutly English voters proved a significant group in some seats. Leaving the EU upturned half a century of British policy, so delving into the motivations of Brexit's biggest fans made sense. But the British voter is large. He contains multitudes.

These days, if you say you're English, you're thrown on telly

In truth, Englishness has a weak hold on Britain. This is no surprise when the concept is so poorly defined. In "England Your England", George Orwell summed up the nation by reeling off sights common in any industrial country ("queues outside the labour exchanges") and values shared by many ("reverence for law"). The result leaves England's finest essayist sounding like Alan Partridge, a boorish fictional TV presenter who wrote a ridiculous poem about working-class life: "Giros, glue-sniffing, dogs on ropes/But I see people with dreams and hopes."

If Orwell stumbled, it is little surprise that today's writers fail. Two visions of English nationalism are offered. One defines it as a bitter ideology that detests its European neighbours and resents its Celtic partners. The other offers a more benign version of civic nationalism, with Gareth Southgate, the eloquent and intelligent manager of the England football team, as its patron saint. Englishness becomes little more than a conspiracy of male writers, desperate to combine their love of football with a degree in English literature. Neither picture fits the facts.

English nationalism is absent because there is no need for it. Nationalism flourishes when people feel thwarted. But what England wants, England gets. England, usually, prefers a Conservative government and so Britain, usually, has one. England wanted out of the EU, and Britain did leave. Having your own way is not a recipe for resentment. So on St George's Day, do the most English thing of all: forget about England. It still has not spoken yet. ■

Sudan in crisis

Sliding towards civil war

A warlord and a general are fighting for control of the capital—and the country

Each morning since April 15th, residents of Khartoum, Sudan's capital, have woken to the thunder of air strikes and the crackle of nearby gunfire. In just the first four days of fighting between the forces of two rival Sudanese generals, nearly 300 people have been killed (most of them civilians) and more than 2,600 injured. Armed men have been raiding and looting homes. "It's like 'Call of Duty'," says a resident whose house was struck by a bullet. Food, water and medical supplies are starting to run out.

The warning signs of an impending crisis were not hard to read. For months tensions had been building between the two most powerful figures in Sudan's military government: General Abdel Fattah al-Burhan, Sudan's de facto leader since a coup in 2019; and Muhammad Hamdan Dagalo (better known as Hemedti), a warlord. He is the leader of the Rapid Support Forces (RSF), a paramilitary unit that grew out of the Janjaweed militias accused of genocidal acts of murder and rape in Darfur. Many warned of an impending clash between the RSF and the government's Sudanese Armed Forces (SAF) loyal to General Burhan.

The crisis worsened fast in the morning of April 13th, when residents of Merowe, in northern Sudan, saw soldiers from the RSF rolling through town and taking up positions around the airport, a base for fighter jets. In response, SAF soldiers surrounded the RSF men and reportedly ordered them to withdraw. Soon the government warned of an imminent confrontation between the two forces, as did representatives of America, the European Union and several other Western governments. Over the next 24 hours, diplomats dashed between the two camps trying to head off a conflict. In Khartoum, residents braced for the worst.

It came early in the morning of April 15th as fighting broke out between the SAF and RSF. Each side accused the other of shooting first. According to the national army, Mr Dagalo's forces had launched a rebellion against the state. The RSF replied that the army had in fact launched a "sweeping attack" against its members. Mr Dagalo called his boss a "criminal" who would either be captured or "die like a dog". Both sides claimed to have swiftly gained the upper hand.

Within hours of the first shots being fired, tanks were driving through the streets of central Khartoum as fighter jets screamed overhead. As the air force bombed RSF bases, the RSF attacked the international airport; videos circulating online showed thick clouds of smoke rising from the tarmac. Clashes have occurred in the area around the state broadcaster and the presidential palace. Soldiers from both sides fired rockets near residential homes where civilians cowered. "We are hearing very heavy artillery," said one resident of ▸▸

→ Also in this section

central Khartoum by text message. "The voices and sounds are terrifying."

Fighting has also spread to other parts of Sudan (see map). Almost immediately the RSF claimed to have captured the airport at Merowe. Heavy gunfire was also reported near the el-Obeid air base in the North Kordofan region, as well as in multiple places in Darfur; three UN aid workers were killed in clashes between the two armies in the city of el-Fasher. It is still unclear whether the conflict will blow up into a full-scale war. But neither man appears inclined to stop the violence and negotiate. Temporary ceasefires brokered by mediators have collapsed in minutes.

Behind the latest clashes is a struggle for power between General Burhan and Mr Dagalo, and between the complex constellations of political parties, militias, rebel leaders and foreign powers allied to them. This is a fight over who will control the direction of Sudan's political transition, which began four years ago with the overthrow of the brutal Islamist regime led by the former dictator, Omar al-Bashir.

Cities with reported clashes between the SAF and RSF April 15th-18th 2023

Source: OCHA

Democracy crushed

Mr Bashir was forced out of power in 2019 after months of protests led by an alliance of pro-democracy activists. Sensing Mr Bashir's time was up, his own generals—among them General Burhan and Mr Dagalo—staged a coup to eject him. Protest leaders and the armed forces then struck a power-sharing deal which was supposed to lead to elections and a civilian government. But Mr Bashir's divide-and-rule tactics, honed over his three decades in charge, left behind a time-bomb: a motley group of militias and armed factions now jockeying for power.

The most powerful and prominent is the RSF. Mr Bashir created it as a counterweight to the army and the intelligence service, with its own command structure and funding. The man at its helm, Mr Dagalo, makes no secret of his ambition to rule.

Neither does General Burhan, who also rose to prominence under Mr Bashir and sees himself as custodian of the army's interests, including its sprawling business empire. Sudan's armed forces have dominated its politics since independence in 1956. Both of the country's previous experiments in democracy—in 1964 and 1985—were crushed by soldiers. General Burhan, who is also backed by powerful Islamist groups linked to Mr Bashir's regime, dealt democracy its latest blow in 2021, when he carried out a second coup against the civilian leaders of a transitional government set up after the ouster of Mr Bashir. The country has been in turmoil ever since.

In December, leaders of the civilian bloc and the junta signed a provisional accord promising a fully civilian government and elections in two years. If implemented, it would help Sudan's collapsing economy by opening the door to foreign aid and debt relief. But it would also mean the integration of the RSF into the SAF, and the creation of a single national army under civilian oversight. A final agreement was due to be signed in early April.

The prospect of a settlement appears to have hastened a showdown. Both men stand to lose from the agreement, which would reduce the power of the armed forces in politics and the economy. Loth to hand over command of his force, Mr Dagalo insisted on being given a decade to integrate the RSF into the national army, while still claiming that he supported the agreement. General Burhan is said to have wanted this to happen within two years in order to defang his rival and to ensure the pre-eminence of the SAF.

More fundamentally, neither he nor the Islamist old guard around him would accept any deal that really curbed the SAF's business interests. Mr Dagalo's additional demand, in the most recent round of negotiations, that more than 800 senior officers be removed from the SAF as part of the integration process, was "simply too much" for General Burhan, notes Jonas Horner, an expert on the region. In early April an Islamist official from Mr Bashir's party, now outlawed, told Reuters that their group was trying to prevent the pending deal.

Islamists within the army may therefore have decided to launch a quick strike in order to "reassert Islamist control over the transition and the country", argues Mr Horner. In recent months both sides have steadily built up their forces and reinforced their positions in the capital and other strategic places. Tanks were spotted moving over the Nile in Khartoum. General Burhan and Mr Dagalo were said to be no longer on speaking terms in the days before the start of the fighting.

The danger of a wider conflagration is considerable. Both the SAF and the RSF have extensive ethnic and patronage networks across Sudan. The Islamists around General Burhan are especially well entrenched in the Sudanese state and economy. As both of these unravel, lawlessness is spreading. In Khartoum, gunmen fired on an American diplomatic convoy and attacked the EU's ambassador in his home. In Nyala, South Darfur, armed men on motorbikes are robbing people in the streets, says Mohammed Osman of Alberdi, a Sudanese rights group. Warehouses belonging to aid agencies have been stripped bare.

The involvement of other countries in the region could also complicate matters. Mr Burhan has the political support of neighbouring Egypt. He may also have its military backing. The *Wall Street Journal* reported that an Egyptian jet had struck an RSF ammunition dump. Videos released by the RSF on April 15th showed captured Egyptian soldiers or pilots and jets at the Merowe air base. Egypt denies any military involvement in the conflict.

Mr Dagalo, by contrast, is close to Khalifa Haftar, a Libyan warlord, and to Issaias Afwerki, the president of Eritrea, who has a long history of meddling in the affairs of his neighbours. Mr Haftar has reportedly sent a shipment of arms to the RSF. Both Mr Haftar and Mr Dagalo have been backed by the United Arab Emirates (UAE) in the past, and RSF troops have fought for Saudi Arabia and the UAE in their war in Yemen.

In a clear bid to win Gulf support for his own war, Mr Dagalo claims he is fighting against "radical Islamists who hope to keep Sudan isolated". So far neither man appears to be doing much to stop the fighting. Mr Dagalo has also ludicrously claimed he is fighting to "protect democracy and uphold rule of law", omitting to mention that in 2019 the RSF massacred more than 100 peaceful pro-democracy protesters.

In the balance

It is still too early to tell which side will prevail. The national force controls the skies, which is why Mr Dagalo's men seem to have concentrated on seizing Sudan's airfields. It also has tanks and the heavier weaponry. But in Khartoum neither appears to have landed a decisive blow. Perhaps if Mr Dagalo is eventually run out of the capital, he will try to hole up in his tribal base in Darfur. That risks turning what is for now a narrow fight between two factions into a wider civil war between regions and ethnic groups. But if he is killed, the RSF could splinter, which might be a recipe for anarchy.

None of this bodes well for Sudan's troubled but once hopeful transition to democracy. Unable to see any light at the end of the tunnel, civilians caught in the middle are now trying to flee Khartoum to seek safety in the countryside. "We don't back either side," says Ahmed Ismat, a protest leader in Khartoum. "Any war means the end of the revolution." ■

Petty corruption in Africa

Synonyms for sweeteners

ABUJA

How to ask for a bribe without asking for a bribe

"CORRUPTION IS OUR biggest enemy and is not welcome here." So goes the slogan of Malawi's most recent anti-graft campaign. Similar messages can be found in public places in many other African countries. In some, such as South Africa and Kenya, citizens are encouraged to call hotlines to report kickbacks.

In most African countries citizens tell pollsters that graft is getting worse. High-profile scandals among bigwigs are one reason for that, though it may also be that dodgy deals are being uncovered more often, rather than becoming more common. For most people, though, it is because they still face regular shakedowns from officials and the police. Fully one in four Africans who used public services or interacted with police told pollsters they had paid a bribe in the previous year, according to a report in 2019 by Transparency International, a Berlin-based NGO. Still, widespread anti-corruption efforts do at least pose awkward questions to the determinedly unscrupulous. For example, how do you best ask for a bribe when you are sitting under an anti-corruption poster?

Some still trust in impunity. "Give me something," demands a woman X-raying bags at Enugu airport in Nigeria, conceding impressively little to anti-graft efforts. Others make small concessions to subtlety. "Can you help me?" asks an immigration officer in Abuja, Nigeria's capital.

Others seem to have grown wary of making blunt demands amid the campaigns against graft. One approach is to talk about something other than money. Some officials, for example, like to keep citizens well abreast of their food and drink preferences. "I really want to drink a Nescafe," declares an airport security guard six times as he frisks your correspondent in Burkina Faso. In Uganda traffic police find ways to mention their favourite soda. In South Africa such requests are so common that bribes for driving offences are known as "cold drink money".

Those wishing for a little more deniability like to imply the drink might not be for them. In Kenya police sometimes ask for *chai ya wazee* ("tea for the elders"). In Nigeria police officers might suggest that they are simply trying to do their job by saying they need fuel for their patrol vehicle. All still expect cash.

Skilled exponents of extortion often approach their targets with an amiable air. "Are you my friend?" asks a smiling traffic cop in Nigeria. Having elicited a solicitous "Yes, sir", he swiftly delivers his demand for a bung. Others mix a measure of concern with a pinch of menace. "We are here for you," says a policeman to a motorist, even as he prevents him from moving on.

Religion can be surprisingly useful to those looking to subtly request a sweetener. Some might invoke Christian charity with an innocent-sounding inquiry: "Anything for Sunday?" Others cloak their extortion as a request to "bless the table."

Foreigners can sometimes feign ignorance by, for instance, taking the request for a drink literally by handing over a bottle or promising to return with a can when next passing that way. Those who come from rich countries are seldom pressed too hard, since arresting or roughing them up would lead to consular protests. Many locals, alas, have no such privilege. ■

Arabs and Israelis in Sinai

Wanderers in the desert

SINAI

Hostility to Israel makes Arabs loth to visit the Holy Land

THE INDIGO FESTIVAL near the seaside southern foot of Egypt's Sinai peninsula sounded jolly enough. Its organisers promised five days of "psychedelic music, sun and sea" in a mood of peace and love. Yet the fiesta has proved controversial, largely because the show was being run by Israelis. The Egyptian branch of a global campaign to boycott and divest from Israel denounced the organisers as "racist Zionist occupiers". After Israeli police recently clashed with young Palestinians near Jerusalem's al-Aqsa mosque, the festival was axed. Israeli-Arab tourism is still blighted by politics and tensions over Palestine.

Similar jamborees on Sinai's southern coast, an easy drive from Israel's border crossing at Taba, have become increasingly popular with Israelis, partly because they are cheaper than in Israel. Almost 700,000 Israelis visited southern Sinai last year. Tourists from Cairo and Tel Aviv rub along happily at the diving centres and beach resorts on the Red Sea. Some local Egyptian businesses advertise their wares in Hebrew and take payment in Israeli shekels. Visitors can buy T-shirts that say "I love Dahab", one of the most popular spots, in Hebrew.

At the water's edge

Some Egyptians, however, are less keen. Last year many were irked by photos of an Israeli flag on the beach during the Hashmaliko festival. Egypt's anti-Israel twitterati raged at two other gigs held in the week when their compatriots celebrated Sinai Liberation Day, marking the end of Israel's occupation of the peninsula in 1982. Organisers' efforts to promote such occasions as peace-building bridges between the two cultures have failed—especially since Egyptians are often not allowed to buy tickets.

Few Arabs across the wider region seem interested in beachside bonhomie. The Israeli tourist industry hoped that the Abraham accords of 2020, which officially normalised Israel's relations with Bahrain, Morocco, Sudan and the United Arab Emirates (UAE), would cause an influx of holiday-making Arabs keen to see the Holy Land. It hasn't happened.

One reason is Arabs' continuing anger about the Palestinians. Most Egyptians abhor the treaty that made peace with Israel in 1979. Polls say the share of Emiratis who view the Abraham accords favourably dropped from 47% when they were signed to 25% at last count.

Still, the accords have encouraged Israelis to head for the Gulf. Last year 150,000 of them visited the UAE. A few chanced a first-time visit to Bahrain. But Israeli tourism to Egypt beyond Sinai has still not taken off. Last year a mere 45,000 Israelis flew directly to Cairo.

Even fewer Arabs visited Israel as tourists. Those from Egypt, Jordan, Morocco and the UAE, which provided most Arab visitors, numbered just 26,400, compared with 2.7m from elsewhere in the world; 5,100 were Egyptian and 1,600 Emiratis. Bahrainis, says Israel's tourism ministry, were "too few to count".

Yemen

Time we stop

DUBAI

A measure of peace will not transform a Yemen falling to pieces

THEY WERE rare scenes of joy in a war that has brought eight years of misery. For three days lines of grinning men (and the occasional woman) stepped off Red Cross planes in Sana'a and Aden, the biggest cities in Yemen. After years in captivity, some looked the worse for wear: faces drawn, black hair turned grey. But they were eager to embrace family members and celebrate their new-found freedom.

A total of 887 people were released in this month's prisoner swap between the Houthis, a Shia rebel group that controls much of Yemen (see map), and the Saudi-led coalition that has been fighting them for eight years. Immediately after the exchange was complete, the Houthis mooted another, larger one. It was a further sign that both sides are nearing a deal to end their war. But peace in our time this is not: more likely it is the end of one conflict and the start of another.

It has been the most pointless of wars. At first Saudi officials said "Operation Decisive Storm" would remove the Houthis within weeks and restore Yemen's internationally recognised government. That was 421 weeks ago. A Saudi-led bombing campaign has killed around 9,000 civilians, including guests at a wedding, children on a school bus and mourners at a funeral. The United Arab Emirates (UAE), the coalition's most effective army, began to withdraw most of its troops in 2019 after it concluded the campaign had reached a stalemate.

Where they once sought to overthrow the Houthis, the Saudis now have one overarching priority: to end their own involvement in the war, and the torrent of cross-border missiles and drones it has invited. The Armed Conflict Location and Event Data Project, an American monitoring group, says the Houthis have carried out more than 1,000 rocket or missile attacks on Saudi Arabia and flown at least 350 drones into the country since the war began.

Coming home to stay

Their attacks have become steadily more accurate: just 15% of them used guided munitions in 2015, a number that rose to 89% last year. Fatalities have been rare. Reputational damage has not. Last year the Houthis struck an oil depot in Jeddah days before the city hosted a Formula 1 race. The Saudis want to attract investors and tourists to help diversify their economy. Ballistic missiles tend to scare off both.

The cross-border attacks worked. After months of talks, on April 9th a Saudi delegation landed in Sana'a, the Yemeni capital, to discuss terms. The first step will probably be to extend a temporary truce agreed last April. Though it expired six months later, both sides have more or less continued to abide by it, and it may now be made permanent. The Houthis also want the Saudi-backed government to pay salaries for civil servants in areas they control.

For the Houthis, victory will be Pyrrhic. They survive to rule a ruined country. Fully 80% of its 30m people rely on foreign aid, and between 2015 and 2020 disease and famine killed at least 131,000. They have forced children into service as cannon fodder, stolen foreign aid, repressed women and turned schools into factories for indoctrination. None of this has endeared them to the populace.

The group has been fighting a civil war against the Yemeni state since the 1990s. Many Yemenis fear it will continue, despite any peace deal. The Houthis have offered vague words about power-sharing. "If we were not looking for full control during the war, then we will not look for full control at any other time," Mohammed Ali al-Houthi, one of the group's leaders, told CNN. A keen observer might recall that, during the war, the Houthis seized the capital in central Yemen and the main port in the west, then tried to capture Aden in the south and oilfields in the east, which looks an awful lot like vying for full control.

Add to that a bewildering mix of other disputes. Rebels in the south, who enjoy support from the UAE, want their region to be independent, as it was from 1967 to 1990. Militias on the west coast want some measure of autonomy. So do those in Hadhramaut, in the south-east, an area that has long had a distinct identity from the rest of Yemen. These groups found a degree of common cause against the Houthis, but their unity may dissolve if they no longer perceive a shared threat.

Yemen has long been hard to govern. With so many foes and so little wider popular support, the Houthis will probably find the task impossible. The country will go on fragmenting. The Saudis did not want a hostile regime on their southern border. But what they and their allies have helped create in the past eight years—a patchwork of competing militias and ungoverned spaces—is hardly better. ■

Fox News

Now what?

NEW YORK

The whopping settlement paid by the conservative entertainment channel may not change its loose approach to something resembling journalism

RESPECT THE audience; make money. That was how Rush Limbaugh explained his success on conservative talk radio in the early 1990s. Educated types derided his listeners—religious, working-class people—but he affirmed them and made things devilishly fun. The charge that he delivered "marching orders" to "mind-numbed robots" had it all wrong, said Limbaugh, who died in 2021. Rather he listened to his listeners, and voiced their convictions. It was wonderful for ratings. "This is a business!", he once exclaimed.

Some 30 years on the same principle drives Fox News, the cable-news network that brought Limbaugh's right-wing, populist sensibility to TV and, on April 18th, settled a mammoth defamation lawsuit over its coverage of the 2020 election. Dominion Voting Systems, a voting-technology firm, had sued for defamation, accusing the network of knowingly spreading a lie that Dominion's machines somehow threw the election to Joe Biden. Not since the phone-hacking scandal at the *News of the World*, a now-defunct British tabloid, had an outlet in Rupert Murdoch's media empire landed in such a legal mess.

Fox will pay Dominion $787.5m, about half of what Dominion had first sought in damages. That figure dwarfs what is thought to be the second-largest defamation settlement involving a news outlet, the $177m paid by ABC News in 2017 to a meat producer whose products it reported were unsafe. The deal was struck moments before a trial was due to start in Delaware. That Dominion's lawsuit had proceeded so far was itself remarkable. Defamation cases are notoriously hard to win in America—defendants must be shown to have knowingly published a lie (the legal standard is "actual malice")—deterring would-be plaintiffs from bringing them.

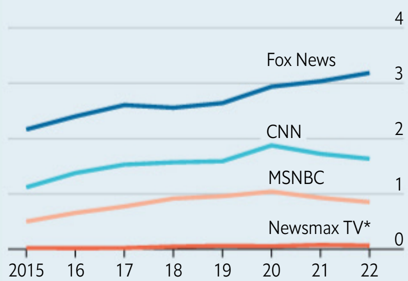
But what really made *Dominion v Fox* extraordinary were its revelations ahead of the trial. The lawsuit laid bare—through the release of emails, texts and depositions of Fox staff and management—the extent to which America's most popular cable network's coverage is shaped by a desire to tell its audience what it wants to hear and also by what its competitors are up to. And the case shed light on Fox's fractious relationship with the politician loved by many of its viewers, Donald Trump.

Fox's trouble started on election night. To Mr Trump's dismay it was the first outlet to call Arizona, a swing state, for Mr Biden (correctly). Later several Fox reporters challenged Mr Trump's claims that there had been widespread voter fraud. Such acts of journalism infuriated the outgoing president, who urged his supporters to switch to Newsmax and One America News, two upstart, fringe networks. That day the share price of Fox News's parent ▸▸

What does Fox say

United States, cable news networks

Estimated distribution & net advertising revenue, $bn



*Does not charge a licence fee

Source: S&P Global Market Intelligence

company, Fox Corporation, shed 6%. Many of his voters duly changed the channel. About two weeks after the election Newsmax's prime-time audience had tripled, to 412,000. Fox's fell by 37% to 3.5m.

Fox got on a "war footing", in the words of one executive. Suzanne Scott, the network's boss, vowed to "plant flags letting the viewers know we hear them and respect them". A journalist who had corrected election-fraud lies was chastised. So was another whose reporting higher-ups deemed "smug". "I can't keep defending these reporters who don't understand our viewers," wrote Ms Scott. The editor in charge of the Arizona decision was fired at the suggestion of Mr Murdoch, chair of Fox Corporation, who called the dismissal "a big message with Trump people".

Meanwhile Mr Trump's lawyers, Sidney Powell and Rudy Giuliani, sat for chummy, credulous interviews. They said that Dominion was owned by a Venezuelan company founded to rig elections for Hugo Chávez, and that the firm paid officials to alter votes. Both claims were made up. Privately people at the network called Ms Powell and Mr Giuliani kooks, full of "crazy stuff". But the audience ate it up. "Any day with Rudy and Sidney is guaranteed gold!", wrote a producer to colleagues.

Court filings showed how quickly the network moved to appease Trumpy viewers and fend off outlets like Newsmax, whose ratings then fell back. (Their threat has thoroughly subsided: big cable distributors no longer carry One America News, and Newsmax was briefly dropped by DirecTV, a satellite provider, in January.) The filings also showed the extent of disdain that both Mr Murdoch and Tucker Carlson, the network's star host, had for Mr Trump. "I hate him passionately," Mr Carlson wrote to a colleague a few days before the Capitol riot. "What he's good at is destroying things. He's the undisputed world champion of that. He could easily destroy us if we play it wrong." A couple of months earlier, Mr Murdoch wrote that Mr Trump was "increasingly mad".

Having followed the audience, as Limbaugh advised, Fox then attempted to lead it. For at least three months the network did not grant Mr Trump an interview, and tried hard instead to boost Florida's governor, Ron DeSantis. Aides to Mr DeSantis have fed story ideas and talking points to Fox, according to records obtained by the *Tampa Bay Times*. Mr DeSantis appeared on the network nearly once a day for months after the election of 2020. It is the kind of collaborative relationship Mr Murdoch seeks with conservative politicians and so unlike that with Mr Trump, who openly criticises the network on social media.

But the audience would not be led. During hearings of the January 6th Committee, the FBI's raid on Mar-a-Lago, or Mr Trump's indictment by Manhattan prosecutors, Fox rallied to Mr Trump's defence. "They can't move until their audience moves," says Nicole Hemmer, a historian of conservative media at Vanderbilt University. Mr Murdoch appears to agree. "[Leading] our viewers…is not as easy as it might seem," he wrote after the Capitol riot. Mr Carlson recently gave an hour-long cuddle of an interview to Mr Trump.

All of which is fascinating for students of Fox and its influence on the American right. But what of the lawsuit's damage? The network can pay the settlement, which is about a quarter of what analysts estimate that Fox News earned in revenue last year. Otherwise the impact is negligible, says A.J. Bauer of the University of Alabama. Viewers will not have heard much about the lawsuit on Fox, since the network barely covered it; those who caught wind of it elsewhere were primed to take Fox's side. "I don't see any reason why the lawsuit changes the way that Fox does business because the way it does business makes it money," says Mr Bauer. Though the network acknowledged the court's rulings finding certain claims about Dominion to be false, it will not have to air any retractions or corrections. A doublespeakish statement from Fox said the settlement reflected its "commitment to the highest journalistic standards".

More legal trouble awaits Fox over its coverage of the 2020 election. Smartmatic, another voting-technology firm, is suing the company for $2.7bn. "Dominion's litigation exposed some of the misconduct and damage caused by Fox's disinformation campaign," said Smartmatic after news of Dominion's settlement. It promised to "expose the rest". ■

Abortion

Rulings have consequences

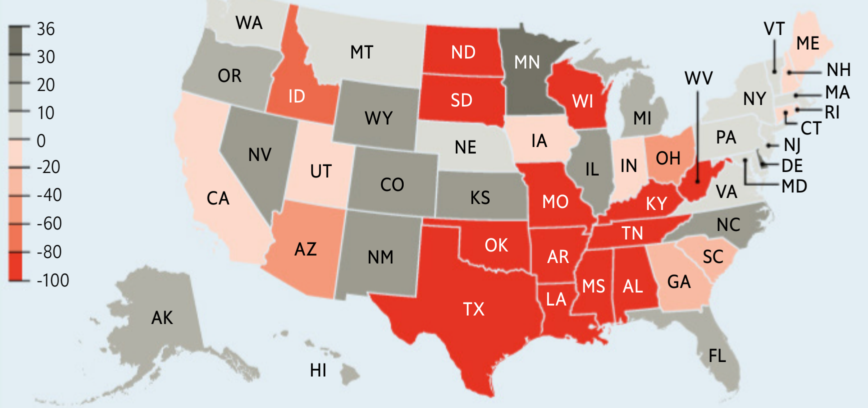
Abortions have become 6% rarer since the end of Roe v Wade

After the Supreme Court issued its ruling in *Dobbs v Jackson Women's Health Organisation* last June, which reversed its decision in *Roe v Wade* and let states ban abortion, the biggest remaining question was what effect the change would have. On paper, *Roe* established a nationwide right to abortion. However, conservative states had already implemented rules before *Dobbs* that made abortions, though technically legal, very hard to obtain. Liberal states, in contrast, were unlikely to impose new restrictions. Were *Roe*'s protections worth as much in practice as in principle?

In the past, state-level data on the prevalence of abortion were patchy. But a report released by the Society of Family Planning (SFP), a non-profit group, quantifies the effect. From July to December 2022 there were 31,180 fewer abortions than pre-*Dobbs* rates would suggest, a decline of 6%. That is despite a rise in abortions administered by virtual clinics, which prescribe abortifacient drugs like mifepristone (which the Supreme Court has temporarily protected).

In early 2022 SFP began compiling a ▸▸

Roe did go
Change in average number of abortions
Apr-May to Jul-Dec 2022, %



Source: Society of Family Planning

database of every clinic, medical office and hospital known to perform abortions. It asked each one to calculate monthly abortion counts, and offered to pay expenses for data collection. Of the organisations contacted, 83% submitted numbers. SFP produced estimates for the remaining 17%.

The overall decline understates the effect *Dobbs* has had in much of the country. Across the 22 states where new restrictions took effect following the ruling, the number of abortions fell by 67,040 (63%). Even in states with tight pre-*Dobbs* restrictions, the decision's impact has been vast. After Texas implemented a law in 2021 that banned abortions once a fetal heartbeat could be detected, its abortion rate fell from 5,400 per month to 2,200. In April 2022 SFP recorded 2,700 abortions in the state. But between July and December 2022 it has logged fewer than 100. Abortion has also all but disappeared in seven other states, including four in the South.

In states with more permissive rules, in contrast, abortions rose by 35,860 (12%). This suggests that slightly more than half of women who would have had abortions in restrictive states before *Dobbs* travelled elsewhere to obtain them. The remaining 31,180 either carried their pregnancies to term or obtained abortions by methods that do not appear in SFP's data.

The states with the greatest increases tend to share borders with places where abortion has declined or vanished. Now that Wisconsin bans the procedure even in cases of rape or incest, abortion rates in neighbouring Illinois and Minnesota have risen by 21% and 36%. Similarly, Florida and North Carolina have become havens for abortion in the South—though Florida, home to half of the region's remaining abortion clinics, is about to reverse course. On April 13th it banned abortion after six weeks of pregnancy.

Perhaps the most striking finding is that abortion has become rarer even where courts have temporarily protected it. In Indiana, a judge blocked a near-total ban just one week after the law went into effect. Even though the procedure remains legal for now, Indiana's abortion rate plummeted: in December 2022 it was 40% below its pre-*Dobbs* level. Similarly, in the three months after a court in Ohio issued an injunction pausing an abortion ban, abortion was 23% rarer than before *Dobbs*.

Often, it is money that determines whether a woman can travel to obtain an abortion. In their dissent in *Dobbs*, the Supreme Court's liberal justices warned that letting states choose their own rules would be "cold comfort…for the poor woman who cannot get the money to fly to a distant state for a procedure". The data appear to support their prediction: of the 13 states where abortions have fallen by at least 80%, seven are among the ten poorest. ■

Automotive imports

What a Kei-motion

CHICAGO

Rural Americans are importing tiny Japanese pickup trucks

A COUPLE OF years ago Jake Morgan, a farmer who lives just outside Raleigh, in North Carolina, realised he needed a new vehicle to get around his property. At first he was looking at "side-by-sides"—a sort of off-road utility vehicle. But watching a review on YouTube of one that costs around $30,000 made by John Deere, he saw a comment that said something like "Why don't you just get a minitruck instead?" That is, a tiny four-wheel drive pickup truck, sometimes known as a "Kei" truck, mostly made in Japan to take advantage of laws there which tax smaller vehicles less.

Intrigued, Mr Morgan started researching. Within a few months, he drove to Newport, Virginia to pick up a 1997 Honda Acty, having spent a total of just $2,000 on importing it. He was delighted. Not only was it "dirt cheap", but the Acty is less than five feet wide, and so can get into tight spaces a normal pickup cannot, like Mr Morgan's barn. And unlike a side-by-side, it can also be driven legally on local roads. "They're amazingly useful," he says. Not long after importing his first, he sold it and bought another. The new one is even better—it has air-conditioning and a button which activates a dumper.

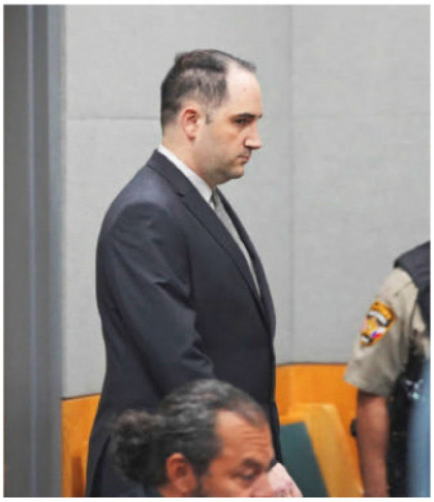
Kei trucks were never intended for sale in America. Most are right-hand drive, and they do not always have airbags or other safety features required in new cars. The bulk are imported under a rule that allows non-compliant vehicles that are older than 25 years to be brought into America, a carve-out intended originally for collectible vintage cars, although a few specialist dealers import newer ones too, for sale as off-road vehicles. They fill a niche American manufacturers are failing to.

Todd Gatto, one of the owners of HVNY Imports, a firm in Goshen, New York, says that he has sold over 300 to local businesses in the past few years. "We bought five of them to start, and we sold them all within seven days," he says. Buyers include farmers, but also building contractors, a deli and Legoland, the theme park. "A lot of commercial businesses see the use of these over an $85,000 F250," he says (the F250 is an enormous pickup truck sold by Ford).

Unlike new vehicles with onboard computers and complicated proprietary parts, Kei trucks are easy to modify and repair. In northern Wisconsin and Minnesota, people fit them out with tracks to drive on ice in winter. Some owners are almost cultish. "MotoCheez", a mechanic from Connecticut, says his YouTube channel's popularity soared after he started featuring his Kei truck.

As the demand grows, some worry that the loopholes that allow their import and use might be closed. Dealers increasingly report trouble getting the vehicles registered for road use, particularly in north-eastern states. Safety concerns are part of the reason. Mr Morgan admits his would be a "death trap" on a busy highway. But some fans suspect an auto-industry stitch-up to keep out cheap Japanese competition. If so, it would not be the first time.

Nothing to prove



The Daniel Perry case

Of arms and harms

DALLAS

All should be armed—and anyone with a weapon poses a mortal threat

In 2020 Daniel Perry (pictured), who was working as an Uber driver in downtown Austin, drove towards a group of "Black Lives Matter" protesters with a revolver in his car. One of the protesters, Garrett Foster, who himself was legally carrying an AK-47 (a detail which in any other country would suggest a war was under way), approached. Mr Perry shot him five times, killing him. Mr Perry argued that he shot Foster in self-defence, because Foster aimed his gun at him.

A jury disagreed with Mr Perry's self-defence claim, convicting him of murder on April 7th. The next day Texas's governor, Greg Abbott, announced his desire to pardon Mr Perry. The move is highly unusual. Mr Perry has not been sentenced and is awaiting a recommendation for a pardon from the state's Board of Pardon and Paroles, whose members Mr Abbott appointed. Both Mr Perry and Foster are white. Foster was an Air Force veteran; Mr Perry was an active-duty soldier. The biggest difference seems to have been their affiliation to different political tribes.

What transpires is worth watching because of what it reveals about Texas and America writ large. First, it shows the strong influence certain media can exert over politicians. Mr Abbott supported pardoning Mr Perry within a day of Tucker Carlson, an influential commentator on Fox News, bemoaning the "legal atrocity" of Mr Perry's conviction and calling out Mr Abbott for believing that "there is no right of self-defence in Texas."

Mr Abbott does not want to seem insufficiently conservative to the Republican base or legislators in Texas, as he pushes his legislative priorities at the Capitol in Austin, says Mark Jones, a professor at Rice University. Coming to Mr Perry's defence also raises Mr Abbott's national profile among Republican voters as he eyes higher office, with Mr Perry's case tying together several of their favourite issues, such as gun rights and distrust of "woke" protesters and progressive district attorneys. (José Garza, the DA for Travis County, which includes Austin, was supported by an outfit funded by George Soros.)

Second, the Perry case points to a growing "pattern of politicising self-defence", says Eric Ruben of Southern Methodist University's Dedman School of Law in Dallas. In recent years politicians have been more willing to wade into contentious cases. Donald Trump offered positive character assessments of Kyle Rittenhouse, a man who shot three people, killing two (he was acquitted of all charges), and Mark McCloskey, who, alongside his wife Patricia, brandished guns at Black Lives Matter protesters from their front porch. (The McCloskeys pleaded guilty to misdemeanours but were pardoned by Missouri's governor.) Some pundits and politicians on the right are saying Mr Perry should never have been prosecuted. The notion that self-defence should "immunise" someone from prosecution is "radical" and a departure from legal norms, says Mr Ruben.

The evidence, let alone the jury's unanimous verdict convicting Mr Perry of murder, make this a bizarre case for the right to uphold as a clear instance of "self-defence" anyway. Mr Perry sent a message to a friend saying that he might "have to kill some protesters on his way to work", and when his friend suggested he should use ammunition wisely, so as not to run out, he replied that he would "only shoot the ones in the front and push the pedal to the metal". In his early debriefing with the police, after reporting that he had shot Foster, he said he "believed" Foster was going to aim his gun at him, not that he already had.

Mr Perry would have lacked potential grounds for a defence, and pundits a platform for outrage, were it not for Texas's "stand your ground" law. Under common law, people have the duty to retreat if possible when threatened, and force is meant to be proportionate to the threat. But since the mid-2000s, starting in Florida, states have been passing laws that give people the right to use deadly force if they feel threatened, even outside their home. Today around 30 states have "stand your ground" laws in place. Mr Perry's murder trial is only one example calling attention to shootings in the name of self-defence; a 16-year-old boy, Ralph Yarl, who recently rang the doorbell of the wrong house in Missouri and was shot twice, is another.

The convergence of broad "stand your ground" laws and more permissive gun laws is a toxic combination, says Kami Chavis, a professor at William and Mary Law School. Messrs Perry and Foster were both armed when they encountered each other, thanks to Texas's lax gun laws. But there is an inconsistency in the logic of Mr Perry's supporters, who say that he justifiably felt threatened and needed to act in self-defence because his victim was carrying an assault rifle. That fear would have had no basis if the open carrying of assault rifles was banned. Gun-rights activists "have to be intellectually consistent in their application of these principles," says Ms Chavis. "Just because you're armed doesn't mean you're a threat." ■

Religious freedom

Postal piety

WASHINGTON, DC

The Supreme Court weighs religious accommodations in the workplace

When Gerald Groff took a job as a pinch-hitting mail carrier for the United States Postal Service in 2012, his strict observance of the Christian sabbath posed no problem. But after the USPS started doing business with Amazon a year later—delivering the internet giant's packages every day of the week—those Sabbatarian commitments became an issue. Mr Groff's rural-Pennsylvania bosses found ways to accommodate him for a time, but colleagues grew weary of taking his shifts and he was instructed to report on Sundays. Mr Groff refused, drawing letters of reprimand and suspensions. Eventually, in 2019, he quit.

Mr Groff lost twice in lower courts when he claimed USPS had violated the bar on religion-based discrimination in Title VII of the Civil Rights Act of 1964. On April 18th, when *Groff v DeJoy* came to the Supreme Court, justices from right to left—and lawyers for both parties—found some common ground. All agreed the court was mistaken in 1977 when it wrote, in *Trans World Airlines v Hardison*, that companies need not "bear more than a *de minimis* cost" when offering religious accommodations. This formulation, to everyone's mind, failed to uphold Title VII's promise that businesses must accommodate such religious requests unless they inflict an "undue hardship on the conduct of the employer's business".

Trying to save *Hardison* from its universally disdained *de minimis* test, Justice Brett Kavanaugh pointed to a footnote in the decision clarifying that only a showing of "substantial" costs could relieve an employer of the duty to make room for an employee's religious practice. Justice Neil Gorsuch built on this in colloquy with Elizabeth Prelogar, the solicitor-general, who defended the postal service. Both parties agree that whether a business must offer an accommodation is "context-dependent", he said, and that civil-rights protections must be robust, not "trifling". And, Justice Gorsuch suggested, there may not be much daylight between "significant difficulty or expense" (Mr Groff's proposed standard) and "substantial cost" (*Hardison*'s). So why, Justice Gorsuch asked, shouldn't the Supreme Court just clarify that, send the case back to the lower court and therefore "be done with it"?

Justice Elena Kagan threw some chilly water on this ostensible solution. All the "kumbaya-ing" in the abstract is lovely, she said, but the parties still disagree about whether Mr Groff had a right to take every Sunday off—and, more broadly, there is currently a big difference of opinion between the parties "as to which cases require an accommodation".

Ms Prelogar argued that Title VII does not require a company to provide an accommodation that would leave it persistently short-staffed or paying overtime week after week. Three of Mr Groff's co-workers were bothered enough by having to fill in for him on Sundays that one quit, one transferred and one filed a grievance. This, Ms Prelogar said, counts as "an undue hardship under any reasonable standard". Mr Groff's lawyer, Aaron Streett, said this approach "would have the effect of eviscerating...any Sabbatarian observance" that "was at the very core" of what Congress was trying to protect when it passed Title VII.

Micah Schwartzman, a law professor at the University of Virginia, said before the oral argument that most observers had been expecting the court to overrule *Hardison*. But the tenor of the hearing puts that prediction on shakier ground. The three more liberal justices—Ketanji Brown Jackson, Justice Kagan and Sonia Sotomayor—may have at least two conservatives on their side in hanging on to the nearly five-decade-old precedent.

Justices Gorsuch and Kavanaugh seem more keen to clarify than to abandon the *Hardison* precedent, and Donald Trump's third appointee, Amy Coney Barrett, also pointed towards a more modest resolution. Justice Kagan said she could count on "like, a finger" how many times the court has overturned similar statutory precedents that Congress could fix by itself.

Justice Samuel Alito took a sharper position, telling Ms Prelogar he was "really struck" by her claim that the courts have been enforcing Title VII faithfully. Friend-of-the-court briefs from "Muslims, Hindus, Orthodox Jews [and] Seventh Day Adventists", he said, claim that *Hardison* has harmed their religious freedom. "Are they wrong?" Yes, Ms Prelogar said. The record shows a "substantial zone of protection for religious exercise" over decades of litigation in American courts.

With the exception of Justice Alito and perhaps Justice Clarence Thomas, who said little, the court seemed receptive to Ms Prelogar's plea not to rock the boat by coming up with a new standard. "What's clear to me, after all this discussion," said Justice Sotomayor late in the hearing, is that although some "might want to provide absolute clarity, there is none we can give, is there?" Justice Kavanaugh sounded resigned, too; "I'm not sure", he said, "we can give you a full manual about how it is going to play out." ■

Church

Counting Christians

WASHINGTON, DC

American religion is becoming less exceptional

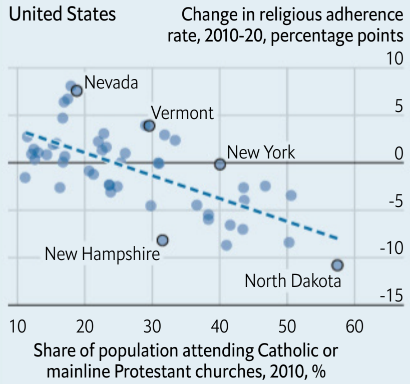
WHAT IS a shepherd without a flock? Many of America's pastors may soon have to answer. In 2014, 3,700 Protestant churches closed, by 2019 that figure was 4,500, according to Lifeway Research, a non-profit organisation that provides resources for ministry. Many parishes simply do not have enough congregants to pay the bills. In 1972, 90% of Americans called themselves Christians; now just 64% do. The waning of religiosity in America is not new, of course. But newly released data shed light on where religious adherence has dropped most, and among which Christian denominations.

Every ten years the Association of Statisticians of American Religious Bodies (ASARB) attempts a tally of membership for every church in the country. It is a monumental feat of data-gathering, covering hundreds of religions and thousands of congregations. Figures for the 2020 census are now finally available. They issue a stark warning to the country's "mainline" Christian denominations: membership of these old churches, such as the Methodists, Lutherans and Episcopalians, is shrinking at an alarming rate. Whereas the ranks of all religious Americans rose by 10.6m believers (7%) from 2010 to 2020 (when the overall population grew by 7.5%), the number of Episcopalians and Methodists dropped by 19% each, and the Lutherans plunged by 25%. Presbyterians, a Protestant group characterised by disdain for flashy ceremony, lost nearly 1m (40%) of their members over the same period—the largest drop of the major denominations.

Church-going fell by far less for evangelicals. The Southern Baptist Convention, the largest and most influential evangelical group, shrank by a mere 11% from 2010 to 2020 despite being roiled by various scandals straight from the Old Testament. Among the 50 largest religious sects in the country, evangelicals account for six of the ten fastest-growing. Not a single mainline Protestant church gained members. But some groups grew quickly: non-denominational Christian churches recruited 9m new members over the past decade, an increase in membership of 72%. Catholics claim they gained nearly 3m members (a 5% increase) despite closing over 1,100 churches. Geographically, the states with the highest shares of Catholics and mainline Protestants have seen the biggest drop in religious adherence (see chart).

Pascal's wager

United States



Sources: US Religion Census; *The Economist*

What has gone so wrong for America's oldest churches? One answer is age. According to data from the Pew Research Centre, a think-tank, a majority of mainline Christians are over 50 and one-third are older than 65. Only about one in ten are under the age of 30. For many churches, older congregants are simply dying too quickly to be replaced by new members.

Another explanation is conversion. Pew finds that just over one-third of Americans between the ages of 30 and 39 who were brought up in Christian households no longer identify with that faith. But only 20% of young adults brought up outside the church have travelled in the opposite direction, making far more leavers than joiners. The problem has become even worse in recent years. According to Pew, in 1990 only one in ten Christian-raised adults between the ages of 30 and 34 became "switchers". Rates have more than tripled since then.

Pew reckons that if these trends continue, the non-religious could become the dominant group in American society as soon as 2055. One concern is what the shepherds will do next. A deeper one is what happens to a wandering flock. ■

Lexington | Detroit is working again

Despite big problems, the city that sums up American success and failure is looking pretty positive

The seal of Detroit, created after it burned to the ground in 1805, anticipated the way despair and determination would vie ever after for the city's future. One woman weeps beside burning buildings while another next to her, smiling, is flanked by a grand, flame-free Detroit. "We hope for better things," sighs one motto, in Latin. "It will arise from the ashes," insists the other.

The arising-from-the-ashes moment has been heralded at intervals for a long time. "There is little doubt that Detroit has turned the corner on some of its most obvious problems," reported the *Washington Post* back in 1980. "Middle-class whites are moving back into the city, and a visitor senses a new vitality downtown." Yet in the decades ahead lay the exodus of hundreds of thousands more residents, more declarations of renaissance and, in 2013, America's biggest municipal bankruptcy.

That history is chastening. Let it be said that Detroit has not turned the corner on all its obvious problems, including a high crime rate and beleaguered schools. But determination has clearly gained the upper hand. Ford, General Motors and Stellantis (whose biggest shareholder, Exor, also part-owns *The Economist*'s parent company) are making big bets on Detroit, as are Amazon, Google and the developer Stephen Ross. Under Mayor Mike Duggan, in his tenth year, the government has courted investment by offering itself not just as provider of tax incentives and expediter of permits but as real-estate agent and HR department.

Stellantis built the first new auto-assembly plant in Detroit in more than 30 years—a $1.6bn investment, constructed as the pandemic raged—after the city traded 200 acres for a promise to give residents first crack at the jobs. Then the city screened candidates, testing them in maths and reasoning, as well as for drugs, offering tutoring to those who needed it. Of 30,000 Detroiters referred by the city, Stellantis has hired some 8,600, at the plant and elsewhere. "It didn't do me any good to land a plant in Detroit and hire a bunch of suburbanites," says Mr Duggan, a practical, old-school liberal in the mould of Joe Biden, to whom he is close. "My job was to get Detroiters to work."

By the beginning of the year, Detroit's unemployment rate had dropped below 7% for the first time since 2000. Mr Duggan boasts that "at this point, anybody in this city who wants to work has a job available." With tax receipts running well ahead of forecasts, the city is applying its federal covid-relief money—more than $800m—to improving its public spaces and its workforce. It is offering full-time jobs, with benefits, at tasks like cutting grass, but letting workers spend two out of five paid days in apprentice programmes for higher-skilled work.

No American city is more haunted than Detroit by America's successes and failures—by American capitalism's power to create and destroy, and by American democracy's capacity to promise opportunity to all yet deny it by race. The city's conflicting legacies burden it but also sustain it, giving it a grip on Americans' imagination no other city can match. "I think across the country folks believe the people of Detroit didn't deserve what happened," Mr Duggan says. "There's been no shortage of people willing to help."

Henry Ford invented mass production in Detroit, and while working on a Ford assembly line Berry Gordy, playing the piano in his mind, began to create the Motown sound. Towards the middle of the last century, the city government was so rich it could shovel money to its Institute of Arts to buy paintings by Rembrandt.

But then hundreds of thousands of auto jobs left, and hundreds of thousands of white people did, too. Detroit became so desolate by the 1990s that Camilo José Vergara, an artist, proposed in *Metropolis* magazine turning the magnificent, boarded-up buildings downtown into a ruins park, an "American acropolis".

One of the most prominent ruins was Michigan Central railway station, a Beaux-Arts massif of marble and bronze designed by the architects behind New York's Grand Central station. In the mid-1990s, when Lexington was a reporter in Detroit, the three-storey depot and its 18-storey office tower stood empty, stripped and smeared with graffiti. He would wander the vast space trying to imagine the city that once filled it with life.

Late this year, after an investment of some $740m, Ford plans to reopen Michigan Central as the hub, with some 5,000 workers, of a 30-acre campus devoted to the future of transport. Farther downtown, buildings Mr Vergara envisioned in his park have been replaced or revived, many by Dan Gilbert, the co-founder of Rocket Mortgage, who is reported to have invested $2.5bn in Detroit.

Don't call it a comeback

Kofi Bonner, chief executive officer of Mr Gilbert's development firm, Bedrock, argues that the sameness of glass-and-steel development in coastal cities has made Detroit more appealing. He rattles off a list of ambitious projects. "None of that was here eight years ago," he says. "The intensity and density of investment that has occurred in a fairly short time frame has finally captured the attention of folks." Mr Duggan sees the downtown as the selling point for Ford and the high-tech workers destined for Michigan Central, and it is true that millennials can be seen walking their somethingdoodles on pavements once vacant at night.

To say it again: Detroit has lots of work to do, not just to enchant the young but to retain families, and to spread the wealth to outlying neighbourhoods. The city sprawls over 140 square miles, which made some sense in 1950 when it had 1.8m people, but less today at a third that many. Under Mr Duggan, Detroit has demolished or sold 40,000 vacant houses; it has about 12,000 to go.

Yet Mr Duggan also finds himself with high-class headaches no Detroit mayor has had for generations. As parts-makers move to be near the new assembly plants, he cannot come up with enough space for a battery factory. "Really," he says, "at this point, I wish I had another three or four hundred acres." ■

Bolivia on the brink

Out of gas and good ideas

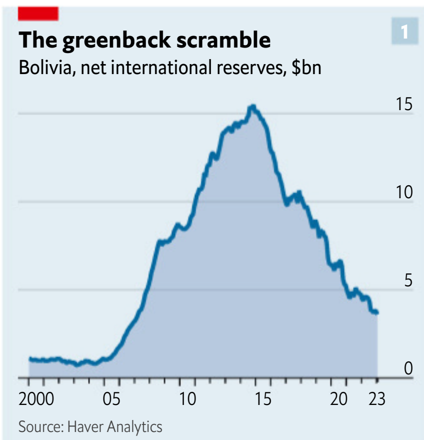
LA PAZ

After two decades of statist policies, the country's economic model is bust

"THERE IS NO shortage of dollars" announces a banner on the homepage of Bolivia's central bank. "Our economy is strong, solvent and stable." The need for the post suggests otherwise. For the past few weeks, Bolivians have desperately been trying to buy dollars. In February the central bank stopped publishing data on its foreign-currency reserves. In March it took the unusual step of selling greenbacks directly to the public after exchange houses started to run out. When the queue got too long the bank made Bolivians book appointments online. The next available one is in July. Investors are spooked. Government bonds maturing in 2028 have lost a third of their value since January.

The dollar shortage is partly a result of tighter global financial markets. When the Federal Reserve started raising interest rates last year it became harder for Bolivia to take on foreign debt. Then came the war in Ukraine, and the annual cost of importing fuel doubled to more than $4bn (or 10% of GDP). The government began dipping into its reserves to prop up the currency, which has been pegged at 6.96 bolivianos to the US dollar since 2011, and to subsidise fuel. Yet although the country's dollar shortage was exacerbated by short-term problems, it has been long in the making. Bolivia's economic model is bust.

In the early 2000s Bolivia experienced robust growth on the back of natural-gas exports. Evo Morales, the leftist president elected in 2005, struck it lucky. Soon after he came to power, multilateral institutions wrote off debt for many of the world's poorest countries. Gas prices doubled to record highs in 2006. This allowed Bolivia to accumulate the largest foreign reserves in its history: they rose from 12% of GDP in 2003 to 52% by 2012 (see chart 1). Real GDP per person has grown by half since 2005. According to the World Bank the proportion of people living on the equivalent of less than $2.15 a day (after adjusting for inflation) fell from 15% in 2005 to 2% by 2019. Annual inflation was 1.7% last year, the lowest in the region.



Pundits praised Bolivia's economic miracle. But it was not sustainable. The government spent much of the windfall from natural gas on fuel subsidies, inefficient state firms and propping up the exchange rate. Fuel prices have been frozen since 2005 at $0.54 a litre, compared with a world average today of $1.31. In 2006 Mr Morales nationalised the country's vast gas fields. Private companies were forced to sign new contracts with the state firm, Yacimientos Petrolíferos Fiscales Bolivianos (YPFB), and hand over majority control. They also pay royalties amounting to 50% of gross production. The state takes a bigger share of revenue from oil and gas companies than in any other country in Latin America after Mexico, says Marcelo de Assis of Wood Mackenzie, a research firm.

Such statist, populist policies have inhibited investment. In 1999, after the country's energy sector was privatised, annual net inflows of foreign direct investment as ▸▸

a share of GDP hit a peak of 12%. Over the past five years it has averaged 0.1%. In 2014 the price of gas fell, and so did production. Annual investment in gas fields declined from over $1bn in 2015 to $300m last year.

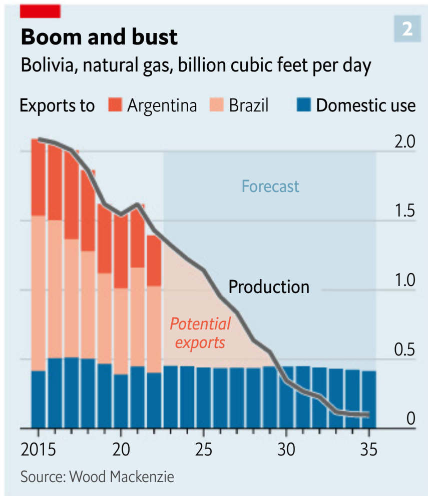
The government refused to adjust its policies when gas prices fell. Instead, it piled on debts and used its reserves to fund its expensive subsidies. Public debt has doubled since 2014 to a whopping 80% of GDP, above the regional and world average, and dangerously high for a lower middle-income country. A study by Fundación Milenio, a think-tank, found that the profits from YPFB hid combined losses from Bolivia's 62 other state-owned enterprises that regularly exceeded 4% of GDP.

Bolivia has run persistent and large fiscal deficits for a decade. The deficit is 7% of GDP. The IMF expects growth to slow to 1.8% this year. In 2021 Bolivia had a current account surplus of 2% of GDP. But the IMF expects this to turn into a 2.5% deficit this year. It is unlikely that Bolivia's reserves can make up the funding shortfall. These have fallen from $12bn in 2012 to less than $3.5bn. Only $370m of that is cash, too little to cover even three months of imports. Most of the rest is gold, which one faction of politicians in the government are unwilling to sell. The situation has probably deteriorated even further since the bank last released weekly data in February.

Pumping problems

In February the government passed laws that encourage farmers and gold co-operatives to sell it dollars by offering them a better exchange rate. "People got scared and thought: why is the central bank trying to buy dollars and what will happen to the boliviano?" says a money-changer in La Paz, the capital. Six months ago he used to buy $3,000 a day and sell half of that. "Today we can't even get $500." Bolivians are taking out their savings, swapping them for dollars, and stashing them at home. In the week leading up to March 12th the central bank sold $24m to the public. Another money-changer says that when the dollars ran out customers started buying euros, Brazilian reais, Peruvian soles, or Chilean pesos. Now he is running out of those, too.

Remarkably, the government denies there is a problem. On April 11th Luis Arce, the president and formerly Mr Morales's finance minister, gave a rare interview in which he said there was no need to devalue the peso or to remove subsidies. Asked about the government's rosy growth projections for this year, which are more than double those of the IMF, he replied, "We are going to disappoint the international organisations again....I am reassured when they say we are going to fall, because that means we are going to grow more." A day earlier Mr Arce met with the private sector for the first time since coming to power in 2020. Rather than inspire hope, "the meeting suggests things are really bad," says Gabriel Espinoza, a former central bank chief.



Mr Arce has no easy way out of the crisis. Gas production has plummeted by a third since 2014. Around a third of this is sold domestically at below-market prices, while the remainder is shipped to Argentina and Brazil. But those exports will cease by 2030, according to a recent report by Wood Mackenzie. This is because production is set to decline further (see chart 2).

In addition a pipeline, which stretches from the world's second-biggest shale oil and gas field in Argentina's far west to Buenos Aires, is set to start operating in June. That will reduce Argentina's need to import the stuff from Bolivia. Although demand from Brazil will continue, Bolivia will have to focus on supplying the domestic market with ever-shrinking production. Private investment will not materialise soon. The law on YPFB having a majority share in any joint venture was included in a new constitution written in 2009.


Elusive white gold

Many within the government hope lithium will be the answer to the country's problems. Bolivia has the world's largest lithium brine resources. But unlike neighbouring Chile or Argentina, it has yet to pump any out of the ground at a commercial scale. In January a consortium of Chinese companies announced a $1bn deal to produce the stuff by 2025. Still, Beatriz Muriel of INESAD, a think-tank in La Paz, doubts lithium can replace gas as a source of revenue. She notes the terms of the Chinese deal have not been made public, and expects protests will erupt if locals do not feel fairly compensated. That would delay production even further.

The government wants to sell its gold reserves, which are worth $2.8bn. But infighting between followers of Mr Morales and Mr Arce, who have fallen out, means the law to sell reserves has not been passed since it was presented to Congress more than a year ago.

Commodity chaos

Two other sources provide Bolivia some breathing room. First, its foreign debt obligations amount to a relatively small 30% of GDP and are mostly held on favourable terms with multilateral lenders. Much of these are not due for at least a decade. Mr Arce's ministers are in talks with development banks to secure additional loans.

Second, the country's gigantic informal economy provides a cushion against a meltdown, thinks Carlos Gustavo Machicado of the Catholic University of Bolivia. Over two-thirds of Bolivians work in the informal sector, one of the highest shares in the world. Sales from contraband are estimated to be worth the equivalent of almost a tenth of GDP. Since fuel in Bolivia is so cheap, much of it gets smuggled abroad and sold at higher prices. Ms Muriel estimates that as much as half of the $3bn Bolivia exported in gold last year was smuggled in from other countries, and exported from Bolivia, where export taxes are lower. This means that there are dollars in the economy, just not in government coffers.

"A balance of payments crisis is coming, like in 1982," says Mr Machicado. That year Bolivia entered into a crisis that ended in hyperinflation. Today the signs of financial pressure are everywhere. On the streets of La Paz opportunists are selling dollars at much higher than the official rate. Unions will negotiate wage increases in May, and are demanding a 10% rise. Mr Espinoza reckons inflation will rise to 6% by the end of the year. That is low by regional standards, but high for the country. That could lead to unrest. In Santa Cruz, in the east, protests have erupted against the government since it came to power. Mr Arce may not be able to deny Bolivia's problems for much longer. ■

The Economist

SPECIAL REPORT:
The car industry

April 22nd 2023

A difficult new world

All change

Everything about carmaking is changing at once. The industry must reinvent itself to keep pace, says Simon Wright

Going for a spin in the first car was a bother. The Benz Patent Motorwagen, which hit German roads in 1886, needed "stain remover" from a pharmacy for fuel, mechanical parts greased by hand, and oil and water tanks filled. Then you had to spin a large flywheel to start the engine, grasp the tiller that controlled the front wheel, and push forward the lever to engage a drive belt that set the vehicle in motion. Repeat the process every 10-15km when fuel and water ran out. Yet the freedom to travel by powering a carriage with an internal-combustion engine (ICE) soon caught on.

A giant industry with annual revenues of nearly $3trn has grown to provide transport to the masses. Over 1bn cars heave passengers along the world's roads. There were many pioneers beside the Germans. The French provided words like coupé, chauffeur and cabriolet. America developed mass-manufacturing with the Ford Model T in 1908 and then slick marketing in the 1950s. Japan invented ultra-reliability and just-in-time production. Europe set the mark for luxury, sophisticated engineering and new technologies such as antilock brakes and airbags.

The next phase of the industry's history will be one in which tech-centric firms and the Chinese come to the fore. Elon Musk's Tesla has kickstarted electric vehicles (EVs) everywhere. China may be a newcomer but it is growing fast. Until the 1980s the country knocked out only a handful of cars such as the Hongqi limousine that whisked Mao Zedong between military parades and tractor factories. But a 40-year rise to economic superpowerdom has created a car industry to match. China overtook America as the world's biggest market in 2009. Last year it passed Germany as the world's second-largest exporter.

The emergence of Tesla and the Chinese as serious competitors reflects unprecedented upheaval in the industry. The obvious shift is electrification. Although a few carmakers are still trying hydrogen fuel cells, lithium-ion batteries have become the key technology. In 2022 around one new car in ten sold worldwide was a battery-powered electric vehicle (EV). Adding plug-in hybrids (PHEVs), which combine a smaller battery with an ICE, and 13% of total sales, or around 10.5m vehicles, were electrified.

China accounts for 6.1m sales of what it calls new-energy vehicles (NEVs and PHEVs). But Tesla is the world's biggest EV-maker, selling 1.3m cars in 2022. China's BYD is second for battery-only cars and is way ahead when counting new-energy vehicles. Of the old guard Volkswagen Group (VW) is the boldest electrifier. Yet it is only in third place, with 570,000 EV sales, 7% of its total.

Electrification is changing carmaking. The old brands have relied on the complexity and cost of ICEs to keep competitors at bay. Having to spend $1bn to develop an ICE and another $1bn for the presses, paint shop and production lines to scale up a new firm to 150,000-200,000 units a year creates huge barriers to entry. It is little wonder that, from the second world war until Tesla's arrival, ▸▸

new brands that made the transition to global significance were few and far between. Those that did, such as Toyota and Nissan in Japan and Hyundai-Kia in South Korea, leant on government support and protected home markets.

The relative simplicity of batteries and electric motors knocks down many of these barriers to entry. A host of startups in China (including Li Auto, Nio and Xpeng) and America (such as Fisker, Lordstown, Lucid and Rivian) are now following Tesla's lead. Electrification has given a leg-up to China's established carmakers, which were long kept from global markets by the big obstacle of ICE tech. China has cajoled state-owned and private companies to build a domestic EV industry partly so as to sidestep petrol power.

Congestion ahead

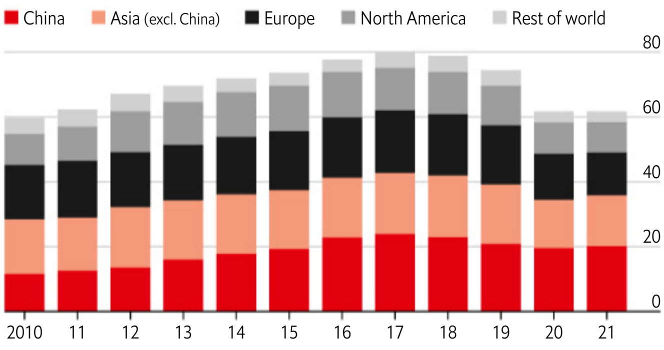
The arrival of a clutch of new competitors will make a highly competitive industry even more so, not least because car sales may have already passed their peak. China's eager buyers gave the market its biggest turbo-boost in decades. But the brakes are now on. Car sales fell over the three years starting in 2018, as a saturated market, a worsening economy and the impact of covid-19 all took their toll. Global car production also peaked, at around 73m passenger cars in 2017. Slowing Chinese demand has been compounded by a shortage of the chips that are liberally sprinkled around all modern vehicles. By 2022 global production of cars had fallen to around 62m.

Forecasts vary widely, but future growth of car sales is likely to be sluggish at best. Pedro Pacheco of Gartner, a consultancy, reckons that sales will eventually return to 2019 levels but they will never go much higher. In a range of scenarios McKinsey, another consultancy, puts the annual number anywhere between 70m and 95m by 2035, but at the upper end most of the growth will be in emerging markets in Africa, India, Latin America and South-East Asia, where the bulk of demand will be for cheap cars. Europe and America have almost certainly peaked already and China is likely to do so soon. Even optimists see growth in China at barely 2.3% a year over the decade after 2019, compared with nearly 7% during the previous ten years.

Legacy carmakers face a big challenge since newcomers, especially the Chinese, are likely to have a clear advantage. Ola Kallenius, boss of Mercedes-Benz, does not underestimate the "monumental industrial task" of swapping drive trains and overturning 130 years of ICE history but says that "what's happening on the software side is bigger". In the past car brands were defined by the adeptness of the mechanical engineering that went into their handling, their horsepower, the status of their bonnet badges and the satisfying "clunk" of closing the doors of a pricier car.

Off peak

Passenger car production, m

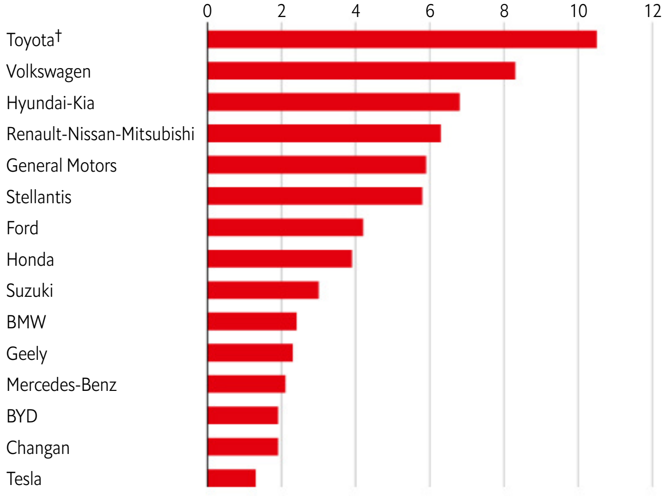


Source: European Automobile Manufacturers' Association

Starting grid

Biggest carmaking groups by sales*, 2022, m

Worldwide



Source: Company reports *Includes vans †Includes Daihatsu

In future cars brands will be differentiated mainly by the experience of using them, which is now determined more by their software than their hardware. Software-defined vehicles, which nowadays resemble supercomputers on wheels, will have ever more features and functions such as infotainment, ambient lighting and voice controls, all improved by over-the-air (OTA) updates after a vehicle has left the factory. That will open up new ways for the car producers to cash in.

Many established firms are looking jealously at Tesla, which claims to be a tech company that happens to make cars. From its roots in Silicon Valley, Tesla has gained a decisive lead in software. Yet in China Tesla is but one of several EV-makers. Chinese carmakers, startups and the tech companies they have joined up with are delivering experiences that far exceed what is available elsewhere. BYD, Nio and Xpeng have all beaten Tesla to provide in-car karaoke microphones. Young Chinese who expect and even demand that their vehicles provide a seamless extension of their digital lifestyles are setting a course for the rest of the world.

The race to autonomous self-driving is also on. Though the road to fully autonomous cars is littered with obstacles, a more limited "hands-off" autonomy that takes over driving duties initially on motorways and eventually in some urban settings is close to commercial deployment. Carmakers are rethinking their involvement in ride-hailing and car sharing, with the big question over mobility becoming how best to monetise the use rather than the mere ownership of cars, triggering a rethink of car retailing.

A final test comes from new geopolitical tensions, notably between America and China. Rising tariffs, growing restrictions on tech transfers, a reshoring of supply chains and greater subsidies for home-grown manufacturing all threaten to halt or even reverse the process of globalisation. Carmakers will find adjusting to such a change especially challenging.

For legacy firms all this requires big change and re-engineering. They retain many advantages: skills in manufacturing, powerful brands and access to massive amounts of capital in an industry that eats through it. However, startups are not weighed down by the heavy legacy of siloed organisations that have for decades been dedicated to mechanical engineering and are encumbered by a complex portfolio of products that heap on costs. Not all legacy firms will survive the coming transformation. ■

Electrification

An electric shock

The car industry is electrifying rapidly and irrevocably

Carl Benz may have been the first person successfully to marry the horseless carriage with the ICE. But early dalliances with batteries predate him. As early as the 1830s Robert Anderson, a Scot, developed a rudimentary EV, but it was not a success. Even after the car industry really took off in the 1890s, as French and American firms joined the fray, electric power was still in the ascendancy. In America in 1900, almost twice as many electric- as petrol-driven vehicles were on the road. Then the Ford Model T, cheaply made by mass production, a growing oil industry and a wider availability of petrol sealed the fate of battery power.

Despite half-hearted resurrections such as the EV1 from General Motors in 1996, it was not until Tesla's arrival in 2003 that the battery-electric revolution began in earnest. This, in turn, hastened efforts to decarbonise road transport, propelling EVs and PHEVs from 0.2% of new-car sales a decade ago to 13% in 2022. The surge is set to continue. By 2025 EVs will account for nearly a quarter of sales, says Bloomberg NEF, a data firm, and closer to 40% in Europe and China. Even conservative estimates reckon that by 2040 around three-quarters of new-car sales worldwide will be fully electric, as better batteries make even PHEVs redundant.

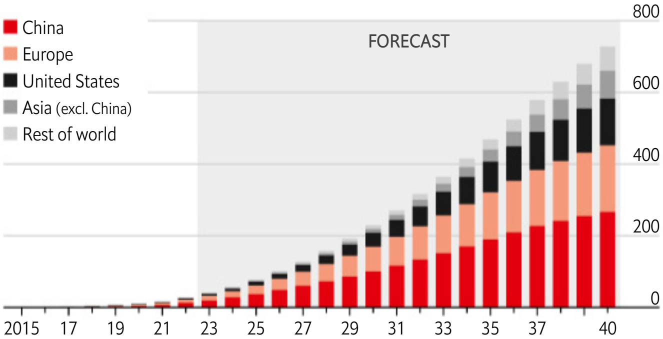
Tough emissions regulations have done much to promote EVs. A draft law approved by the European Union in February may mean a total ban on new ICE cars by 2035 (though Germany has won an exception for cars using carbon-neutral synthetic fuels). Governments and cities are cracking down on carbon and other emissions that affect local air quality. China is demanding that 20% of cars must be NEVs by 2025, with a full switch away from cars with only an ICE by 2035. Even in America, the land of the petrolhead, Joe Biden unveiled on April 12th proposals for strict limits on vehicle emissions, the toughest of which would require around two-thirds of car sales to be battery-powered by 2032. The president is backing this up with huge handouts to domestic EV industries. The 2022 Inflation Reduction Act, a vast clean-energy package, subsidises sales of America-made EVs with domestic-made batteries from raw materials supplied at home or from allies.

Carmakers are duly investing vast sums: around $1.2trn by 2030, according to Reuters, a news agency. America's GM says it will go all-electric by 2035 and Ford wants its European arm to do the same by 2030. The goal of Stellantis (whose largest shareholder, Exor, part-owns *The Economist*'s parent company), formed by a merger in 2021 of Fiat Chrysler and PSA Group, owner of Citroën and Peugeot, is for all new cars in Europe and half its American output to be EVs by 2030. Volkswagen says its namesake brand will be EV-only by 2033 in Europe and that Audi, an upmarket sibling, will go fully electric worldwide by the same year.

The biggest deterrents to buying an electric car—price and range—are slowly being overcome. Tightening bottlenecks for raw materials, such as lithium and nickel, caused battery prices, which are still around 40-50% of the cost of a new EV, to rise slightly in 2022. But scale and new tech have pushed prices down by as much as 90% since 2008. Better batteries mean longer ranges, partly alleviating concerns about a slow rollout of public charging infrastructure. Generous subsidies and an ever-increasing choice of new models mean that Tesla and a handful of unattractive "compliance" cars are no longer the only choices. The total cost of owning an EV, including running costs, repairs and fuel, is already roughly equivalent to some ICE cars. By the end of this decade the sticker price of most EVs will be equal to that of ICE cars—and they will be cheaper to run. ■

Electric take-off

Global passenger electric-vehicle fleet by market, m



Source: BloombergNEF

Barriers to entry

New kings of the road

Electrification is lowering the industry's daunting barriers to entry

Wolfsburg, the company town that Volkswagen calls home, is drab. Most executives choose to live in the surrounding countryside or in Berlin, an hour away by train. Its function is to serve a carmaking empire that churned out nearly 11m cars in 2019 (pre-pandemic) and has vied with Toyota and the Renault-Nissan-Mitsubishi alliance to be the world's biggest carmaker. It seems inconceivable that such a mighty firm, epitomised by Wolfsburg's vast assembly halls, dedicated power station and towering offices adorned with giant company logos, could be under threat.

VW bosses want to reinvent the firm so as to make the most of established carmakers' strengths, such as powerful brands, mass-manufacturing prowess and money, while learning from Tesla and the Chinese how to change their business. VW is symbolic of what Henrik Fisker, boss of an American EV startup, calls "a giant machine [incumbents] have to keep alive". Philippe Houchois of Jefferies, an investment bank, says size matters to spread the industry's high fixed costs and to generate the cashflows to pay for the EV transition. But, he adds, it is "hard to unlearn the past".

The industry has refined itself since Henry Ford's River Rouge factory, where raw materials acquired from mines or rubber plantations owned by the company went in one end, and a shiny new car came out the other. By outsourcing as much as they can to suppliers, firms have concentrated on design and marketing, managing complex supply chains, manufacturing to exacting tolerances and integrating the mechanical tech acquired from "tier 1" suppliers, such as Bosch, Continental, Delphi and Denso. Outsourcing has reduced costs but left tech advances to others.

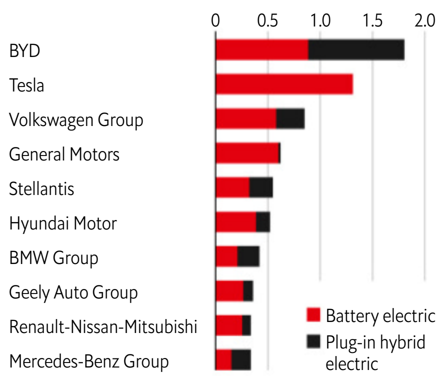
Mr Musk's innovation was to bring River Rouge up to date, borrowing the "full stack" business model from the tech industry. Vertical integration now ensures innovativeness and agility while

keeping more profits. Car buyers and investors like what they see. In 2012 Tesla made around 3,100 cars and had revenues of $413m; by 2022 those numbers were 1.4m cars and $81bn. An initial public offering in 2010 valued Tesla at $1.7bn. The belief that it might come to dominate the car industry propelled its market capitalisation up to $1.2trn in November 2021. A tech sell-off and concerns about Tesla's performance then dragged it back down to $650bn, but that is still more than the next five car companies combined.

Tesla's rise was not struggle-free. It acquired a factory in 2010 in Fremont, California, for just $42m from GM and Toyota. But the "production hell" that Mr Musk described in 2018 nearly tipped his firm into bankruptcy. Since then it has built five new battery or car plants and has plans for another in Mexico. Mr Musk has restated his belief that Tesla will be making 20m cars by 2030. Most analysts reckon 5m is nearer the mark, yet that would still be a huge achievement. Adam Jonas of Morgan Stanley, a bank, suggests that the "innovations brought to market by Tesla [will] become the industry standard".

One reason is that vertical integration is back, not least to ensure supplies of raw materials. Arno Antlitz, VW's chief financial officer, says "battery supply is a constraint on transformation". VW has the most ambitious electrification plans of any established carmaker: it wants half its sales in North America and China and 80% in Europe to be electric by 2030. But battery-making is dominated by China, Japan and South Korea. Six of the top ten firms are Chinese, supplying 60% of the world's batteries. China also has a firm grip on raw materials, such as lithium, graphite and nickel, and also on processing capacity.

The pioneers
Global electric-vehicle sales*, 2022, m
Top ten manufacturers



Source: EV-volumes.com
*Light vehicles only

Breaking China's domination has meant bypassing established supply chains. Tesla was the first to sign an "off-take" agreement directly with a mining company. But other carmakers have followed suit. Ford has signed deals with BHP, a mining giant, for nickel and Rio Tinto, another industry titan, for lithium. GM has signed deals to get lithium from CTR in Australia and cobalt from Glencore, another miner. Toyota's battery joint-venture with Panasonic will source lithium from Argentina. Tesla has commissioned a lithium refinery in Texas.

Another change is the move towards "gigafactories". Most carmakers have joint ventures with established battery firms, such as GM's with South Korea's LG Chem or Mercedes-Benz's with China's CATL, the world's biggest battery-maker. PowerCo, VW's dedicated battery unit, plans investment of €20bn in five factories by 2030, adding to a partnership with Volvo in Northvolt, a Swedish startup run by Peter Carlsson, a former Tesla man. Kai Müller, boss of PowerCo, explains that VW has the financial clout to stay in control of its battery supply. Leaving it to a joint venture would mean putting up half the money but handing direction to a third party.

Other functions are moving in-house. Much of the software for new features and functions will be developed by carmakers. Tesla makes some of its own batteries, chips, motors and other bits of the powertrain. It even makes its own seats. China's BYD, which began life as a tech firm producing batteries, makes almost everything for its new models bar glass and tyres.

Carmakers are also entering the charging business themselves. Tesla's Supercharger network could become a big business, as the firm has opened it up to other cars, a move that Goldman Sachs reckons could be worth as much as $25bn a year. Juniper Research thinks that charging could rake in $300bn in revenues globally by 2027, up from $66bn in 2023. As part of the deal to resolve the "dieselgate" scandal that embroiled VW in 2015, the company put $2bn into Electrify America. GM has invested $750m in 40,000 charging points in North America. Mercedes-Benz, which has a stake in Ionity with BMW, Ford, Hyundai and VW, plans to spend $1bn on an American business that it intends to manage along with ChargePoint, which is one of the world's biggest charging companies.

The carmaking giants will not manage vertical integration as easily as newcomers can. As Mr Hummel notes, it is too expensive to bring everything back in-house. Yet for new firms, scale, experience, brands and access to capital are no longer huge barriers to success, as the experience of China is showing. ■

The new challenge

Cars and Chinese characters

The legacy industry's greatest assets are not worth as much as in the past

AT THE START of the 20th century at least 100 American firms were handmaking expensive cars. The economics of mass production led to the concentration of the industry in a few vast firms. Now the process has gone into reverse. In China alone some say there are 300 EV-makers. Batteries and electric motors, which can be bought off the shelf, obviate the need to spend billions developing several ICEs to serve a range of cars with different requirements. One sort of battery can come in a variety of sizes; one sort of motor will suit a variety of vehicles with performance characteristics tweaked by software. So profitability can be reached from smaller volumes.

Creating an artist's impression of a car and a slick presentation is simple. Even making a handful of cars by hand is not hard. But Factory 56, located at Mercedes-Benz's mammoth plant in Sindelfingen near the company's base in Stuttgart, shows that manufacturing at scale is hugely complex. Each high end S-Class is available in several levels of trim and with a variety of options, from exclusive woods and leathers to composite brakes, requiring thousands of parts to be brought to the correct place in the assembly line at just the right moment on robot shuttles. Power tools are controlled wirelessly to tighten the right bolts for torque settings.

The challenge for a newcomer is to replicate this process. It helps that EVs have fewer parts and are easier to assemble than ICE cars. New entrants often make only one or a handful of models, with few options. Even Tesla makes just four, though the cybertruck, a pickup, will soon be available and Mr Musk has promised a cheap Model 2 starting at around $25,000. Simplicity reduces costs, which translates into higher profits. Tesla says the production costs for its Model 2 will be half those of the Model 3, its current smallest vehicle. In an industry where mass-market firms' operating margins can be in low single figures and premium carmakers such as BMW or Mercedes have generally counted 10% as a triumph, Tesla's margin is an impressive 15% or so.

Yet carmaking "is still a scale business", says John McClure of Lincoln International, a bank. Newcomers will not be first in line for batteries and chips in EVs. Drawing on the tech playbook, small firms could find a different, asset-light approach. Fisker, an American EV firm founded in 2016, is using Magna, a contract manufacturer usually employed by carmakers for niche assembly such as early production runs or smaller volume models (it makes Jaguar's only full-electric model, the iPace). Magna will manufacture the firm's mid-range Ocean, which costs from $35,000. Fisker will do the rest.

The practice of teaming up with specialist assemblers may reduce the risks of manufacturing. Fisker will manufacture the Pear, a small cheaper model, with China's Foxconn, better known for making Apple's iPhones. Geely, a Chinese carmaker that owns Sweden's Volvo, and has a 10% stake in Mercedes-Benz, has a deal with Foxconn to make cars for third parties. In 2021 Foxconn also bought a share in Lordstown Motors' EV factory in Ohio. If any company has greater ambitions even than Tesla, Foxconn's long-term plan is to manufacture half the world's EVs.

Tesla's rise, its gaggle of followers and the Chinese firms eyeing sales in Europe suggest that old rules about the difficulty of establishing a car brand are breaking down. Because firms old and new are starting from scratch, EV buyers may put less store by established brands. This is especially true in the mass market, where brand loyalty has always been weaker. Premium carmakers tend to do a better job of hanging on to customers. Openness to new brands could give the Chinese firms a leg-up as they try to conquer the world. The growing importance of Chinese motor shows is further evidence of China's rise. Chinese exports are growing fast: 51% by volume in 2022 to 3.2m vehicles, after expanding by only 2% a year in 2011-20, says Bernstein, a broker. Chinese firms that once exported cheap ICE cars to poorer countries in South Asia and the Americas are now focusing on Europe and EVs.

Brand disloyalty

Both BYD and Great Wall Motor (GWM) with Ora, its budget brand, and upmarket Wey, displayed attractive EVs at October's Paris Motor Show. Two Chinese EV startups, Nio and Xpeng, are selling cars across Europe and, along with Li Auto, they sold over 120,000 cars apiece in China last year. Along with MG, which is owned by SAIC, and Geely's Polestar, China accounted for 6.2% of EV sales in western Europe in 2022, says Schmidt Automotive, a data firm. That share seems sure to grow. BYD plans to construct a European EV factory (and not, it has already said, in post-Brexit Britain). Gartner, a consultancy, predicts that by 2026 more than 50% of EVs sold globally will be Chinese.

Chinese firms can lean on the vast scale and low costs of serving their home market, their grip on the battery business and their access to generous state funding. But the maturity of China's market and excess capacity at home combine to make exporting crucial for future growth. Low volumes and the high cost of batteries make it hard for Western legacy firms to switch to making EVs profitably. Bernstein calculates that swapping drive trains increases costs for legacy firms by up to 50%, mostly because of the battery, which in turn makes these vehicles less profitable than their ICE equivalents. Ford says its EV division will lose $3bn in 2023. Carlos Tavares, boss of Stellantis, is blunt: "to fight the Chinese, we will have to have comparable cost structures." Bernstein notes that Chinese EVs are "on par with global brands on range and efficiency, and yet less expensive". BYD's Atto 3 sells for €38,000 in Germany, making it 10-20% cheaper than VW's similar all-electric ID.4.

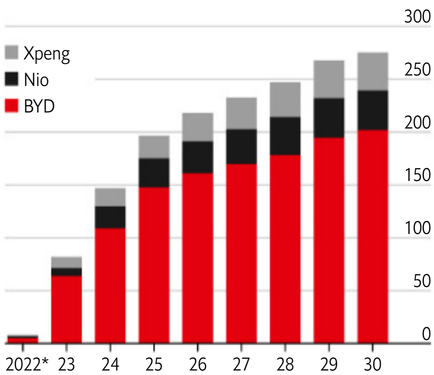
Mr Tavares favours more tariffs on Chinese EVs. But other European firms face a dilemma. Unlike Stellantis, which sells few cars in China, VW, BMW and Mercedes-Benz rely on the country for much of their profits and are big producers there. VW has 33 factories with joint-venture partners and 100,000 Chinese employees. Any move to punish Chinese carmakers in Europe could invite retaliation.

The ability of European firms to cash in on the Chinese market is now waning as the tastes of Chinese car buyers change. European brands once conferred status but their slow response to fast-moving domestic competitors is hitting sales. In 2021 foreign carmakers accounted for less than

China rising

Europe, Chinese electric-vehicle sales by brand

Forecast, '000



Sources: Bernstein; IHS *Estimate

half of sales for the first time since China became a big market. Once it was all about flashy foreign brands, but innovation is what buyers want now, says Michael Dunne of ZoZoGo, a consultancy that closely watches China.

Easy access to capital may also be a boost for Chinese firms. But other newcomers have also had little trouble finding the cash that they need. Private equity, tech firms and even old-fashioned carmakers have poured money into any startups that looked as if they might become the next Tesla. Electrifying the pickups that Ford, GM and Chrysler rely on for most of their profits persuaded Amazon, Ford and T. Rowe Price, a big money manager, to invest in Rivian, an American EV pickup firm that was founded in 2009. Its R1T is a match for Ford's F150 Lightning, the electric version of its bestselling pickup, and will doubtless stand up to electric pickups from GM and Chrysler that are going on sale this year. China's Xpeng has raised money from domestic investment firms and Alibaba, a Chinese tech giant.

Firms with big plans on paper but few vehicles to sell have also attracted huge valuations at initial public offerings or by going public via special-purpose vehicles. Rivian was valued at nearly $130bn shortly after it floated in 2021. Nio hit a peak of $97bn. But the savage readjustment of Tesla's valuation and investors' doubts about tech shares have battered many newcomers that have struggled with carmaking, missing production and sales targets. Rivian and Nio are now valued in the $12bn-15bn range. Shares in Xpeng are at one-seventh of their peak in 2022.

For the newcomers it is a question of how much cash they burn and how long they can keep in the race. Lucid Motors, an EV startup backed by Saudi Arabia's sovereign-wealth fund, noted at a results presentation in February that it had enough to reach 2024, hardly a ringing endorsement of its long-term prospects. The lavish sums being thrown at new carmakers are drying up even as the established industry still sells ICE cars in large numbers. The newcomers need to scale up; the established industry needs to transform. Neither will find the task easy. ■

The software shuffle

Tech wars

It is easier for a tech firm to make cars than a carmaker to become a tech company

A VISIT TO Nio house in Berlin, which is modelled on a network of 100 similar establishments in China, offers evidence of a fundamental change. Here you can still acquire a car, but unlike a traditional dealership only a small fraction of the floorspace is taken up by vehicles. Nio sees itself as a lifestyle brand and tech firm. The "focus is on the user experience", says Lihong Qin, its president. Using a Nio is about enjoying the journey and the community built around its brand. Its cars are packed with high-definition screens and state-of-the-art sound systems. In Berlin owners, potential owners or anyone else can drop by the coffee bars and meeting rooms, buy locally sourced branded goods, or even leave their children in a high-tech play area.

The usual way of differentiating car brands by mechanical excellence was personified by the ICE's performance, design and *Spaltmass* (a German word for slim regular gaps between bodywork panels that are hard for newcomers to reproduce). Nowadays buyers are no longer so bothered. McKinsey, a consultancy, reckons that only 8% are "petrolheads" who love driving for its own sake. Future drivers and passengers want to make the most of their trips. The features and functions that do this rely on software rather than hardware. Tu Le of Sino Auto Insights, a consultancy, puts it bluntly: "customers don't care about panel gaps." The software updates keeping Tesla's technology fresh matter more.

Mastering software becomes vital for carmakers merely to stand still

Dirk Hilgenberg, boss of Cariad, VW's software division, says the car will be a "third living space" between home and work. Software controls performance, driving features and the experience of sitting in the vehicle. Safety features such as automatic braking, automatic lane-keeping and changing, adaptive cruise control and automatic parking are already available. Others will make things more fun and become increasingly useful as autonomous driving becomes common. These include huge improvements to such features as infotainment—the best navigation maps, sound systems and screens to watch films or play video games—and advanced voice controls, a particularly important feature in China. Michael Mauser, boss of Harman, a tech firm supplying carmakers, describes how smart devices have changed the expectations of consumers: spending $100,000 on a car comes with the same demand for personalisation as a $300 smartphone.

The established car industry has been good at delivering cars on budget and on time but not at considering the business case of the car, says Johannes Deichmann of McKinsey. Increasing connectivity—by 2030 four cars in five will be internet-enabled, says UBS—will allow over-the-air updates to software. For carmakers that means new opportunities to sell things. For owners it means vehicles can be continuously updated and improved when they buy new features and functions. Legacy carmakers will have the hardest job replicating the advantages of startups, for which software is the most important element, and Chinese firms, whose customers demand and expect a seamless extension of their digital lifestyles in their cars.

Software can be lucrative. UBS forecasts $700bn a year in revenues by 2030, but adds that this will compensate only for declining revenues elsewhere as negligible growth combines with higher costs and lower profits. Mastering software has become vital for carmakers just to stand still. But established firms have to rethink a business model dedicated to mechanical-engineering excellence. The industry operates on roughly seven- or eight-year model cycles, with research and development frozen before the start of production. This leisurely pace is far removed from software's timescales, with small updates coming weekly or monthly and big overhauls perhaps every year, as they do for smartphones.

Big carmakers have done a good job of claiming to be tech companies, but informed observers detect a resistance to change. Mr Li says that Nio and other Chinese firms starting from scratch develop software and hardware together. Clean-sheet designs can incorporate more centralised and efficient computing systems, whereas current ICE models integrate separate bits of technology developed by suppliers, making cars a mass of hundreds of electronic control units. At least the launch of all-new EVs allows established firms to redesign their computing architecture.

The dinosaur era

Firms that have long had a mechanical mindset struggle to set up the units needed to develop the software that now makes brands distinctive or to strike deals with tech firms that today matter as much as traditional suppliers. According to Daniel Roeska of Bernstein, a broker, the average European car executive is 55 and has worked in the industry for 22 years. He drily notes that this is "not the right mix of experiences and capabilities" for firms that need to be "more agile and innovative than ever before". Gartner's Pedro Pacheco is equally damning, suggesting that some firms don't want to change their corporate culture and are "running with an iron ball around their ankle".

Carmakers are appointing chief software officers, presenting strategy at "software days" and setting up software divisions. A new seven-storey building at the Mercedes plant in Sindelfingen, built at a cost of €200m, will house a third of the firm's 3,000 software engineers. Cariad, the software unit created by VW in 2020, has a large site in Ingolstadt, not far away, for its 6,000 software employees. Stellantis aims to have 4,500 software engineers by 2024. GM had planned to hire 8,500 techies in 2022. But only Volvo and Ferrari have CEOs with a background in tech.

How much and what to keep in-house remains a big issue. VW says its once-stated ambition to develop 60% of its own software was a means to reinforce the importance of software rather than an actual target. Most car firms have settled on developing no more than 20-30% in-house. As UBS puts it, carmakers that want to do everything are "set up for expensive failure" but those relying "100% on an external software stack" are the "worst case...for brand equity". Most carmakers realise that they should concentrate only on what they can do better.

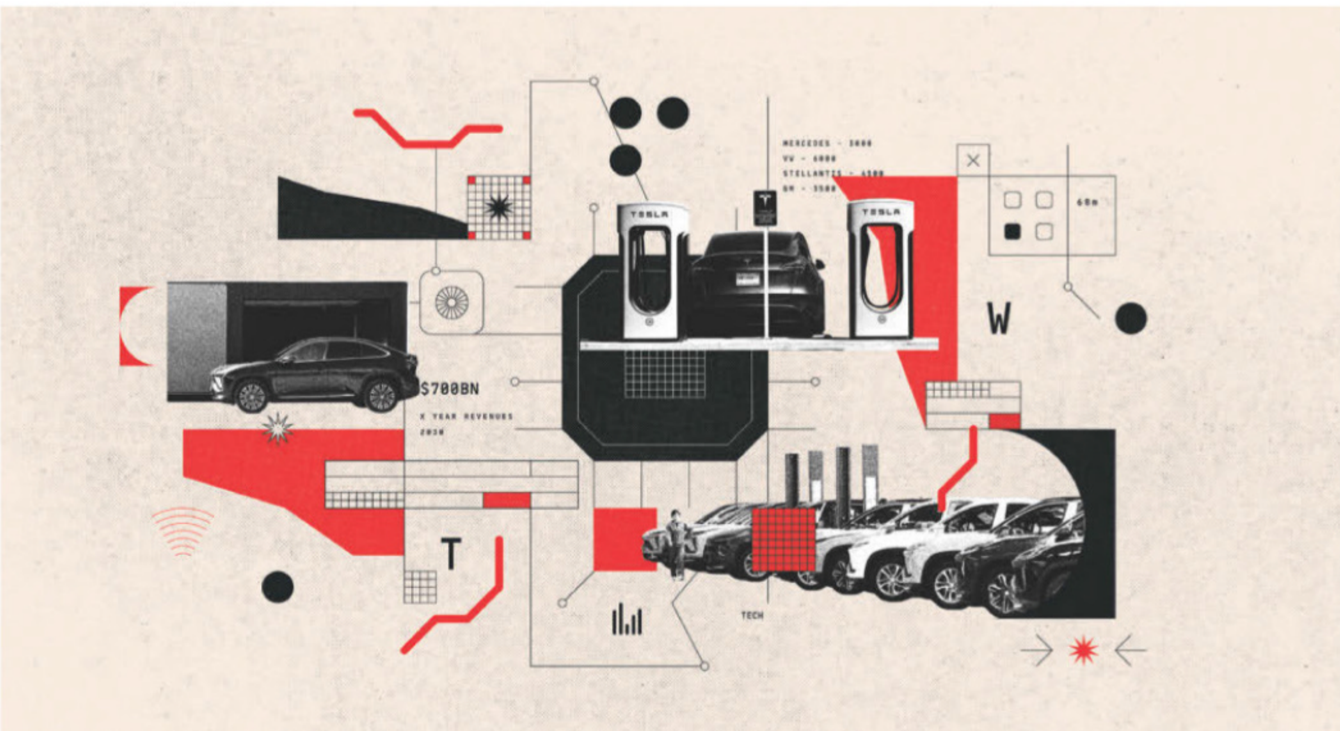
That means having a clear view of what is best kept in-house but also trying to stay in control of what is bought in. Ola Kallenius of Mercedes-Benz says the role of legacy car firms is to become the "architect of the house". It is creating its own operating system and teaming up with the best contractors, such as Nvidia for chips, and deepening a partnership with Google to improve navigation systems. Mr Kallenius argues that car firms still have a vital role as integrators, as no tech firm can deliver off-the-shelf software for all four separate domains of driving and charging, comfort (such as lighting and massaging seats), infotainment and autonomy.

Carmakers need to strike deals with tech firms that are also eyeing their business as a potential source of new revenues. But do drivers want a proprietary system or rather something closer to what they are already familiar with from their phones? In 2022 Renault announced a deepening of its relationship with Google's Android Automotive, which lets driver access phone features and apps, to speed up its digital transformation. Bernstein asks if carmakers should "forgo control and adopt a platform that consumers appear to readily accept?" Gill Pratt, Toyota's chief scientist, similarly suggests that car software must be a seamless part of the smartphone ecosystem.

Yet this runs the risk of ceding users' experience to the tech firms. The latest version of Apple's CarPlay, due in September, connects iPhones to a car's infotainment screen, offering a more seamless experience for maps, driving information and connections to smartphone apps by taking over the screens in cars. But Apple will keep the data on drivers. Some think the slow reaction of the industry to software means the game is already up. Olaf Sakkers of RedBlue Capital, a mobility investment fund, says that Apple has already won the "in-car experience" and that legacy firms have "already lost but are acting like they haven't".

For Tesla and other newcomers this is hardly an issue. Innovating and rapidly turning out new software features is at the core of what they do. Michael Dunne of ZoZoGo, a consultancy, reckons Tesla's software is five years ahead of the established firms. Most agree they are behind the Chinese when it comes to user experience. Mr Hilgenberg agrees that his firm has much to learn from the speed of decision-making and time to market of Chinese firms. Even Western startups cannot keep pace. John Makin of the automotive division of Luxoft, a software company, says Rivian and Western startups are quick but the Chinese are quicker still, rolling out updates in hours or days rather than weeks or months.

Getting the software right by marrying the speed and agility of the tech industry to the old world of carmaking will be especially hard for legacy firms. Some at least have the right idea, but for many it will prove all-but impossible. And that could create a big opportunity for the new entrants that have mastered the tech skills now needed. ■



Autonomous vehicles

Hands off the wheel

The next challenge for legacy firms is to adapt to autonomy

FULLY AUTONOMOUS electric robotaxis, cheaper and more convenient than a private car, once seemed to threaten the entire industry. Six years ago it was assumed that nobody would buy cars any more, says Amnon Shashua, boss of Mobileye, an autonomous-driving tech firm. At best carmakers would be "white label" suppliers of cheap mass-produced hardware to ride-hailing firms such as Uber or tech giants that had mastered self-driving software. In turn robotaxis would be key for the shift to integrated systems that wove together public transport with private fleets of e-scooters and e-bikes. Such mobility platforms would provide one-click payments for a journey that might use several methods of transport. Smartphone apps would provide integrated, efficient and green urban travel at a fraction of the cost of car ownership.

The promise was backed by data suggesting that young people are no longer so keen to own or even drive cars. Evidence that the screen-obsessed youth of the rich world would rather be glued to a smartphone than slide into a driving seat is supported by the falling proportion obtaining driving licences. The inevitable outcome seemed to be plunging car sales. Yet in fact autonomous vehicles (AVs) and mobility services may be creating new opportunities for firms that can get them right.

A first myth to dispel is that the young are giving up driving for good. In car-mad America, which has around 890 cars per 1,000 people, only 1% of new cars are bought by people under 24. The share of 16-year-olds with a licence fell between 1983 and 2018, from 46% to 26%, but the decline for older people was less precipitous. In 1983 95% of 35- to 39-year-olds had a licence compared with 91% in 2017. In Britain the proportion of over-21s with licences has hardly budged in 20 years. Just as they are deferring much else, such as settling down or having children, young people are simply getting their driving licences later. The average age of a buyer of a new car in Europe and America is also well over 50.

A second myth is that Tesla's Autopilot, its driver-assistance feature, offers the "full self-driving" experience that the company claims. The go-anywhere-anytime, eyes-off-hands-off autonomy—"level 5" in the jargon—is years away from widespread rollout. A trip in Nissan's most advanced AV around a test zone in Woolwich in South London shows why. The car attracts attention not for the driving, which is steady and safe, but for the rooftop array of shoebox-sized lidars, laser-based sensors that work in tandem with radars, cameras and high-definition maps. These ensure the car knows where it is to the nearest centimetre and tells it what other road users, pedestrians and static objects to avoid. But they require a boot-full of computers and a "safety driver" in case the vehicle meets an "edge" case that the data cannot respond to.

Where regulators are more relaxed, robotaxis are more developed. Cruise, a subsidiary of GM, is adding paid driverless rides in Phoenix, Arizona, and Austin, Texas, to the service that it launched for the public in San Francisco in February 2022. Waymo, the self-driving arm of Alphabet, Google's parent company, operates in Phoenix and San Francisco. Uber's app with vehicles from Motional, a joint venture between South Korea's Hyundai and Aptiv, an American supplier, allows the hailing of self-driving rides in Las Vegas. Amazon is running robotaxis between its offices in San Francisco, operated by Zoox, a self-driving startup that it bought for $1.3bn in 2020. In China Baidu, a tech firm, is operating similar services in several cities. Didi, a ride-hailing giant, and WeRide, an AV startup that has teamed up with GAC, a car firm, are testing out robotaxis in some Chinese cities.

Yet it will be a long time before jumping in a robotaxi is commonplace. Services are "geofenced" to specific areas. Cruise's 30 cars in San Francisco must for now avoid the busy financial district. Hours of operation may be limited to less congested times and safety drivers or remote monitoring are required. As the cost of the technology falls, robotaxis may spread. UBS, a bank, thinks the market could be worth $2.1trn a year in revenues by 2040, though that would still be only 6% of all kilometres driven. But high costs and distant profits allied to uncertainty over business models mean that most carmakers have less grandiose plans.

Not autonomous enough

"Profitable, fully autonomous vehicles at scale are a long way off," is the conclusion of Jim Farley, the boss of Ford. VW and Ford pulled the plug on Argo AI, their robotaxi joint venture, in October 2022. Even Alphabet's investors are nervous about the costs of Waymo. Carmakers and tech firms are now adopting a more evolutionary approach. This has the benefit of profits arriving sooner by allowing carmakers to follow Tesla's lead and charge for advanced driver-assistance systems, preloaded in their cars or switched on as subscription services. Tesla has developed its own system using data gathered from its fleet of nearly 3m vehicles. But its Autopilot still requires drivers to stay attentive and keep their hands on the wheel. "Level 2+" and "level 3" autonomy will start by letting drivers let go of the wheel and take their eyes off the road on motorways, although a human must be ready to break off from eating, sending emails or watching a film if need be.

Mr Kallenius, the boss of Mercedes-Benz, says such systems would offer time for work or leisure. Mr Farley adds that "future automated driving tech—hands-free, eyes-off highway driving—has potential to redefine our relationship with our vehicles." Ford is investing in level 2+/level 3 systems. To master AV, most established carmakers have concluded that they need to team up and share revenues with tech firms. McKinsey reckons that autonomous driving for passenger cars alone could produce sales worth $400bn by 2035.

As with other software, carmakers want to retain some control. Mobileye, acquired by Intel in 2017 for $15bn and recently floated, switched from a "black box" approach to the open-source system of its competitors, Qualcomm and Nvidia, when it became clear that carmakers were reluctant to risk unknown tech. It says its system will be ready by 2025 and, at roughly $15,000, will cost the same as Tesla's Autopilot. Mercedes-Benz may be the first to give Tesla competition. Drive Pilot, its level 3 system, has been approved by Nevada for public roads and should be available later this year. McKinsey reckons between four and six out of ten new cars may have autonomous-driving capability by 2035.

It will be a long time before jumping in a robotaxi is commonplace

It is the huge tech firms that may do the most to keep American and Chinese carmakers ahead. UBS argues that China has the potential to lead in the mass deployment of self-driving cars. In 2020 the government laid out its strategy for 2025: the large-scale production of level 3 vehicles and the launch of robotaxis in some areas. As in America, China's AV industry has tech giants, startups and incumbent carmakers all hard at work to serve a large market of tech-obsessed Chinese. Competition is fierce among makers of lidars, radars and cameras, and map firms. Local governments have pitched in by creating test

zones and designating thousands of kilometres of roads as suitable for autonomous-car testing.

The established industry is also rethinking another business that seemed to offer an alternative when merely selling cars lost its appeal. When ride-hailing and other mobility services that came at a fraction of the cost of car ownership were growing and the values of Uber, Lyft and Didi were soaring, carmakers were quick to get in on the act. Yet ride-hailing and car-sharing have not lived up to their early promise. Massive investment before any return (Uber, Lyft and Didi have never made an annual profit), tight margins and the attention of regulators have hobbled ride-hailing. Car firms are trying out new ways to sell mobility. Stellantis's mobility arm lumps together car rentals, car-sharing, parking and recharging. Toyota's Kinto unit is developing seamless, joined-up multi-modal transport and payment systems, car-sharing and flexible subscriptions.

Many firms are copying Tesla by adopting direct sales, as well as new financing packages, to establish a direct relationship with customers in order to collect their data and sell them services more easily. Financing deals are being supplemented with more flexible all-inclusive monthly subscriptions that lower the upfront cost and commitment of using a private car, which may attract younger motorists. Chinese firms are using the subscriptions to attract customers in Europe, such as Lynk&Co, owned by Geely, which calls itself the Netflix of cars.

Autonomous driving should eventually change long car journeys from a chore to a better use of time. For carmakers it will be a way to make money from supplying the systems. More free time in cars should also create opportunities to sell new features such as upgraded infotainment and services such as streaming music and films. The new approach to mobility is one more sign of a switch from ownership to usership. ■

Geopolitics

Troublesome tensions

The unhelpful fallout from Sino-American squabbles

THE WORLD'S carmakers are nowadays perforce learning from Chinese car firms and their customers what the future might look like. Similarly, Chinese carmakers are trying to understand what they need to do to conquer the West. Just as big firms have engineering and design centres in China, so do Chinese firms in America and Europe. But even as foreign carmakers begin to struggle in China, Chinese hopes of selling millions of cars abroad may fall foul of a deteriorating political landscape. A souring of relations between America and China means rising geopolitical tensions, new trade barriers, a subsidy race, shifting supply chains and tighter restrictions on access to Western technology and data-sharing. These could even add up to the deglobalisation of what is in many ways the archetypal global industry.

The dwindling market share of foreign firms in China owes much to the perception that the software in their electric vehicles is not as advanced as in their Chinese competitors. Sales of VW's ID series of EVs in China have disappointed. Slowing EV sales as government subsidies were cut prompted Tesla to slash prices, triggering a price war at the start of 2023 that hit less coveted EVs from foreign carmakers. Growing nationalist sentiment among Chinese buyers and greater efforts by the government to encourage domestic firms such as BYD will make China an even harder place to do business in future.

At the same time carmakers are reconfiguring supply chains to make them less exposed to geopolitical concerns, with reliance on China a growing issue. The country is one of the world's biggest exporters of car parts, to a value of over $45bn in 2021, a quarter of which went to America, says a study by Sheffield Hallam University. In 2020, 12 Chinese car-parts firms were in the world's top 100 by revenues. Pandemic-induced snarl-ups sent shipping prices soaring and hit the supply of car parts. China's zero-covid policy meant widespread lockdowns that caused further delays. However forming new relationships with suppliers from India, north Africa or Mexico is a lengthy business. Firms usually change suppliers only when they make new models. Yet the process of shifting supply chains away from China is clearly under way.

Restrictions on access to the West's technology may also have an effect. America's efforts to bar Chinese firms from advanced technology include a ban by the Commerce Department on exporting certain semiconductors to China. And the CHIPS act passed last year offers new subsidies for manufacturing semiconductors at home. China's car firms may lead the world in EVs and automotive software but they rely almost entirely on chips imported from America, Europe and Taiwan. To plug the gap carmakers such as BYD and Geely are making their own chips, and start-ups like Nio, Li Auto and Xpeng may also do so. The Chinese government plans to spend billions on a domestic chip industry.

Efforts to pull up the drawbridge will hamper China's exports. So might worries about the security of data gathered from users of Chinese-made cars. America already imposes hefty tariffs on Chinese cars: 27.5%, against 10% levied by the EU. That may not hold back the import of Chinese cars for ever, as cheaper models could still be competitive. But the effects of America's Inflation Reduction Act, passed last year, which offers big subsidies to American-made EVs with batteries that use raw materials sourced in America ▸▸

or from close allies, will do more to bring production home.

The results are already evident. Tesla is scaling back European investment to focus on North America, and will build a new gigafactory in Mexico. Ford chose Michigan for a new battery factory. GM will invest in a lithium mine in Nevada. VW is thinking of relocating a battery factory from Europe, reckoning it could be worth $10bn in subsidies over its lifespan. Few carmakers seem able to resist the American lure. Europe is intent on responding to America's lavish handouts. But even without big inducements the industry will become more regional. Manufacturing batteries, which are bulky and make up a big proportion of a car's value, is better done close to where cars are made and sold. The EU's car firms have their own plans to weaken China's grip on battery-making. New incentives to make batteries locally could mean that Europe sees 40 battery gigafactories by 2030. Caught between America and the EU, Britain is looking on nervously.

Were China's sabre-rattling over Taiwan to turn into full-scale war, this slow regionalisation would speed up rapidly. Russia's attack on Ukraine shows how fast a country with a small car industry has been affected. Western car firms with manufacturing plants were forced to suspend operations or to pull out entirely. Renault had to sell its operations in Russia, including a 68% stake in AvtoVAZ, Russia's biggest carmaker. VW suspended manufacturing after the invasion and has had its assets frozen by a Russian court. Toyota closed its Russian factory. Ironically Chinese car firms then grabbed a bigger share of the Russian market.

Rising tensions with China would affect many industries besides cars. And even if the broad influence of China on both carmaking and the experience of driving persists, tastes will still differ between regions. Chinese tech, the American love of large pickups and Europe's taste for small cars all show a world that is not entirely uniform. Yet a more regionalised, more protected and hence less efficient car industry would not be a better one. ■

The future

Changing lanes

The challengers to the established industry should result in more choice and better motoring

SINCE THE first motorist sparked up a Benz Patent Motorwagen, little has changed. Cars powered by an ICE and carrying four or five passengers have done the same job for 130 years. Several firms that flourished at the outset (including Peugeot and what became Mercedes-Benz) survive. But electrification, tech and autonomous driving may now upend an industry used only to slow change.

The legacy industry must reinvent itself to cope with competition from new carmakers starting from scratch or emerging from China—or both. New technologies demand new ways of doing business as revenues from services are needed to plug the gap of dwindling volumes and EVs that are not as profitable as ICE cars. Ashwani Gupta, chief financial officer of Nissan, says the switch is from "one time transaction to lifetime engagement". Not every firm will manage it. While scale is less of an issue for newcomers, it matters for existing firms that must pay for massive restructuring. Weaker ones, especially small Japanese makers like Subaru or Mazda, may not survive unless they team up with bigger ones.

Can even big companies adjust their cost structures as volumes decline? It may be easier at the upper end of the market, although Tesla as well as China's Xpeng and Nio are snapping at the heels of

The future may be hard for some, but for others it could be as bright as a shiny new car

Audi, BMW and Mercedes-Benz. America's big three of Ford, GM and Stellantis's Chrysler, which make most of their money selling pickups, face new entrants such as Lordstown, Rivian and Tesla's Cybertruck. Middling European carmakers such as Renault, which rely on the mass market where competition is fiercest, brand loyalty is lowest and profit margins are slimmest, will have the hardest job of all to fend off the Chinese.

China will be a force because its EV leadership lets it add European sales to those in poorer countries. Whether its car firms can fight through new geopolitical tensions to crack the American market is less clear, but they will keep trying. Tesla may not be making 20m cars a year by 2030 but it will eat away at the market share of incumbents. And some newcomers, seeking to emulate Tesla's success, will manage to reach scale. Even if many newcomers do not survive, a handful will be making 1m or so cars a year.

The changing industry may let others in. If Foxconn and others operate as manufacturers, scaling up is less of a problem, opening the door to startups. Saudi Arabia's deep pockets and urge to diversify from oil could make it a force in carmaking. Lucid, backed by the Saudi sovereign-wealth fund, is due to start production of 150,000 cars a year in Jeddah. Ceer, another firm backed by the kingdom, aims to make cars with Foxconn. Building a battery and raw-material industry is also on the Saudi list. And big tech may also have a say. Rumours persist that Apple's assault on carmaking may extend beyond CarPlay into making vehicles itself. Sony is teaming up with Honda to make EVs. China's Alibaba, Huawei, Tencent and Xiaomi all have designs on the industry.

But if there is much that is new about the car industry there are still many reminders of the past. Wresting the EV advantage from the Chinese is triggering a new protectionism. Estimates vary over the effect of shifting to less complex EVs that require fewer workers and how many will lose out as the ICE winds down. But there is little disagreement that there will be fewer jobs. "We absolutely have too many people in some places, no doubt about it," notes Jim Farley, boss of Ford, which announced 3,800 job cuts in Europe in February, citing EVs as the cause.

The road from rickety contraptions of wood and iron to self-driving supercomputers on wheels has had many twists and turns. The latest upheavals are perhaps the most profound since Carl Benz's brainwave. The size, reach and impact of the car industry on personal mobility will change. If the eventual outcome of today's trade tensions and subsidy wars is deglobalisation, the arrival of new entrants may raise costs and reduce efficiency, making cars less affordable and the industry less efficient.

Yet a more optimistic forecast is that startups and new Chinese entrants will force every other carmaker to speed up electrification, to bring forward software that makes journeys better, and to provide more ways to use and pay for trips by car. This could forge a new relationship with the car as a pleasant place to work and play as well as a way to get from A to B. The future may be hard for some, but for others it could be as bright as a shiny new car. ■

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Japan and EVs

Fumbling the future

FUJI AND TOKYO

Toyota, Honda and Nissan, innovators of yesteryear, are now playing catch-up

THE GREEN floors of JATCO's Fuji Area 2 factory hum with quiet confidence. Diligent inspectors appraise the gears and pulleys that make up the Japanese car-parts maker's transmission systems. Robots stamp parts and flip them onto production lines. For decades, JATCO, like the rest of Japan's vaunted auto industry, has perfected carmaking. Japan has been at the forefront of the industry, pioneering just-in-time manufacturing and leading the development of hybrid cars. But the next big evolution—the shift to electric vehicles (EVs)—has become a source of angst. "The EV shift will be a big transformation, there's no denying that," says Sato Tomoyoshi, JATCO's CEO. "Our company will have to change drastically."

So far, Japan and its carmakers are lagging in the race towards EVs, the industry's fastest-growing product area. Battery-powered electric vehicles and plug-in hybrids (PHEVs) accounted for around 13% of all cars sold globally in 2022, up from 2.6% in 2019. In some markets, including China, the share is some 20%. But in Japan, it was just 2%. The firms pulling ahead in the EV race include newcomers, such as Tesla and China's BYD, and established giants such as Germany's Volkswagen.

Japanese carmakers are not among them. None is in the top 20 for global EV sales, even though Nissan and Mitsubishi released some of the world's first EVs more than a decade ago. Toyota, the world's largest car company, sold just 24,000 EVs out of its 10.5m in total sales in 2022. (Tesla sold 1.3m.) Sales of Toyota's first fully electric model, an SUV called the bZ4X, had to be paused last summer due to defects that caused the wheels to fall off.

Critics worry that this early stalling on EVs could cause the wheels to fall off the Japanese auto industry at large. Some see parallels with semiconductors and consumer electronics, industries which Japanese firms initially dominated, then missed important trends abroad and ultimately lost out to nimbler competitors. A similar decline in the auto industry, which accounts for nearly 20% of Japan's exports and some 8% of Japanese jobs, would have huge economic and social implications.

Japanese carmakers are revving to catch up. Toyota has a new CEO, Sato Koji, tapped in part to lead the company's push for electrification. At his first press conference on April 7th, Toyota announced plans to release ten new EV models and boost annual EV sales to 1.5m by 2026. "We will thoroughly implement electrification, which we can do immediately," said Mr Sato.

Honda has plans to launch 30 EV models by 2030 and set up an EV joint venture with Sony last year. The company pitched a corporate reorganisation taking effect this month as an "electrification acceleration". In February Nissan said it would release 19 new EV models by 2030; it now calls electrification the "core of our strategy".

Japan's slow start on EVs stems in part from its earlier successes—or as Mr Sato of JATCO puts it, it is a classic case of the innovator's dilemma. Industry leaders hesitated to embrace a new technology that might undermine areas in which Japan leads, such as standard hybrid vehicles, which ▸▸

combine an internal combustion engine (ICE) and an electric motor powered by batteries that capture energy from regenerative braking (rather than charging with outside electricity, as with PHEVs). Engineers at Japanese firms that fine-tuned complex hybrids were also unimpressed by EVs, which are simpler mechanically. "Within the industry, there are still a lot of people attached to the engine," Mr Sato says. Executives worried about the implications of the EV shift on their network of suppliers such as JATCO, given that EVs require fewer parts and widgets than ICEs. Carmakers assumed eventually switching gears to EVs would be a cinch: "The logic was that when the time comes, we can easily shift from hybrids to EVs," says a former executive at a large Japanese car company.

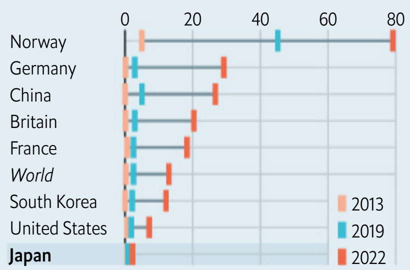
Japan also made an early wrong turn with hydrogen, another emergent auto technology with the potential to be carbon-free. Toyota, Japan's most influential carmaker, bet that using hydrogen fuel-cells would become the leading way to electrify cars. Abe Shinzo, Japan's prime minister from 2012 to 2020, championed policies to make Japan a "hydrogen society"; in 2015, Toyota delivered its first hydrogen fuel-cell sedan, the Mirai, to Abe himself. While hydrogen may come to play a big role in decarbonising hard-to-electrify sectors, such as steel production or fuelling long-haul trucks, it has so far turned out to make little sense as a technology to electrify light consumer vehicles. Even in Japan, which has built a fair amount of hydrogen-refuelling infrastructure, Toyota has struggled to peddle the pricey Mirai: the company has sold a total of just 7,500 fuel-cell vehicles in its home market.

While governments in China, Europe and America have increasingly subsidised EVs as part of their climate policies, Japan has done less to incentivise their adoption. The government has called for 100% of vehicles sold by 2035 to be electrified. But that would include hybrid vehicles, in contrast to other governments which have defined the next generation of vehicles more

Keeping the flame alive

Electric-vehicle sales*, % of total

Selected countries



*Battery & plug-in hybrid, light vehicles only

Source: EV-volumes.com

narrowly. Subsidies for fuel-cell vehicles remain much larger in Japan than those for EVs. Strict regulation has hampered the expansion of EV charging infrastructure: Japan has roughly one-quarter as many public EV chargers as South Korea, its much smaller neighbour.

Nagging scepticism about EV technology explains some of Japan's wariness. Japanese carmakers and officials are "still questioning", says Tsuruhara Yoshiro of AutoInsight, an industry journal: "Are EVs what consumers want? Do they provide value to them? Are they the best way to reduce CO_2?" Toyoda Akio, the previous Toyota CEO and grandson of the company's founder, liked to say that "carbon is the enemy, not the internal combustion engine." Even under Mr Sato, a protégé of Mr Toyoda, the company is sticking to what it calls a "multi-pathway" strategy that sees EVs as one part of a diverse fleet. "We think that the way to get the most carbon-dioxide emissions reductions net overall throughout the world is to tune the solution for each part of the world," says Gill Pratt, Toyota's chief scientist. For example, in developing countries, where renewable energy uptake has generally been slower than in the West, traditional hybrids might offer a more practical and economical way to reduce emissions in the interim.

But some think Japan's carmakers are moving too late to catch up with the changing times in more developed markets. "They are like the Tokugawa shogun-era closed country—they refused to see what is happening in the world," says Murasawa Yoshihisa, a management consultant. While Japanese cars were once synonymous with fuel efficiency and therefore environmentalism, they risk coming to stand for climate denialism. Japan's three biggest carmakers—Toyota, Honda and Nissan—rank lowest among the top ten global auto companies on decarbonisation efforts, according to a recent study by Greenpeace, an environmental group.

As Toyota's experience with the bZ4X suggests, designing and building top-of-the-line EVs may not be as simple as the Japanese firms assumed. "They were so overconfident that once they decide to do it, they will dominate the EV market," Mr Murasawa says. "But their offerings have turned out to be old-fashioned." Creating EVs that appeal to consumers requires putting more focus on software, while Japanese firms traditionally prioritise hardware. Even as they at last start gearing up, Japanese companies are already losing loyal customers. Japanese brands that "built a legacy" in America have been "caught flat-footed in the context of 2022", concludes S&P Global Mobility, an American research outfit. As the study notes, consumers switching to EVs in 2022 were largely moving away from Toyota and Honda. ■

India and EVs

Two wheels good

MUMBAI

EVs in India are mostly electric scooters—and spreading fast

Even licence plates contribute to the feast of colour that is an Indian city. Private vehicles have plates with black characters on white; commercial ones, black writing on yellow; rental vehicles, yellow on black; prized diplomatic plates are white and blue. And in the past few months a fourth colour scheme has become a lot more common: white on green. That is the licence plate allocated to electric vehicles (EVs), and they are suddenly everywhere—especially in the form of two- and three-wheelers.

Say the words "electric vehicle" and racy images of Tesla and its boss Elon Musk spring to Western minds. But outside rich countries, especially in India, the two-wheeler is the chariot of the middle classes. More than 70% of all vehicles on Indian roads are two-wheelers, chiefly scooters and motorcycles. Three-wheeled autorickshaws (which foreign tourists insist on calling "tuk-tuks") make up another 10%. These two categories accounted for 92% of EVs registered in India last year.

Their growth is impressive. EVs represented 4% of the 16m two-wheelers sold in 2022, up from 1% the previous year, according to Counterpoint, a market research firm. E-rickshaws are spreading much faster. About 40% of the 632,000 three-wheelers sold in 2022 were electric. That is projected to rise to 95% by the end of this decade. Four-wheelers are lagging. Just 1.3% of the 3.8m cars newly registered in India last year were electric, up from 0.5% in ▸▸

2021. Much of this growth is being driven by consumers in smaller cities, where public transport is poor and two-wheelers rule.

The growth spurt is largely fuelled by government incentives for both producers and consumers. In 2013, the then Congress-led government launched the first national scheme—the National Electric Mobility Mission Plan—to push EVS. Two years later, Narendra Modi, by then the prime minister, launched a demand-incentive scheme known by the acronym FAME, with an expanded second phase in 2019. Most state governments subsidise EV purchases, too. The incentives spurred the growth of EV scooter startups such as Ola Electric Mobility and Okinawa, which have gobbled up market share, though new firms are still emerging. The government aims for EVS to account for 30% of passenger car sales, 70% of commercial ones and 80% of two- and three-wheelers by 2030.

Is that realistic? A report by two government think-tanks charged with forecasting two-wheeler EV penetration produced a wide range of scenarios, with adoption by 2031 ranging from 3.1% to 87.7%. Arghya Sardar of Technology Information Forecasting and Assessment Council, one of the think-tanks, says it will be around 72%. Bain, a consultancy, forecasts a more modest 40-45%. Either way, incentives alone will not be sufficient. Battery technology will need to improve and become cheaper. Battery-swapping could also help.

Many challenges remain. The high upfront cost of EVS, despite the incentives, is a persistent one. Charging infrastructure will have to be built to address range anxiety, particularly for four-wheelers. The e-rickshaw market grew big and fast because an informal manufacturing industry produced vehicles using old-fashioned lead-acid batteries. It needs to be regulated and its technology upgraded.

Yet the payoff looks considerable. Over 85% of India's crude oil is imported. Petrol alone made up 24% of India's import bill in 2021-22. By contrast, coal, on which India's electricity supply depends, is mostly produced domestically. EVS should therefore help India cut its goods-import bills and energy dependence. That alone would not address climate change. But it would have major health benefits. Internal combustion engines produce an especially deadly form of pollution, known as PM2.5. One study estimates they contribute 20-35% of these lung-burning particles in the filthy air of Indian cities. And the number of vehicles on the roads is ballooning.

More hopefully still, India is starting to make strides in greening its energy mix, with the aim of meeting half of its needs with renewables by 2030. That is heroically ambitious. Still, the quiet electric revolution taking place on Indian roads shows the possibility of real progress. ■

Uzbekistan's new constitution

Enough Mirziyoyev

NUKUS AND TASHKENT

Uzbekistan's president clings to power while passing liberal reforms

"THE CONSTITUTION is yours!" proclaim red banners emblazoned on billboards and on buses zipping around Tashkent, Uzbekistan's capital. As Uzbeks prepare to cast ballots in a referendum on constitutional reform on April 30th, the government is whipping up such a fervour for a yes vote that even children have been dragooned in support. In a video that sparked mockery on social media, a nursery teacher led a group of tots in chanting pro-constitutional reform slogans.

Shavkat Mirziyoyev, president of the Central Asian country of 35m, presents the proposed overhaul as the latest item in a reform agenda he has pursued since coming to power in 2016, after the death of his tyrannical predecessor, Islam Karimov. Mr Mirziyoyev has freed political prisoners, relaxed media controls, promoted market reforms and ended forced labour in Uzbekistan's vast cotton fields.

The new constitution, which would rewrite 65% of the existing one, would foster "a modern democratic state that prioritises every person's individual rights", said Jakhongir Shirinov, chairman of the parliamentary committee overseeing the reforms. "Where once the state came first, now the citizen comes first."

The draft constitution includes guarantees on gender equality. Signalling a big change in patriarchal Uzbekistan, these would follow the recent adoption of a law criminalising domestic violence. The draft also recognises the rights of prisoners and defendants in a country that previously jailed and tortured dissidents on an industrial scale. Arresting officers would be obliged to read detainees their rights. Officials also highlight the draft's stipulations on the inviolability of private property. The new constitution signals the "irreversibility of reforms" in Uzbekistan, says Eldor Tulyakov, director of the Development Strategy Centre, a pro-government think-tank charged with publicising them.

Uzbekistan, which saw economic growth of almost 6% in 2022, partly thanks to Mr Mirziyoyev's reforms, is on the up. Yet there is a catch. The new constitution, which is almost certain to be voted through in the absence of a no campaign, could allow him to stay in power for a quarter of a century. Both the existing constitution and the new draft restrict presidents to two terms in office, and his second term ends in 2026. But the new constitution would "reset" Mr Mirziyoyev's terms to zero, permitting him to stand for two more. With the duration of presidential terms also set to be extended from five years to seven, Mr Mirziyoyev could retain power until at least 2040. He would merely need to keep winning re-election, which is eminently doable in a country with no political opposition. The new constitution would even entitle him to turn his current five-year term into a seven-year one and thus rule until 2042.

This is just the sort of constitutional trickery used by Mr Mirziyoyev's predecessor to rule for 25 years. A recent media crackdown also recalls Mr Karimov's time. Social-media users have been under pressure to delete posts critical of the new constitution. Mr Mirziyoyev said recently that he was committed to the "spirit of freedom" for the media, but that promises to be somewhat short of the real thing. "The

Uzbeks buy what Mirziyoyev's selling

press cannot raise the issues it wants to," 40 free-press advocates said in a statement last month, which also complained of media "pressure and intimidation". "We'll see after the referendum whether there will be no censorship and whether people who pressure journalists will be punished," said Anora Sodiqova, a reporter who was one of the signatories. She recently announced her departure from a pioneering independent media outlet that she had co-founded, citing "pressure and blackmail" from unidentified figures.

Many voters have not got to grips with the contents of the draft constitution, even if they plan to vote for it. The reforms will "change things for the better for us", enthuses a retired teacher in Tashkent, though he could not explain how.

In Karakalpakstan, in the country's north-west, voters seem more sceptical. The constitutional reform sparked turmoil in the autonomous region last year, after Karakalpaks took to the streets to protest over a clause in a first draft of the rewrite that would have stripped them of their right to secede. Mr Mirziyoyev scrapped the clause after 21 people were killed during an intervention by security forces to quell the protests.

Anger still simmers over the killings and its aftermath—including the conviction of 61 prominent lawyers, journalists and other civilians of fomenting the turbulence as part of a separatist plot. No law-enforcement officers have been held responsible for the deaths. In Nukus, Karakalpakstan's capital, many plan to stay away from polling stations. "I'm not voting after they killed all those people!" exclaimed one market trader, a typical response in Karakalpakstan. ■

Banyan The big man of land reform

Michael Lipton, who died on April 1st, championed land rights for the poor

In the district courthouse in Rangpur, crowds throng magistrates' doorways in search of redress. Many grievances in this northern quarter of Bangladesh have to do with land. Almas, a peasant-farmer in his 60s, clutches contracts in a dispute dating back to the 1980s. He sold an inherited plot to a more powerful neighbour who, he says, never paid for it. Justice grinds slowly, especially if you cannot afford to sway corrupt judges. Worry-lines crease Almas's face. Unable to afford other land, he is struggling.

Michael Lipton, a British economist who died this month at the age of 86, would have grasped what was at stake in Almas's case. Much of his life's work was dedicated to devising laws and processes to promote "land reform". The goal of such measures was to reduce poverty by increasing the proportion of farmland controlled by the poor. Most of Mr Lipton's fieldwork, and the biggest successes for his approach, were in Asia.

His main insight was as powerful as it was simple. In poor countries the neediest people are nearly always in the countryside, and often underserved by public policy due to an "urban bias". Attending to their needs through well-conceived land reforms brings greater reductions in poverty and inequality than any other approach, including the "green revolution", which boosted fertilisers and new crop strains to raise yields. In most places, merely having a clear claim to a bit of land is the best guarantee not only against destitution but of possible advancement. Over the past century, Mr Lipton wrote, "land reform has played a massive, central role in the time-paths of rural and national poverty, progress, freedom, conflict and suffering."

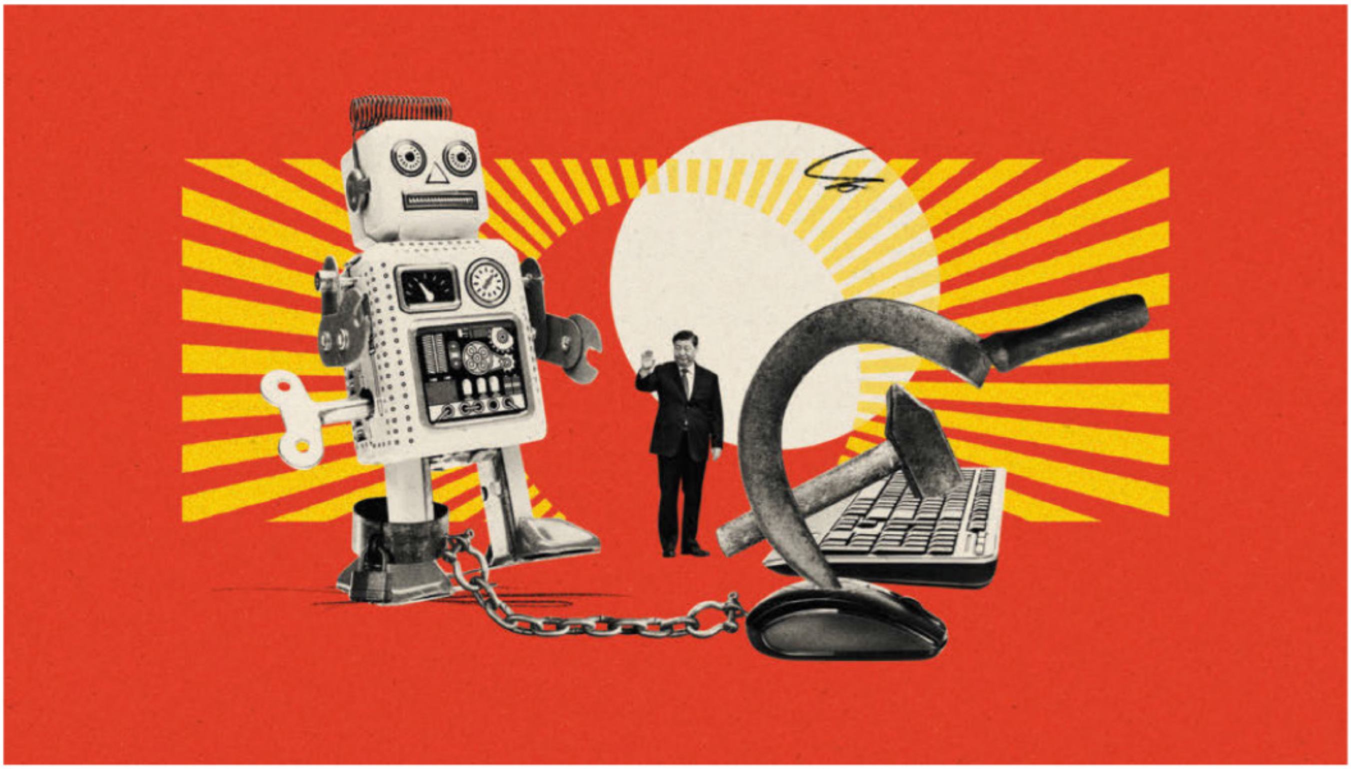
Mr Lipton came of age as the results of radical land reforms in East Asia were becoming apparent. Before the second world war, the region was ripe for change, with large and growing rural populations and a relatively small number of landlords owning most of the cultivable land. As Joe Studwell explains in "How Asia Works", demand for land was growing faster than supply. Instead of investing to increase yields, landlords simply let out their land at ever more crippling rents. It was then a small step to act as money-lenders to tenants. A form of debt bondage ensued. This was the pre-war situation in East Asia. Much the same happens in parts of Pakistan and northern India today.

After victory in China's civil war in 1949, Mao Zedong set to redistributing the land, starting by slaughtering millions of landlords. Under American tutelage, Japan, South Korea and Taiwan embarked on redistribution without the brutality. Marketing institutions and rural credit helped small household farms to flourish. In the decade after Japan's reforms, farm output grew by half. In South Korea rice yields doubled. Taiwan's farm incomes grew by as much as 150% in real terms.

These reforms were the foundation of East Asia's economic miracles. Needing to import less food, the countries could retain scarce foreign exchange—indeed, high-end vegetables were early export successes. Farm entrepreneurialism created new demand and markets, such as for light machinery. The countryside was a test-bed for future exports—Japanese cars' reputation for reliability was partly won on bumpy country roads. China's land reforms, by contrast, were disastrously reversed in the late 1950s, as Mao herded farmers into giant collectives. Only after the dismantling of the collectives after Mao's death in 1976 could China's growth spurt begin.

Land reform had political benefits, too. Inclusive rural growth in South Korea and Taiwan prefigured the inclusive politics of their impressive democracies today. Countries that have only halfheartedly reformed their land (Cambodia, Thailand and the Philippines, with its vast *haciendas*) represent not only a massive loss of human welfare and potential. They also reflect stunted political development. Mr Lipton referred to the "Big Man" model of land ownership. In the Philippines the patron-client relationships of the *haciendas* mirror the patronage systems of the country's politics. The Big Man model is invariably associated with unhappiness, unrest or political strife.

Mr Lipton estimated that at least 1.5bn people today own some farmland as a result of land reform. Most of them are in Asia. But in a few Asian countries, land reform has barely begun—above all in Myanmar, now racked by civil conflict. And like Almas, many poor landowners in Asia lack clear title to their land. Land reform in Asia has come a very long way. It still has a way to go.



Artificial intelligence

Welcome to ChatCCP

BEIJING

Like the internet three decades ago, artificial intelligence will test the Communist Party's ability to control innovation without crushing it

In the past month or so, China's tech giants have been showing off. Alibaba, Baidu, Huawei and SenseTime have all flaunted their artificial-intelligence (AI) models, which can power products and applications such as image generators, voice assistants and search engines. Some have introduced AI-powered chatbots similar to ChatGPT, the human-like conversationalist developed in America that has dazzled users. The new offerings have names such as Ernie Bot (Baidu), SenseChat (SenseTime) and Tongyi Qianwen (Alibaba). The latter roughly translates as "truth from a thousand questions". But in China the Communist Party defines the truth.

AI poses a challenge for China's rulers. The "generative" sort, which processes inputs of text, image, audio or video to create new outputs of the same, holds great promise. Chinese tech firms, hit hard in recent years by a regulatory crackdown and sluggish sales, hope that generative AI can create vast new revenue streams, similar to the opportunities brought by the advent of the internet or the smartphone.

The party, though, sees generative AI opening up vast new ways for information to spread outside its control. Its leaders may draw different comparisons to the internet, which seemed destined to help democratise China by increasing access to unfiltered news and communication tools. "Nailing jello to a wall" was how, in 2000, Bill Clinton described the party's attempts to control the web. Yet by deploying an army of censors and digital barricades the party has largely succeeded in creating an internet that serves its own purposes, and has cultivated an industry around it. Might something similar happen with AI?

Rules proposed by China's internet regulator on April 11th make clear the government's concerns. According to the Cyberspace Administration of China (CAC), firms should submit a security assessment to the state before using generative AI products to provide services to the public. Companies would be responsible for the content such tools generate. That content, according to the rules, must not subvert state power, incite secession, harm national unity or disturb the economic or social order. And it must be in line with the country's socialist values. Those restrictions may sound arcane, but similar rules, applied to the internet, let the party repress speech about everything from Uyghur rights to democracy, feminism and gay literature.

China's proposals come as governments around the world wrestle with how to regulate AI (see Science & technology section). Some, such as America's, favour a light touch, relying on existing laws to police the technology. Others reckon that new regulatory regimes are needed. The EU has proposed a law that categorises different uses of AI and applies increasingly stringent requirements according to the degree of risk. China's approach appears more piecemeal and reactionary. Last year, for example, the party feared that "deepfake" images and videos might disrupt the tightly controlled information environment, so it issued new rules on the technology. One banned AI-generated media without clear labels of origin.

There are similarities to China's approach to the internet. Its web controls, often referred to as the "great firewall", may seem monolithic. But keeping out "harmful" foreign content is only part of a more layered effort, developed over time and in-

→ Also in this section

volving many agencies and companies. The first stage was all about laying the groundwork for an internet the party could control, says Matt Sheehan of the Carnegie Endowment for International Peace, a think-tank. Today China's government is again building up its bureaucratic muscles and adding to its regulatory toolkit, this time with generative AI in mind. Mandating security reviews and requiring firms to register their algorithms with the state are examples of this, says Mr Sheehan.

China's control of the internet has not stifled innovation: just look at firms such as ByteDance, the Chinese parent of TikTok, a popular short-video app. But when it comes to generative AI, it is difficult to see how a Chinese company could create something as wide-ranging and humanlike (ie, unpredictable) as ChatGPT while staying within the government's rules.

The CAC says that the information generated by such tools must be "true and accurate" and the data used to train them "objective". The party has its own definitions of these words. But even the most advanced AI tools based on large-language models will occasionally spout things that are actually untrue. For a product such as ChatGPT, which is fed on hundreds of gigabytes of data drawn from all over the internet, it is hardly feasible to sort through inputs for their objectivity. Strict enforcement of China's rules would all but halt development of generative AI in China.

So experts doubt that the measures will be tightly enforced. Within the draft regulations there is scope for moderation. When generated content falls outside the rules, the government calls for "filtering and other such measures" and "optimisation training within three months". That sounds similar to the tweaking of models carried out by Western firms to, say, stop their chatbots from spewing homophobic content. Local AI regulations introduced by the city of Shanghai are even looser, stipulating that minor rule-breaking might not be punished at all.

The arbitrary nature of the CAC's proposed rules means that it can tighten or loosen them as it sees fit. Other countries might endorse such flexibility. But as big internet firms can attest, the Chinese government has a habit of rewriting and selectively enforcing rules based on the whims of President Xi Jinping. In recent years companies in fields such as e-commerce, social media and video-gaming have had to rethink their business models. In 2021, for example, state media branded video games "spiritual opium": regulators told gaming companies to stop focusing on the bottom line and reduce kids' desire to play. If Mr Xi does not like where generative AI is going, he could reset that industry, too.

One way Chinese AI firms may be held back is by limiting the personal data made available to train their AI models. The party runs the world's most sophisticated mass-surveillance state. Until recently, China's tech companies were also able to hoover up personal data. But this freewheeling era seems to be coming to an end (for the private sector). Now companies wanting to use certain types of personal data must, in theory, obtain consent. Last year the CAC fined Didi Global, a ride-sharing company, the equivalent of $1.2bn for illegally collecting and mishandling user data. Under the draft rules on AI, firms would be responsible for safeguarding users' personal information.

New jello, new nails

The CAC's proposed regulations come six years after China's master plan for AI called for "major breakthroughs" by 2025 and domination of the industry by 2030. Progress towards those ends has been mixed. Chinese companies in fields such as AI-assisted image recognition and autonomous driving, which have less to fear from the government's preoccupation with social stability, are doing well. They benefit from lots of public money—in fact, some provide tools that enable state repression.

But China is still behind America in terms of investment and innovation. Foreign investors have been turned off by American sanctions. Worse, America has restricted exports to China of the type of cutting-edge semiconductors that power AI, a move that could hobble the industry.

China may have more success when it comes to regulation. Under its master plan China is to have written the world's ethical code for AI by 2030. That is a stretch, but its rules on generative AI are more detailed and expansive than those suggested elsewhere, thus influencing the debate over handling the new technology. If China is quick to lay down new regulations, other countries will learn from it. One risk is that it moves too forcefully and hinders innovation. But Jeffrey Ding of George Washington University points to the other side of the argument. He notes the ingenuity of China's internet companies, and says that obstacles sometimes spur innovation.

Still, the idea that China may act as the lead guide when it comes to AI ethics ought to terrify Western governments. They may share some of the same concerns as China, including over misinformation and data protection, but not for the same reasons. Again, China's experience with the internet is informative. It has steadfastly opposed the notion of the web as a place of freedom and openness. When governments gather to discuss online regulation, China consistently sides with Russia and other tramplers of free speech. Mr Clinton was naive to think the Communist Party could not pound the internet into submission. It would be naive for Western leaders to think it cannot do the same with AI. ■

Youth unemployment

The lessons of Kong Yiji

Young people invoke an old literary character to express their frustration

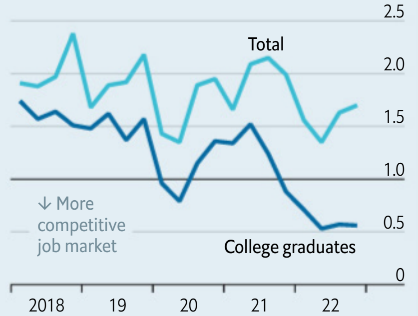
THERE ARE two classes of customers at the tavern in Lu town. The scholars sit inside, sipping wine in the long robes that mark their intellectual status. The workers, dressed in short robes, drink cheaper booze outside. Only one customer wears a long robe and stands outside: Kong Yiji, a miserable scholar-turned-beggar. He is mocked by the other customers for being poor, yet clinging to his erudite image. They sneer at the way he recites classical verse and tries to teach children how to write obscure Chinese characters. Away from the tavern, Kong steals and is beaten as punishment. Yet he still crawls to the bar—leading to more mocking. When he disappears he is assumed dead.

The story of Kong Yiji was written in 1918 by Lu Xun, a celebrated Chinese satirist (pictured on next page). But it is being cited today by young Chinese, who relate to Kong. A record 11.6m of them are expected to graduate from university this year. Many will be unable to find work. The unemployment rate for people aged 16 to 24 in cities is nearly 20%. The CIER index, a measure of labour-market competition produced by Renmin University in Beijing, shows a big gap between the number of college graduates and the number of jobs available (see chart). The phrase "out of school means out of work" is commonly seen online nowadays, as are memes about Kong Yiji.

That has annoyed the authorities, who believe today's youth should learn a different lesson from Lu Xun's tale. Kong Yiji could have improved his lot through hard work, but he was too pretentious to step off his intellectual pedestal, says a commentary on the website of CCTV, China's state

University challenge

China, CIER index, ratio of vacancies to job-seekers



Source: China Institute for Employment Research

What would Lu Xun think?

television. The implication is that Kong was to blame for his own suffering—as are today's young people, whose degrees, like Kong's robe, have made them too arrogant and lazy to do low-skilled jobs.

The government and its backers extol young people who they regard as anti-Kongs. The Communist Youth League recently highlighted a young woman from Jiangsu province called Wei Qiao. Ms Wei was praised by Xi Jinping, China's leader, for moving to the countryside and becoming a "new farmer". Young people should learn to "roll up their pants and enter the fields", said the league. Similarly, state media profiled a young university graduate, referred to as Ms Huang, who earns a living collecting garbage for recycling in Henan province. Office jobs are boring, says Ms Huang in the video. "We should not be shackled by our educational degrees."

Chinese netizens have ridiculed these reports. "Why don't we all stop going to school, go turn screws in factories, and save ourselves 15 years of effort?" asked one Weibo user. "My parents spent their lives working in factories and saving money to give me this scholar's robe. How can I take it off?" asked another. A young vlogger poked fun at how the state expects endless positivity from young people. In a sarcastic music video about "sunny-spirited Kong Yiji" he sings, "I went to school to help China rise, not to be some delivery guy." It was viewed 3m times before it was censored.

At a recent forum Yu Hua, a novelist, was asked for his views on all this. The problem is not the scholar's robe, but the job shortage, said Mr Yu, adding that he knew a publisher who had received more than 6,000 applications for six openings. The only solution is to seek economic growth so that more jobs are created, he said. China's GDP grew faster than expected in the first quarter. But the weak labour market for graduates—and memes about Kong Yiji—are likely to persist for some time. ■

China, Taiwan and pineapples

Spiky relations

Taiwan accuses China of stealing the fruit of its labour

In their quest for the perfect pineapple, Taiwan's agricultural engineers spared no effort. They spent almost 25 years developing a variety with a mango-like fragrance, a longer shelf life than the island's dominant strain, and a resistance to blemishing in its hot and humid summer. Released in 2018, it was officially named Tainung No. 23. But it soon became known as the Mango Pineapple.

The cultivar is now the focus of a fresh Chinese attempt at pomological warfare. On April 4th Taiwan's deputy agriculture minister, Chen Junne-jih, accused China of "plundering" plant breeders' rights after mainland media reported that Mango Pineapples were being grown in southern China. Smuggling seeds or seedlings to the mainland was "absolutely unacceptable", he said.

Pineapples are valuable exports for Taiwan. China has targeted them before to put pressure on the island, which it claims. But this latest development comes at a sensitive time, with China and America stepping up preparations for a potential war over Taiwan. The self-governing island will also hold a presidential election in 2024 in which farmers are an important constituency.

Since taking office in 2016, President Tsai Ing-wen has tried to reduce Taiwan's economic dependence on China by expanding exports to other countries. Her government is making progress towards a trade deal with America, both sides say. For now, though, China remains the island's biggest trade partner.

China lifted tariffs on Taiwanese pineapples in 2005, when it hoped to forge closer ties through trade. By 2020 it was buying $49m worth, more than 90% of Taiwan's annual exports of the fruit. Then, in 2021, China banned all Taiwanese pineapple imports, saying they carried pests. Taiwan called that a political ploy. Soon the pineapple became a symbol of resistance against China.

These taste like freedom

Ms Tsai urged her people to "eat Taiwan's pineapples until you burst". Local businesses added pineapple to products ranging from beer to beef noodles. Taiwan also called on other countries to buy its "freedom pineapples". That echoed a campaign to promote Australian "freedom wine" after China hiked tariffs on that product in 2020.

Japan responded to Taiwan's appeals with gusto. By the end of 2021 it had bought 62% of the island's pineapple exports. But further sales were hindered by the short shelf life of Taiwan's dominant Golden Diamond variety. So Taiwan began promoting Mango Pineapples, which were given temporary intellectual-property protection in Japan in 2022.

China, meanwhile, has rapidly expanded cultivation of Golden Diamonds and begun marketing them abroad as "Chinese pineapples". Its farmers now appear to be setting their sights on Mango Pineapples. On March 11th a state-run news website in the province of Hainan reported that both types were being grown on some 60 hectares of farmland.

Taiwan has just 27 hectares of Mango Pineapple under cultivation, with production restricted to four seedling companies and three farming households. Only Taiwan and Japan legally protect the cultivar. Taiwan and China established a plant-patent work group in 2010, but the Chinese side stopped talking in 2016.

On March 16th Taiwan's cabinet approved an increase in the maximum penalty for illegally exporting seeds or seedlings to three years in prison. Still, it will be hard to establish how the new variety reached China: it can be planted using buds from the pineapple's crown.

The news has been especially tough on staff at the Taiwan Agricultural Research Institute who began developing the cultivar in the 1990s by cross-pollinating different strains by hand. "It's a real disappointment," said Huang Shou-horng, a researcher there. "It's very damaging for us as individuals, as researchers and as a country."

Chaguan | What "de-risking" China means

European leaders call for de-risking but not decoupling from China. Alas, China wants to be a risk

De-risking is an ugly name for an interesting idea. When explaining how they hope to manage future relations with China, a growing number of Western leaders describe some version of risk management. This approach is presented as a middle path between the impossible—ie, trying to contain or isolate a country of China's size and importance—and the intolerable—namely, dependency on an autocracy that often bullies smaller countries.

The European Commission president, Ursula von der Leyen, is a prominent user of the term. The head of the European Union's permanent executive says that it is neither viable nor in Europe's interest to decouple from China, a vital trading partner and leading player in efforts to tackle climate change and other global challenges. Instead, citing China's growing repression at home and assertiveness abroad, she calls for de-risking ties.

De-risking is actually a catch-all for several defensive strategies. Mrs von der Leyen emphasises diplomatic candour, to avoid misunderstandings. Before a recent visit to Beijing she spelled out Chinese actions that damage trust, from unfair trade practices to Xi Jinping's embrace of Vladimir Putin, even after Russia's "atrocious and illegal invasion of Ukraine". In the same vein, on April 18th foreign ministers from the Group of Seven (G7) club of rich countries listed behaviours for China to avoid, among them forcing foreign firms to hand over technologies or data in return for market access and supporting the cyber-theft of commercial secrets. For good measure, G7 ministers warned China against using force to resolve territorial disputes, including in Taiwan (a scenario which could, by itself, devastate the global economy).

In America, the EU and elsewhere, de-risking can involve screening and even curbing investments in and out of China, as well as subsidies for rebuilding domestic industries, to reduce Chinese dominance of vital supply chains. It can also describe the use of national-security tools. To prevent China from building potent weapons with foreign technologies, America, Japan and the Netherlands are restricting exports to China of cutting-edge semiconductors and the equipment needed to make them.

Liberal democracies are even turning to risk management in such fraught domains as human rights. Foreign criticism will not end China's iron-fisted rule over Xinjiang. In the name of fighting Islamic extremism in that far-western region, authorities have demolished mosques, jailed poets and sent Uyghurs to re-education camps, coercive work programmes and harsh boarding schools. But democracies have a right to protect consumers from buying the fruits of repression. America's Uyghur Forced Labour Prevention Act, enacted in 2021, bars goods from Xinjiang and those that use inputs from the region, unless traders can prove they were not made with forced labour. In the past ten months, customs agents have impounded almost a billion dollars' worth of goods including solar panels, a product that often uses polysilicon mined and processed in Xinjiang. Without singling out China by name, the EU has proposed its own ban on products of forced labour.

Alas, to succeed, these various strategies will have to overcome a large obstacle: Mr Xi's China does not want to be de-risked. Start with diplomatic candour, and the supposed benefits of handing China lists of behaviours that make Western powers cross, or concessions (eg, international commitments over climate change) that would make Europeans and others cheer. In reality, China is increasingly confident that lectures from America and its allies are resented by many countries, especially poorer ones. America-scolding comments by two presidents, Emmanuel Macron of France and Luiz Inácio Lula da Silva of Brazil, during recent visits to China, further confirmed this view. China's foreign ministry duly spurned the statement issued by the G7 in terms calculated to appeal to the global south. A spokesman accused the group of "arrogance" and of "pointing fingers condescendingly", in a way that "runs counter to the prevailing trends of today's world".

Nor does China want its supply chains de-risked by outsiders. Quite the opposite: China's dominant role as a producer of vital goods and commodities is Mr Xi's stated goal. Some years ago the Communist Party boss called foreign dependence on Chinese supply chains "a powerful countermeasure and deterrent capability". In contrast, Mr Xi repeatedly urges China to avoid dependence on foreigners and achieve self-reliance in key technologies.

Where everything is a matter of national security

It is risky for foreign firms in Mr Xi's China even to screen their own supply chains for abuses. The Central Political and Legal Committee, a powerful law-enforcement body, marked National Security Education Day on April 15th by warning Chinese citizens about the devious ways of foreign enemies, including in the realm of economic security. One case study involved a Chinese supply-chain auditor punished under anti-espionage laws for helping a foreign NGO "concoct" allegations of forced labour in Xinjiang. That reflects an unhappy trend, says a supply-chain expert. A few years ago Chinese suppliers tolerated foreign audits as a sign of quality control. Today, he says: "anything related to forced labour, broadly defined, is a total no-go. You can't ask those questions without endangering everyone you contact." Major auditing firms refuse to work in Xinjiang, citing restrictions on access.

Revealingly, when self-interest calls, China will allow foreigners to conduct due diligence. In late 2022 American officials were allowed to visit chipmaking firms in China to check that they were not selling US technologies to military end-users. That reflected a contest of strength. America dominates many fields of chipmaking and had threatened to put Chinese firms on a blacklist.

De-risking is not a foolish way to approach relations with China. When trust collapses, continued engagement requires risk management. Still, expect China to call de-risking just another form of containment. Decoupling will not be easily avoided. ■

Sudan is not a one-off

Why are civil wars lasting longer?

KAYIN STATE, MYANMAR, AND PORT-AU-PRINCE, HAITI

Blame complexity, criminality and climate change

FIGHTER JETS roar over Khartoum. Bombs rattle the Sudanese capital. Many civilians, sheltering from what may be the start of a civil war, wonder: "why?"

It is tempting, and correct, to blame individuals. A conflict cannot erupt unless someone starts fighting, and Sudan has two conspicuous villains (see Middle East & Africa section). The army's head is battling a militia boss for control of Africa's third-largest country. General Abdel Fattah al-Burhan, Sudan's de facto ruler, runs a military junta that keeps delaying a promised handover of power to civilians. Muhammad Hamdan Dagalo (better known as "Hemedti"), leads paramilitaries called the Rapid Support Forces, which in an earlier guise committed genocide in Darfur.

Both sides have the kind of ambition that often leads to bloodshed in countries with few checks and balances. They crave unaccountable power and the perks that come with it. The army already has a vast, shady business empire; Hemedti has reportedly made a fortune from gold mines and selling military services abroad. Neither man seems willing to share power. Each calls the other a "criminal".

Yet Sudan's misfortunes are not simply the fault of these two odious men. The country has been tormented by civil war for most of the time since independence in 1956. It is an example of a global problem: the increasing persistence of conflict.

As attention is focused on great-power rivalry between America, Russia and China, conflicts in the rest of the world are getting worse. The number of people who have been forced to flee their homes has doubled in the past decade, to roughly 100m. Even as global poverty has retreated, the number of desperate people needing emergency aid has doubled since 2020, to 340m. Some 80% of this is driven by conflict, estimates the International Rescue Committee (IRC), an NGO.

Since 1945, conflicts have come in three overlapping waves. First, people in European colonies struggled for independence. Then, rival groups fought for control of these newly independent states. The cold war raised the stakes: the West backed insurgencies against governments that professed to be Marxist, from Angola to Nicaragua. The Soviet Union supported anti-capitalist guerrillas and revolutionary regimes on every continent.

After the collapse of the Soviet Union in 1991, the number of wars fell sharply. So, too, did the estimated number of deaths in battle. But after 2011 came a third wave. Both the number of wars and their deadliness increased, as the Arab spring led to conflagrations in the Middle East, a new form of jihadism spread across the Muslim world and Vladimir Putin resurrected old-fashioned Russian imperialism.

Mr Putin's invasion of Ukraine is unusual: a straightforward attempt by one state to conquer another and steal its territory. Most modern armed conflicts are harder to understand. They are usually civil wars, though many involve foreign meddling. They are largely in poor countries, especially hot ones like Sudan. (Indeed, they form a belt of pain around the equator—see map on next page.) They cause millions of deaths, but exactly how many is hard to estimate. Far more perish from war-induced hunger or disease than from bullets or shrapnel.

Fighting makes poor places rapidly poorer. A typical five-year civil war reduces income per head by a fifth, estimates Christopher Blattman of the University of Chicago in his book "Why We Fight". So it is alarming that wars are lasting longer (see chart 1 on the page after next). The average ongoing conflict in the mid-1980s had been happening for about 13 years; by 2021 it was nearly 20 years.

There are several plausible reasons for this. First, global norms are eroding. When Russia, a permanent member of the UN Security Council (UNSC), brazenly violated the UN's founding charter by invading Ukraine, murdering civilians and kidnapping children, it showed how much taboos have weakened. When China, another permanent member of the UNSC, called Mr Putin a "dear friend" despite his indictment for war crimes, it confirmed that for some world powers, might makes right. This emboldens smaller bullies.

In Sudan, for example, hardly anyone has been held to account for mass slaughter during the country's various wars, nor for mass rape, nor the widespread enslavement of black Africans by the country's Arabic-speaking elite. General Burhan and Hemedti pretended to listen to popular demands for justice after the overthrow of a former dictator, Omar al-Bashir, who has since been convicted of corruption. But it seems unlikely that they ever planned to hand over the reins to civilians, as they were supposed to do last week.

Impunity is not the whole story, however. Other factors are causing conflicts to burn for longer. Climate change is fuelling fights over water and land. Religious extremism is spreading. Organised criminals are making the world's most unstable states even more so. And conflicts are growing more complex.

The stuttering rifles' rapid rattle

Between 2001 and 2010 around five countries each year suffered more than one simultaneous war or insurgency. Now 15 do (see chart 2 on the next page). Sudan has conflicts in the east, west and south. Complex wars are in general harder to end. It is not enough to find a compromise that satisfies two parties; a deal may need to please dozens of groups, any one of which may cock its Kalashnikovs again if unsatisfied.

Civil wars are also becoming more international. In 1991 only 4% of them involved significant foreign forces. By 2021 that had risen 12-fold to 48%, reckons the Uppsala Conflict Data Programme, a research project. In the past decade this process has been driven partly by America's retreat from its role as global policeman, and mid-sized powers filling the vacuum. Russia and Turkey spar over Libya and Syria; Saudi Arabia and Iran have fought a proxy war in Yemen (see Middle East & Africa section). In Sudan, Egypt supports General Burhan while Hemedti is pals with Russia.

Foreign meddling can be benign, as UN peacekeeping operations generally are, even if they often blunder. But interventions by external powers with selfish agendas tend to make civil wars last longer and cost more lives, finds David Cunningham of the University of Maryland. The costs for external actors are lower—their own cities are not being destroyed—so they have less incentive to make peace.

Climate change is aggravating the mayhem. It does not directly cause conflict, but when pastures dry up, herders drive their hungry cattle farther afield, often encroaching on land claimed by rival ethnic groups. A review of 55 studies by Marshall Burke of Stanford University and others found that a one-standard-deviation increase in local temperature raises the chance of intergroup conflict by 11% compared with what it would have been at a more normal temperature.

Globally, some 24m people were displaced by extreme weather in 2021, and the UN expects that figure to soar. In Sudan, some 3m people were displaced by conflict and natural disasters even before the current round of fighting began.

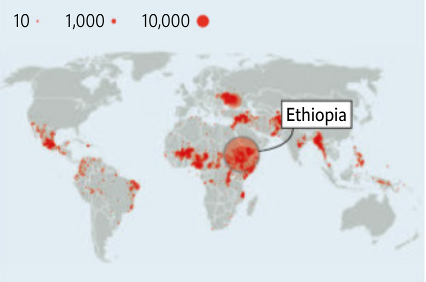
The bloodiest war in the world last year was not in Ukraine but in Ethiopia, notes Comfort Ero, the head of Crisis Group, a think-tank. Olusegun Obasanjo, a former president of Nigeria who helped broker a peace deal in November between the government and the Tigray region, has put deaths at 600,000 between 2020 and 2022. No estimate for Ukraine is as high.

Mohammed Kamal, an Ethiopian farmer, was ploughing his fields when he heard shooting. Returning to his village, he found that gunmen had murdered 400 people, mostly women and children. "Only a small number survived," he says.

Even if the peace deal holds, which is uncertain, it will not help Mohammed. For the massacre he witnessed was part of an entirely separate conflict, which is still blazing. While government troops were distracted by the war in Tigray, members of Ethiopia's largest ethnic group, the Oromo, revived an old insurgency, and are trying to drive other ethnic groups out of their home region. Mohammed says the gunmen who killed his neighbours were from the Oromo Liberation Army (OLA), a rebel group; their victims were from the Amhara ethnic group. (The OLA denies involvement.)

If that sounds complicated, it is actually much more so. Ethiopia has more than 90 ethnic groups, many of whose leaders are tempted to stir up hatred to win control of one of the country's 11 ethnically based regions. It hosts hundreds of thousands of refugees from four turbulent neighbours (Eritrea, Somalia, South Sudan and Sudan). The dictatorship next door (Eritrea) has sent armies to fight against a previous Ethiopian government, and arm-in-arm with the current one.

Ring of fire
Deaths directly caused by organised violence*
Feb 2022-Feb 2023



Source: UCDP
*Includes state-based, non-state and one-sided conflicts with over 25 total deaths in a year

War creates a vicious circle. As droughts and floods have devastated rural areas, young men with no prospects feel more tempted to pick up a gun and grab land or loot. Rebel recruiters understand this only too well. Facebook accounts linked to OLA show videos of young fighters celebrating with stacks of cash they have liberated from banks. With so many fighters lurking in the bush, kidnapping shopkeepers and murdering officials, businesses flee the area and public services get even worse. Locals then grow even more frustrated and angry, especially when the state responds with repression, which it often does.

The holy glimmers of goodbyes

To countries destabilised by bad governments and climate change, extremism adds gelignite. Consider the Sahel, a vast arid area below the Sahara desert. Five countries—Burkina Faso, Chad, Mali, Niger and (northern) Nigeria—suffered droughts in 2022 and the most severe food crisis in 20 years. Nearly 6m people were also hit by floods. Some 24m in these five countries are "food insecure" (meaning they struggle to feed themselves). In just one sub-region of Mali, the IRC found no fewer than 70 conflicts in late 2021. Half were about land; a third were about water. A seventh resulted in lots of people being driven from their homes.

Into this desperate environment have stepped jihadist groups. Since the Arab spring affiliates of al-Qaeda and (later) Islamic State have spread across the Middle East, Africa and beyond. They promise justice—such as the restoration of stolen grazing land—in countries where formal courts barely function. Once they have gained a foothold, they accelerate the collapse of state authority. Between 2020 and 2022 in the five countries mentioned above, the number of schools that were closed due to violence trebled, to 9,000. Half the region's children do not feel safe in school.

In Burkina Faso rival jihadist groups have made much of the country ungovernable. Towns are besieged. The government's efforts to vanquish the jihadists often make matters worse. Trucks carrying goods to jihadist-controlled areas must have a military escort, which may or may not be available. Jihadists block roads and plant bombs on bridges. All this gums up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Allegro
SEBASTIAN KULCZYK
Manta Ray vc, InCredibles

Pain, prolonged

World, average length of ongoing conflicts, years

Source: International Rescue Committee

trade and makes remote areas even poorer. The government's inability to beat the jihadists infuriates nearly everyone: the country suffered two coups in 2022.

A similar dynamic afflicts the whole of the Sahel. Instability is infectious. Farmers displaced by climate change cross unmarked borders and spark clashes. Jihadists seek havens in neighbouring countries. Their ideas spread rapidly online and in radical madrassas.

Western powers have tried to help, but failed. In November 2022 France gave up on Operation Barkhane, a military intervention to help the governments of Burkina Faso, Chad, Mali, Mauritania and Niger suppress jihadists. Earlier that year Mali's new military regime ordered French troops out and welcomed help from Russia's Wagner mercenary group, which has already been accused of massacring civilians.

Sebastian von Einsiedel of the United Nations University in Tokyo argues that the spread of jihadist groups makes it harder to end wars. Their demands are often impossible to meet, their footsoldiers are fanatical, and external mediators hate dealing with terrorists.

For rebel groups with no religious inspiration, mammon provides motive enough to take up arms. A study by James Fearon of Stanford University finds that civil wars in which a major rebel force earns money from illicit drugs or minerals tend to last longer. And the globalisation of crime has made it "easier than ever before" for such groups to get their hands on guns and cash, notes Mr von Einsiedel.

Government forces are often greedy, too. Among the reasons why Congo's war is "self-perpetuating", argues Jason Stearns in his book "The War That Doesn't Say Its Name", is that officers are paid a pittance but can make fortunes from embezzlement and extortion when deployed to combat zones. Locals complain about the "pompier-pyromane" (firefighter-pyromaniac) problem: regional strongmen who start a fire so the central government has to negotiate with them to put it out.

An extreme example of the links between crime and conflict is Haiti. In 2021 its president, Jovenel Moïse, was assassinated. No one knows who ordered the hit, but many suspect a link to the drug trade. The country has been in chaos since. Gangs that once dominated only slums now control much of the capital, Port-au-Prince. They have seized roads, market places and anywhere convenient for extorting money from terrified civilians. Joe, a school director who prefers to stay anonymous, describes how his school received a bullet in an envelope, with a demand for $50,000 protection money to keep classes open. "On the spot, we had to close the school until further notice," he sighs.

Haiti's prime minister, Ariel Henry, is begging for a foreign military intervention to help the police restore order. Many locals would welcome it. Ralph Senecal, the boss of a private ambulance firm, who was kidnapped in October, says that only American troops can restore order. However, opposition groups fear that such an intervention would only prop up Mr Henry, who seized power after Moïse's death and is widely regarded as illegitimate.

One country in Asia illustrates all the ills that make civil wars endure. In an old wooden farm house near the Thai-Myanmar border, Ko Khaht is boiling chicken and rice. When it is cooked, he liquidises it, sucks it up with a syringe and feeds it to his injured comrade, who is missing part of his skull and cannot move or speak.

Myanmar is home to some of the world's oldest insurgencies, and some of the newest. Ko Khaht belongs to the People's Defence Force (PDF), which was set up after a military junta seized power in 2021. It is the armed wing of the National Unity Government, a parallel state of activists, politicians and ethnic leaders that aims to restore democracy. He joined it after he saw soldiers murder a man in front of his home. He packed a small bag and fled to the Thai border, where he worked in a bomb-disposal unit. He has lost his right hand, and his skin is pockmarked by shrapnel.

Multiple menaces

World, number of countries with two or more conflicts

Source: International Rescue Committee

Myanmar's strife is staggeringly complex. Perhaps 200 armed groups control slices of territory or are fighting to overthrow the government. Some are armies seeking autonomy for large ethnic groups; others are local militias trying to defend a single village. The country has not had a conflict-free year since independence in 1948. Even compared with this violent past, though, norms have atrophied in the past two years. "There's a new level of brutality, with the tone set at the top," says Richard Horsey of Crisis Group.

In March a company calling itself the "Ogre column" was dropped into Sagaing, central Myanmar. They went on a killing, raping and torturing spree. But rebels say such atrocities only serve to strengthen their resolve.

Climate change is at work: the insurgency has gained strength in the central dry zone, which has been made poorer by drought. Crime, too, gives many fighters a reason to keep fighting. The army is deeply enmeshed in heroin and jade smuggling, as are some ethnic militias. Mr Horsey expects the war "to grind on for a generation to come".

No prayers nor bells

The world is not short of ideas for how to end wars. Find a respected mediator. Start unofficial talks long before the belligerents are prepared to meet publicly. Include more women and civil-society groups in the peace process. Accept that any peace deal is likely to be ugly. "Excluding people you don't like from politics doesn't work," notes David Miliband, the head of the IRC. Purging the Iraqi army of all supporters of Saddam Hussein's regime was a mistake, as was trying to build a system in Afghanistan without the Taliban. But the most important measures (build functional states in war-torn countries, curb climate change) could take decades to implement.

And global efforts to promote peace are hobbled by the fact that two veto-wielding members of the UNSC are serial human-rights abusers that object to interference in the internal affairs of blood-spattered regimes. Russia has used its UNSC veto 23 times in the past decade, scotching resolutions to allow more aid into Syria, investigate war crimes in the Balkans and (of course) to uphold Ukraine's sovereignty. China has issued nine. America has issued three, mostly to protect Israel; France and Britain, none at all. In 2001-10, when Mr Putin's imperial ambitions were more limited and Xi Jinping was not yet in power, Russia issued only four vetoes; China, two.

A French proposal to suspend the veto when mass atrocities are occurring passed the UN's general assembly last year, but has no way past Mr Putin's veto pen. The world is entering what Mr Miliband calls "an age of impunity". ■

Professional services

The too-big four

Even as EY shelves its plans, the commercial logic for splitting up the largest firms is getting stronger

"WHOEVER SAID don't question things? We say question everything." So began the television commercial that EY aired in 2021 during the Super Bowl, a sports extravaganza known as much for its pricey ads as for the American football they interrupt. On April 11th, under a little too much questioning from its American branch, the professional-services giant decided to delay indefinitely plans for a separation of its audit and advisory businesses. A big sticking-point was the division of the tax practice, coveted by both auditors and advisers. Plans to publicly list the advisory business and load it with debt to pay off audit partners also looked cleverer when the deal was conceived in 2021, amid low interest rates and frothy share prices.

This suspension is a huge blow to EY's global bosses, who underestimated just what an uphill climb "Project Everest", the unfortunately codenamed break-up project, would prove. To EY's split-averse professional-services rivals in the so-called "big four", Deloitte, KPMG and PWC, it looks like vindication. Joe Ucuzoglu, Deloitte's global chief, insists the "multidisciplinary model" is the "foundation" of his firm's success. Bill Thomas, his opposite number at KPMG, says his firm's decision in the early 2000s to list its advisory arm (since regrown) was "not the right thing". Bob Moritz, who leads PWC, insists keeping the businesses together is central to his firm's ability to recruit and retain talent.

Yet the case against turning the big four into a biggish eight is far from open and shut. That is because the commercial logic of the split is getting more compelling. At stake is the future of one of the business world's most critical oligopolies.

The big four are the heavyweight champions of professional services. They dominate the market for audits—checking the books for 493 of the companies in America's S&P 500 index and a big proportion of European blue chips. They also offer clients a one-stop shop for advice on issues from dealmaking to digitisation. Together, as of last year, they employed 1.4m people and generated $190bn in fees, up from $134bn in 2017 (see chart 1 on next page). KPMG, the smallest of the big four, generates three times the revenue of McKinsey, the high priest of strategy consulting.

The driving force behind the big four's growth in recent years has been the rapid expansion of their advisory businesses, which now account for half their combined revenues (see chart 2). In the early 2000s EY, KPMG and PWC all spun off or sold their consulting arms in response to new conflict-of-interest regulations, which barred them from selling advice to audit clients. (Deloitte planned but then abandoned a spin-off.) With little room to expand in audits, however, the giants were soon lured back into the fast-growing business of advice.

The rebundling has in many ways paid off. The opportunity to dabble in different service lines has helped the big four entice the bright-eyed young things their businesses rely on. A career in bean-counting looks more appealing when it comes with the opportunity to work on big acquisitions or advise governments on important matters, observes Laura Empson of Bayes Business School in London and formerly of ▸▸

→ Also in this section

the board of KPMG's British branch.

The big four's breadth has helped them win over clients, too. Expertise in areas such as tax and valuations has helped KPMG and the others solidify their position as auditors-of-choice for large companies, says Mr Thomas. Widely recognised audit brands, meanwhile, have boosted the reputation of the firms' advisory arms.

Mr Moritz argues that the multidisciplinary model has also helped PWC and the other professional-services giants adapt to the digital era. Software and data now underpin nearly all the services the firms offer. The auditors benefit from the technological know-how of the advisers, while the advisers benefit from the steady demand for audit work, which can fund investments even during downturns.

All that explains why some have balked at the idea of a separation. Firms operate franchise-like structures, with independent partnerships in each country, which also makes big shifts like a break up tough to pull off—as EY discovered in America.

Yet the case for staying conjoined is weakening as the big four's businesses shift towards consulting. Auditor-independence rules have turned from an inconvenience into a drag; a bugbear of EY's is its inability to team up with the software firms it audits, such as Salesforce, to help them roll out their technology to clients. Newish requirements in Europe and elsewhere for firms to rotate their auditors, typically every ten years, have increased clashes between audit and advisory partners over who will serve big customers.

Meanwhile, auditing has been steadily losing its internal clout, says Ms Empson. Sarah Rapson, deputy head of the FRC, Britain's audit overseer, worries that the firms no long foster the "culture of scepticism and challenge" that auditing relies on. The problems are on display in a string of much publicised audit snafus. On March 31st APAS, Germany's accounting watchdog, barred EY's German branch from taking on new publicly listed audit clients for two years over its failure to spot mischief at Wirecard, a fintech darling turned fraud. Last year KPMG was fined £14m ($18m) by the FRC for feeding misleading information into a review of two of the firm's audits. In 2020 Deloitte was fined £15m ($19m) by the FRC for audit failings, too.

Those audit flubs have tarnished the consultants by association. They could also lead to greater pressure from regulators to invest more in auditing, particularly around fraud detection. At the same time, the advisers are getting increasingly capital-hungry—they want to expand into managed services, running functions such as compliance, payroll and cybersecurity on behalf of clients, and they need new technology to do it. An advisory spin-off would leave the auditors flush with cash while freeing the consultants to pump themselves up with fresh equity from outside their partnerships.

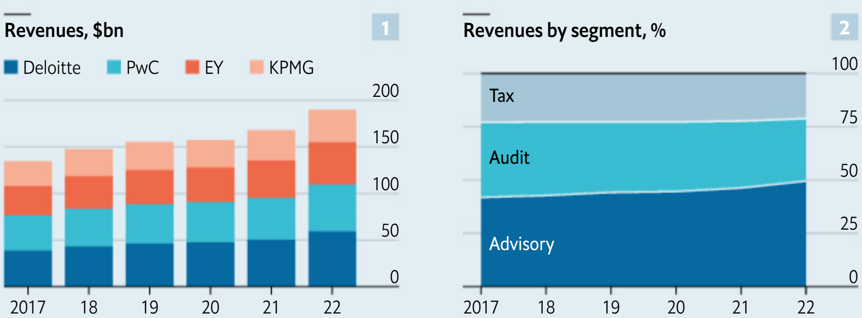
Staying together may no longer be good for attracting talent, either. The increasingly specialist skills offered by the big four leaves fewer opportunities for junior staff to dabble in different tasks. Few bosses want to receive cybersecurity advice from a fresh-faced accountant.

Mr Ucuzoglu of Deloitte warns that auditor-adviser break-ups have "never once played out as intended". The consulting business KPMG listed two decades ago, under the name BearingPoint, went bankrupt in 2009. And the sale of EY's and PWC's old advisory businesses to, respectively, Capgemini and IBM, two IT-focused consultancies, resulted in messy culture clashes.

As EY reels from its graceless tumble down Everest, it and its three rivals will think twice before embarking on a similar expedition. Still, the break-up logic is unlikely to go away. Accenture, a consulting giant, emerged from the rubble of Arthur Andersen, the collapse of which in the early 2000s turned the "big five" into the big four. It has thrived since, now raking in $62bn a year in sales, more than any of the big four. Since listing in 2001 its market value has risen 20-fold, to $185bn. Such a prize may be too tantalising to resist. ■

The bigger and bigger four

Big four accountancy companies



Source: Kennedy Research Reports

India

Apple branches out

The global gadget-maker spies new opportunities in Asia

THE INTRICATE timber roof-tiles were assembled in Delhi, the bright stone walls sourced from Rajasthan. But the man who opened the door of Apple's gleaming new Mumbai outlet on April 18th had been flown in from California. Tim Cook, Apple's boss, dispensed high-fives and *namastes* as he opened that shop and, two days later, an equally ritzy outlet in Delhi, the first Apple stores in India.

Soon to become the world's most populous country, India has a new strategic importance for the world's most valuable firm. As the crowds at Apple's stores demonstrated, India is a growing consumer of pricey tech gadgetry. And as the humming factories outside Chennai show, the country is also increasingly a maker of them. With political and logistical difficulties mounting in China, Apple is putting down roots in a new Asian market.

Take consumers first. India will shortly have more of them than any country, as its population of 1.4bn edges past that of China this year. Apple products are beyond the means of most Indians. Whereas Apple accounts for more than half the phones sold in America, its market share in India last year was 4.5%, according to Counterpoint, a research firm. But as they get richer, Indians are upgrading their handsets. In the year to March, Apple's revenues in India were almost $6bn, an increase of nearly 50% on a year earlier, according to Bloomberg. Dan Ives of Wedbush Securities, an investment firm, forecasts that its Indian revenues could reach $20bn in 2025. "India is a hugely exciting market for us," Mr Cook told investors in February. "We are, in essence, taking what we learned in China years ago…and bringing that to bear."

That applies to manufacturing processes, too. In the first two decades of the century Apple shifted most of its manufacturing to China. But China is becoming a riskier place for American firms to do business. One danger is political, as the two countries vie for tech supremacy. America's threat to ban TikTok, a popular Chinese-owned social-media app, could be met by equivalent sanctions on American firms. Another risk is logistical. China's zero-covid policy has interrupted manufacturing supply chains, most recently in November and December, when a series of hiccups hampered production of the iPhone 14 Pro.

Given these risks, the company is scrambling to avoid having all its apples in one basket. India, where Apple began manufacturing with the domestic market in mind, is now seen as a future export base. Government subsidies help. In September Apple announced that it was making the iPhone 14 in India, the first time it had assembled a latest-generation phone in the country. By 2025 a quarter of iPhones will be made outside China, mainly in India, forecasts JPMorgan Chase, a bank. Vietnam, where Apple is reckoned to make almost half its AirPod earphones, has been another winner. Apple is now in talks to make its MacBook laptops in Thailand, *Nikkei* reported earlier this month.

Apple plays down the idea that it is deserting China; even in a worst-case scenario it would keep manufacturing there for China's vast domestic market (worth more than $70bn to Apple last year) and for some export, insiders say. Last month Mr Cook visited Beijing, where he hailed the "symbiotic" relationship between Apple and China and was applauded as he toured the company's flagship store in the capital.

He has little choice but to maintain friendly relations. Even as Apple shifts some final assembly of its products to other countries, it relies on its long Chinese supply chains for components. Making tech gadgetry is a capital-intensive business. No country will have a manufacturing ecosystem like China's any time soon, says Anshul Gupta of Gartner, a research firm: "There will always be some interdependence across these markets. You cannot just be completely decoupled."

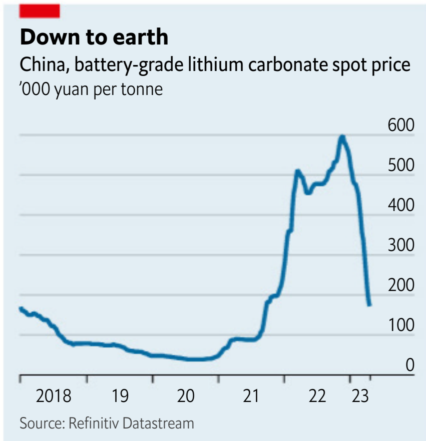
Nonetheless, India and others are eager to take whatever slice they can of Apple's manufacturing pie. On April 19th Mr Cook was entertained in Delhi by Narendra Modi, India's prime minister. A noted selfie-enthusiast, Mr Modi has been spotted wielding a gold iPhone. Judging by the crowds at Apple's new stores, he soon won't be the only one. ■

Battery metals

Ahead of the pack

Why crashing lithium prices will not make electric cars cheaper

Among the commodities that are key to decarbonisation, lithium is in the driving seat. Dubbed "white gold", the metal is needed to produce nearly all types of batteries powering electric vehicles (EVs). A single pack typically includes ten kilograms of the stuff. In the past two years turbocharged EV sales worldwide helped boost prices twelve-fold, prodding miners to invest, carmakers to sign supply deals and governments to label it a strategic material. Most commodity prices stalled this winter, but lithium continued to ride high.



The rally has since gone into reverse. Prices for Chinese lithium carbonate, one of the two main forms of refined lithium, have more than halved this year (see chart). One reason is slowing demand for EVs in China, the biggest market for them. Another is that carmakers such as Ford and Volkswagen, eager to enter a race dominated by Tesla and Chinese rivals, signed battery-supply deals at high prices last year. They are now reviewing the terms, further dampening appetite.

Global supply of mined lithium is rising fast, meanwhile. After growing by 1% in 2022, to 575,000 tonnes, it could jump by nearly a fifth this year as big mines come online in Australia and Chile, says Tom Price of Liberum, an investment bank. The sudden price slide has hit the valuations of SQM and Albemarle, the world's largest miners of the metal. But the big miners are unlikely to suffer too much. Lithium is still expensive. Benchmark Minerals, a consultancy, estimates that carbonate prices are four times what they were, on average, between 2016 and 2021, when many big projects were commissioned (mines take about five years to build).

Prices have yet to reach a floor but they are unlikely to fall far enough to bury big miners' profits. Prices below $22,000 a tonne, far lower than today's levels, would cause many of China's domestic mines to shut down, lowering supply. And even as the refined product has become cheaper, the price of spodumene, a feedstock used to transform lithium ores, remains high, squeezing processors' margins. They too may be forced to slash production, supporting prices of the refined stuff.

And there are signs demand will revive. ▸▸

Not-so-precious metal

In April the chief of the China Passenger Car Association said he expected sales of EVs in the country to rise by 30% this year. JPMorgan Chase, a bank, reckons a rebound will tip the lithium market into a deficit in 2023 and 2024. EV sales elsewhere remain healthy. The price of lithium hydroxide, a refined form of lithium used in more expensive, longer-range batteries, which are preferred outside China, has held up better than that of carbonate. It will help that hydroxide cannot be stored for ever. In the longer run rising demand for lithium for energy storage, supported by green policies in America, Europe and China, could make the market even tighter.

This explains why big miners are still moving forward with new projects, such as Albemarle's $1.3bn lithium hydroxide plant in South Carolina. A slump in the share price of rivals could allow them to grow bigger. In March Albemarle offered to buy Liontown Resources, an Australian producer, for $3.7bn. Insiders expect more deal activity. Carmakers, for their part, are anxious to secure more lithium. In April General Motors said it would invest in a startup that proposes to extract metal from previously ignored deposits, the latest in a series of recent bets on lithium ventures.

A recovery in prices would disappoint carmakers. Lithium-ion battery prices have plummeted over the past decade or so, yet last year soaring metal prices helped to push up battery costs by 7%. The recent fall in lithium prices should again mean cheaper batteries, but it typically takes months for lower prices to translate into cheaper cars, by which point prices may be rising again. After a multi-year tear, white gold is taking a pause. Enjoy the pit stop while it lasts. ■

Bartleby What makes a good office perk?

Something that an employer can cut and that an employee really values

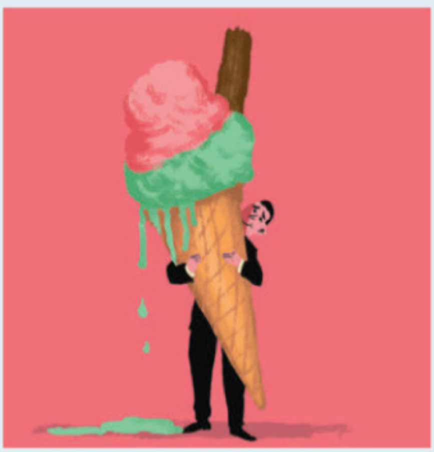
When companies tighten their belts, they look first to discretionary spending. Meta got rid of free laundry for its workers last year. In January Google announced a round of lay-offs that included 27 in-house massage therapists. Salesforce, another tech firm, has axed its contract with a Californian "wellness retreat", where employees would have done God-knows-what with each other. The chopping of such benefits has been christened the "perkcession". But just as perks get cut in bad times, so they return in the good. Eventually you can expect to read articles about a "perkcovery". What makes a good perk?

Dispensability is part of the point. This is not like a salary or a health-care plan; if it cannot be cut, it is not a perk. Views on what counts as a discretionary benefit can shift over time. Before the pandemic being allowed to work from home every so often was seen as a perk. Anyone who still describes it that way has failed to grasp how much the world has changed for white-collar workers. By the same token many of the perks that are now being cut were designed for a pre-pandemic world of long weeks in full offices. Last month Google warned that services at snack bars and cafeterias were being reviewed because attendance patterns had changed.

Working out which perks are valuable to workers is hard. Asking employees may not always yield good answers. A poll conducted last year for Trusaic, a software firm, asked American workers what perks they would like to see introduced: the top answer was hangover leave. Perks that sound great in theory may not work out that well in practice. Several firms, Goldman Sachs and Netflix among them, tout the fact that they offer members of staff unlimited holidays. But other companies have abandoned the policy because the absence of clear rules leaves employees unsure how much time they can really take off; some take less than they did under a fixed allocation of vacation days.

Perks should reinforce a culture, not be undermined by it. Firms should not be offering employees access to advice on financial well-being if they pay worse than everyone else. They should not be touting mindfulness courses if they expect employees to work until they drop from exhaustion. And perks should be motivating to the widest possible group. Snack cupboards filled with calorific goodies are some people's version of a sugary paradise, and others' idea of obesogenic hell. If your perk is a source of controversy, it's probably not right.

The framing of a perk matters, too. Mental accounting is a concept that was coined by Richard Thaler, a behavioural economist, to describe how people put different values on money depending on context. A discount on a small purchase feels more significant than the same amount off a big-ticket item, for example. Helping people with things they resent paying for can also be more effective than doling out treats.



In "Mixed Signals", an enjoyable new book on incentives, Uri Gneezy describes an experiment he conducted with three academics in Singapore, in which taxi drivers there were rewarded if they did a certain amount of exercise. Some drivers were given $100 in cash and others were given a credit equal to the value of a much-disliked rental fee they had to pay to the firm that owned the taxi. The rental credit proved much more motivating to drivers. Employers who offer help with pet insurance or student-loan debt repayments may be onto something.

Perks also work best if they are noticed. Employees can quickly become habituated to something that is unvaryingly available. Ben and Jerry's offers its staff three pints of ice cream and frozen yogurt a day; that risks being a benefit which fades into the background, even if its employees are less likely to. Time-limited seasonal benefits are a good answer to this: some firms let their people knock off early on Friday afternoons during the summer, for example. By the time the days lengthen and the weather warms, that perk might help to keep good employees in their posts.

No employer should mistake perks for the things that really matter to their staff. Research into what workers value most reveals the same priorities: stimulating work, being recognised by their managers, good wages. When it comes to office environments, too, basics like natural light count for more than a massage. But perks can help at the margins. If you are going to dole them out, the trick is to find something that is both discretionary and meaningful.

Big pharma

Close to the edge

A fast-approaching patent cliff prompts a flurry of deals

A PRICE TAG of $10.8bn would look hefty for most acquisitions of smallish and newish companies. But for Merck, a drugs giant known as MSD outside America, the money it is spending to buy Prometheus Biosciences, a biotech firm based in California, is relatively small change. In the world of big pharma such deals have the potential to generate enormous returns.

Even though Prometheus makes no profits to speak of and has no approved drugs on its slate, the big prize for Merck is PRA023, a drug approaching the late-stage of clinical trials developed by Prometheus to treat ulcerative colitis, Crohn's disease and other nasty autoimmune conditions. For now, Prometheus is burning through cash at a fast-rising rate. Merck's decision to scoop it up is a bet on what comes next.

The American giant badly needs promising new treatments to replenish its drugs pipeline. Like other pharma companies, it is facing a cliff-edge as patents on money-spinning treatments come to an end. Keytruda, Merck's cancer-immunotherapy drug, accounted for over a third of its sales in 2022, but will face competition from cheaper copycats once key patents expire in 2028 in America and in Europe two years later.

The problem goes industry-wide. Patents for more than 190 drugs will expire before the end of the decade, leaving sales worth as much as $236bn at risk of a dramatic drop-off. Few will be spared the coming onslaught. The world's ten biggest drugmakers, including Merck and Pfizer, an American rival, stand to lose around 46% of their revenues, which amounted to over $500bn combined in 2021, according to ZS, a consultancy. For five of these companies, at least half of their annual revenues are at stake.

Pharma bosses are spending big to plug the gaps. The industry has long turned to dealmaking as a way of compensating for the potential loss of revenue from expiring patents. Despite a dearth of mergers and acquisitions in other sectors, drugmakers are driving a wave of consolidation across the sector. PWC, a consultancy, estimates that the value of takeovers in the pharma and life-sciences industries could reach $275bn in 2023, up by almost three-quarters from last year.

So far, the prices buyers are willing to pay have come with huge premiums. Merck is forking out $200 per share for Prometheus, a whopping 75% above the firm's closing price just before the offer was made. Another acquisition unveiled in March will see Pfizer pay $43bn for Seagen, a loss-making cancer biotech firm. The industry's richest deal in three years came at a 33% premium to Seagen's share price. And on April 18th GSK, another pharma giant, agreed to buy Bellus Health, a Canadian biotech firm with a promising treatment for chronic coughs, at around double the company's pre-deal value.

The benefits of paying out vast sums for drugs that are close to regulatory approval are clear. It can take more than a decade to bring a new drug to market, and many cures fail along the way. With a healthy $1.4trn in cash piles waiting to be deployed, big pharma is choosing to buy its way out of trouble instead. ■

Fast Retailing

Faster, please

SINGAPORE

Uniqlo's success mirrors the growth of Japan's industrial giants

DRIVE THROUGH any city in South-East Asia and Japan's commercial presence is visible everywhere: vehicles made by Toyota, Honda and Nissan clog the roads, the result of decades of market dominance in the region. If Fast Retailing, the parent company behind Uniqlo, a clothing retailer, has its way, the drivers of those vehicles will soon be wearing Japanese clothes, too.

The company's latest results were a boon for shareholders, with operating profits of ¥103bn ($760m) in the three months to the end of February, up by 48% compared with the same period last year. They already had good reason for cheer: the company's shares have risen by 53% in the past 12 months, making it one of the best-performing large listed companies in Japan. Its shares are now just 10% shy of their all-time highs in February 2021, and, with a market capitalisation of $76bn, it is the country's sixth-largest listed firm.

At first glance, Uniqlo is an unusual story of a Japanese retailer succeeding overseas. Fast Retailing's main international competitors—Hennes & Mauritz AB, the parent company of H&M, and Inditex, the parent of Zara—are based in Sweden and Spain respectively. But the firm's growth abroad follows as much in the footsteps of Japan's industrial and manufacturing firms as its European peers.

Japanese industrial firms, carmakers in particular, made South-East Asia a second home from the 1960s onwards. Fast Retailing is also expanding particularly rapidly in Asia, where sales (excluding its home market and greater China) are up by 71% in the six months to the end of February, compared with the same period a year ago. The region now accounts for 16% of sales, up from 11% a year ago, and it is closing in on mainland China, Hong Kong and Taiwan, which dropped from 25% to 22% over the same period. In the 1960s the focus of Japanese firms was on exploration for oil, the supply of natural resources and producing industrial goods in countries with import-substitution policies. Now the region represents a promising market for Uniqlo rather than somewhere to put factories.

The comparison extends beyond geography. Exposed to demographic constraints in fast-ageing Japan, Fast Retailing has used technology and automation to replace workers, further mimicking the country's large manufacturers. Keyence, a largely unheralded giant of industrial automation, is Japan's second-largest listed firm, worth $111bn. Since 2017 Uniqlo has embedded all its garments with tiny identification tags, which enable automatic scanning at checkouts.

The reliance on automation goes deep into the company's business operations and supply chain, too. In 2019 it joined up with Japan's Mujin and France's Exotec Solutions, both small robotics companies, with the aim of automating the jobs in its warehouses. It had already joined forces in 2018 with Daifuku, a larger automation firm, which helped reduce the workforce at a warehouse in Tokyo by 90%.

The savings are no longer just a bonus for the firm's bottom line. Uniqlo raised salaries for some employees by up to 40% in March, in an effort to make corporate wages comparable to similar firms internationally, in order to compete for talent, and will set pay based on global standards in future. Savings from automation will be a necessity if the company wants to avoid eating into its profit margins to bump up salaries for its staff. ■

Schumpeter | Meet the new co-pilot

How businesses are experimenting with generative AI

EACH EARNINGS season comes with new buzzwords. As companies ready their scripts for the most recent quarter, one phrase in particular is sure to end up on many bosses' lips—generative artificial intelligence (AI). Ever since ChatGPT, an artificially intelligent conversationalist, began dazzling the world, bosses have been salivating over the potential for generative AI to turbocharge productivity. Zurich, an insurer, is now using a customised version of ChatGPT to simplify lengthy claims documents. Mattel, a toymaker, is designing new playthings using DALL-E, another tool that conjures images based on text prompts. Absci, a biotech company, is using the new wonder to assist with the development of therapeutic antibodies. Plenty of other firms are dipping their toes in this unfamiliar water.

The toolmakers of the knowledge economy have more fully embraced the innovation frenzy. Microsoft has announced a string of product updates that will allow desk jockeys to offload tasks from drafting emails and summarising documents to writing computer code. "Like working in dog years", is how Eric Boyd, head of AI for the tech giant's cloud-computing division, describes the company's hectic release schedule. Google, a rival, is likewise souping up its suite of tools, as are Adobe, Salesforce and Bloomberg, makers of software for creative types, salesmen and financial whizzes, respectively. Startups like Harvey, a ChatGPT-like legal assistant, and Jasper, a writing aid, are emerging thick and fast.

Despite all the experimentation, companies remain uncertain about how to make use of AI's newfound powers. Most, according to Mr Boyd, either underestimate or overestimate the technology's capabilities. Efforts are being made to determine which jobs are the strongest candidates for reinvention. A study published last month by OpenAI, the outfit behind ChatGPT and DALL-E, looked at the share of tasks within an occupation that could be speeded up by at least half using the new technology. Topping the list were occupations involving copious amounts of routine writing, number crunching or computer programming—think paralegals, financial analysts and web designers.

It is unlikely that firms will soon dispense with such jobs entirely. Generative AI may do a good job of producing first drafts but relies on humans to give instructions and appraise results. Microsoft, tellingly, has labelled its new suite of tools "co-pilots". In "Impromptu", a recent book by Reid Hoffman, co-founder of LinkedIn, a social network for professionals, the author counsels users to treat ChatGPT and others "like an undergraduate research assistant". (The book was written with the assistance of a bot.)

What's more, as coders, salesmen and other white-collar types become more productive, there is little evidence yet that companies will want fewer of them, argues Michael Chui of McKinsey, a consultancy. Software may eventually eat the world, as one venture capitalist predicted, but so far it has only nibbled at the edges. And most companies will surely choose more sales over fewer salesmen. Yet various hurdles lie ahead for businesses looking to make use of generative AI. For a start, many firms will need to rethink the role of junior staff as apprentices to be trained, rather than workhorses to be whipped. Getting the best out of generative AI may also prove tough for firms with clunky old IT systems and scattered datasets. On the plus side, large language models like the ones powering ChatGPT are better at working with unstructured datasets than earlier types of AI, says Roy Singh of Bain, a consultancy that has inked a partnership with OpenAI.

Other reservations could still slow adoption. Companies have a much higher bar than consumers when it comes to embracing new technology, notes Will Grannis, chief technologist for Google's cloud-computing division. One concern is shielding confidential or sensitive data, a worry that has led companies from JPMorgan Chase, a bank, to Northrop Grumman, a defence contractor, to ban staff from using ChatGPT at work. Zurich does not allow customers' personal information to be fed into its tool.

A bigger concern is reliability. ChatGPT-like tools can spit out plausible but incorrect information, a process euphemistically dubbed "hallucination". That may not be a problem when dreaming up promotional material, but it is a fatal flaw elsewhere. "You can't approximate the design of an aeroplane wing," notes Mike Haley, head of research for Autodesk, a maker of engineering software. Humans err, too. The difference is that generative-AI tools, for now, neither explain their thinking nor confess their level of confidence. That makes them hard to trust if the stakes are high.

Productivity to the people

Bosses could also find their appetite for generative AI spoiled by growing worries over the risks the technology poses to society, particularly as it gets cleverer (see Science section). Some fret about a barrage of AI-generated scams, misinformation and computer viruses. Such concerns are spurring governments to action. America's Commerce Department is seeking comments from the public on how it should approach the technology. The European Union is amending a planned bill on AI to encompass recent advances. Italy has, for now, banned ChatGPT.

A final fear is that rolling out clever AI could undermine the morale of staff, if they worry for their futures. Yet so far employees appear to be among the new technology's most enthusiastic supporters. Of 12,000 workers surveyed in January by Fishbowl, a workplace-network app, 43% had used tools like ChatGPT for work-related tasks—a large majority without their bosses knowing. Such enthusiasm suggests few tears shed for the loss of menial tasks to AI. "No one goes to law school to spend time trawling through documents," says Winston Weinberg, Harvey's co-founder. That may be enough to encourage firms to continue experimenting. With productivity growth in rich countries languishing for two decades, that would be no bad thing. ■

Bewildering data

The Mona Lisa effect

How to explain the puzzle of the world economy

WHAT IS MONA LISA doing? At first glance the subject of the world's most famous painting seems to be smiling. Look again and her smile fades. When it next reappears, it is a different sort of smile. Leonardo da Vinci achieved this ambiguous effect with the use of *sfumato*, where he blurred the lines around Mona Lisa's face. No matter how many times you look, you are unsure quite what is happening.

The post-pandemic economy is like the Mona Lisa. Each time you look, you see something different. After chaos in the banking industry, many analysts are now convinced that the world economy is heading for a "hard-landing" recession. Few seem to expect a "no-landing" scenario, in which the economy remains untroubled by rising interest rates—a fashionable opinion just weeks ago, and one which itself supplanted a common view late last year that a mild recession was certain.

In short: forecasting has rarely been harder. In the past year the range of analysts' expectations for American quarterly GDP growth has been twice as wide as in 2019. The word "uncertainty" appears more than 60 times in the IMF's latest global economic outlook, about twice as many as in April and October 2022. When the banking panic struck, no one had the slightest idea what the Federal Reserve would do with interest rates in March—some investors expected a rate rise, some no change, some a cut—and the next few meetings look equally unpredictable. At the European Central Bank's most recent monetary-policy meeting last month, Christine Lagarde, its president, was blunt about her institution's role. "It is not possible to determine at this point in time what the path will be going forward," she said.

Official statisticians are struggling to understand the picture. As a matter of course they update their estimates of everything from GDP to employment as more data come in. But something profound has changed. GDP revisions in the euro area are four times bigger than normal. In March Britain's statistics office issued some huge revisions. The release showed real business investment was in line with its pre-pandemic level, not 8% below as once believed. Last month Australian statisticians more than halved their estimate of productivity growth in the third quarter of 2022. That year America's Bureau of Labour Statistics (BLS) issued revisions to its estimate of nonfarm payrolls (not adjusting for seasonality) of 59,000 a month between the first and third estimates, compared with 40,000 in 2019.

What is going on? Perhaps the world is simply more volatile. In the past year Europe has seen its biggest war in seven ▸▸

→ Also in this section

decades, supply-chain snarl-ups, an energy crisis and banking panic. The rest of the rich world has only been a bit more stable.

Yet there are also deeper changes at play. The first relates to covid-19 disruptions. The world lurched from crashing to soaring growth as lockdowns came and went. This has played havoc with the "seasonal adjustments" common to most economic numbers. In February the BLS changed the factors that it applies to inflation, which makes interpreting monthly rates much more difficult. Annualised core inflation in the final quarter of 2022 "increased" from 3.1% to 4.3%. It is also harder than normal to understand euro-zone inflation. Kamil Kovar of Moody's Analytics, a consultancy, notes that depending on how seasonal adjustment is done, core month-on-month inflation in March was as low as 0.2% or as high as 0.4%.

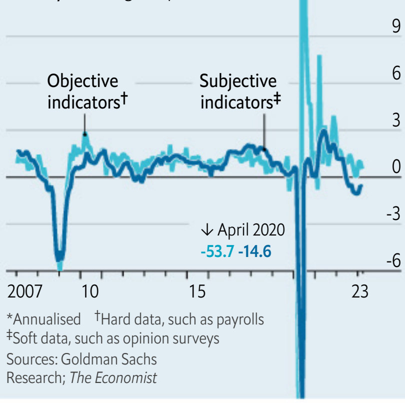
The second change relates to sample sizes. The pandemic accelerated a trend in which a growing share of people fail to respond to official surveys. In America the response rate for the survey used to estimate vacancies has fallen from nearly 60% just before the pandemic to around 30%. When covid struck, the response rate to Britain's labour-force survey fell by roughly half. During lockdowns, some businesses closed. People fell out of the habit of filling in questionnaires. Distrust in government may also have grown, leaving people disinclined to help statisticians.

Blanked

Falling response rates probably increase data volatility. They may also lead to bias. The people who stopped responding to surveys appear less prosperous than those who continue to do so, misleadingly inflating income. Jonathan Rothbaum of the Census Bureau suggests that real median household income growth in America from 2019 to 2020 was 4.1%, not 6.8% as originally reported, after proper corrections for non-response. Since 2020 non-response has continued to push up income statistics by about 2%. A report by Omair

Blinding ignorance

Developed markets, economic activity, % change on previous month*



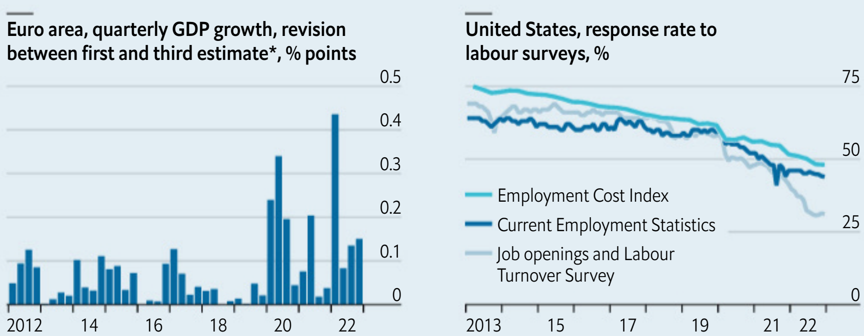
*Annualised †Hard data, such as payrolls
‡Soft data, such as opinion surveys
Sources: Goldman Sachs Research; *The Economist*

Sharif of Inflation Insights, a consultancy, suggests that correcting for "non-response bias" may also have contributed to recent big revisions to American earnings data.

The third reason for confusion stems from the disparity between "hard" and "soft" data—objective measures such as the level of unemployment, and subjective measures such as people's future expectations. Normally the two types move in sync. Right now they are far apart. "Soft" measures look recessionary. "Hard" measures point to a decent expansion. The divergence may reflect people's grumpiness with inflation. Prices in the rich world are still rising by 9% year on year.

Investors and statisticians will get better at understanding the world economy during periods of volatility and inflation. As the effects of the pandemic fade, so will distortions to seasonal adjustments. Economists have already made progress in incorporating alternative data into forecasts, helping to overcome the problem of declining responses. But this is scant comfort for governments and businesses that need to make decisions right now—or for people just trying to keep up with the news. Do not be surprised if the global economy remains *sfumata* for a while yet. ■

Never finished, only abandoned



Sources: Eurostat; Bureau of Labour Statistics; *The Economist* *In absolute terms

Finance post-turmoil

Storm damage

WASHINGTON, DC

Are American banks out of danger?

AFTER A HURRICANE has passed there is a period of calm that can feel euphoric. Survival is no longer at stake. Then, once the relief begins to fade, it is time to assess the damage. What destruction has been wrought? How difficult will it be to recover? This sequence will be familiar to anyone who has been paying attention to American banks this year. In the days that followed the sudden failure of Silicon Valley Bank, once the country's 16th-largest lender, as well as two other banks, panic and fear ripped through the financial system. Now, though, the storm seems to have passed. Certainly, no lender has been imperilled since. Cue the relief.

What of the wreckage? The extent can be hard to discern in the immediate aftermath. But America's listed banks must, once a quarter, disclose their balance-sheets and earnings, offering a 30,000-foot view of the mess. Results season, which began on April 14th, when Citigroup, JPMorgan Chase, PNC Bank and Wells Fargo reported their first-quarter results, will continue to be closely watched through to April 24th. That is when First Republic, a bank in San Francisco which narrowly avoided failure in March, will belatedly disclose its results, having postponed its normal schedule in light of events.

The panorama so far visible indicates that damage has not struck each part of the banking industry evenly. The simplest way to see this is to examine three measures—deposit bases, interest income and profits—at three differently sized banks. The biggest, with \$3.7trn in assets, is JPMorgan Chase; one of the largest regional banks, PNC, with \$560bn in assets, is up next; Western Alliance Bancorp, an Arizona-based lender with a mere \$70bn in assets, completes the trio.

On each measure, JPMorgan is doing well. Flight from other parts of the industry, as institutions and individuals moved to bigger and safer-seeming banks, resulted in deposit "flock". Thus the bank's deposit base grew by 2% from the end of 2022. Although Jeremy Barnum, JPMorgan's chief financial officer, cautioned that he would not assume these deposits would stick because, "by definition, [they] are somewhat flighty", the bank nonetheless expects to earn a lot more interest income now (that is the difference between what a bank collects on its loans and what it pays for its funding). At the end of last year, JPMorgan thought it would make $74bn in interest income in 2023. The bank now thinks it will make some $81bn, since it will have to pay less to retain deposits across the board. All this has helped increase profits at the firm to $12.6bn, up by 15% on the previous quarter and 50% on the previous year. JPMorgan looks just as structurally sound—perhaps even more so—than it did before the storm arrived.

Things are not quite so comfortable at PNC, our midsized bank. The good news is that the firm's deposit base has held up—it was $435bn on average in the final quarter of 2022 and ended the first quarter of 2023 at $437bn. The bad news is that the firm is paying considerably more for these deposits. At the end of last year, PNC customers held around 31% of their deposits in non-interest-bearing accounts, and PNC paid around 1.07% on the deposits that did earn interest. Now customers hold just 28% of deposits in non-interest-bearing accounts and PNC paid an average of 1.66% on the rest during the quarter. Although increases in the interest PNC is paid on its loans has numbed the pain, the bank's net-interest income still dropped from $3.7bn to $3.6bn. The institution is clearly being cautious—it grew its loan book by just 1% in the first quarter—and this caution means it also set aside less for loan losses than it did in the final quarter of last year. The overall result is that profits ticked up just a little in the first quarter.

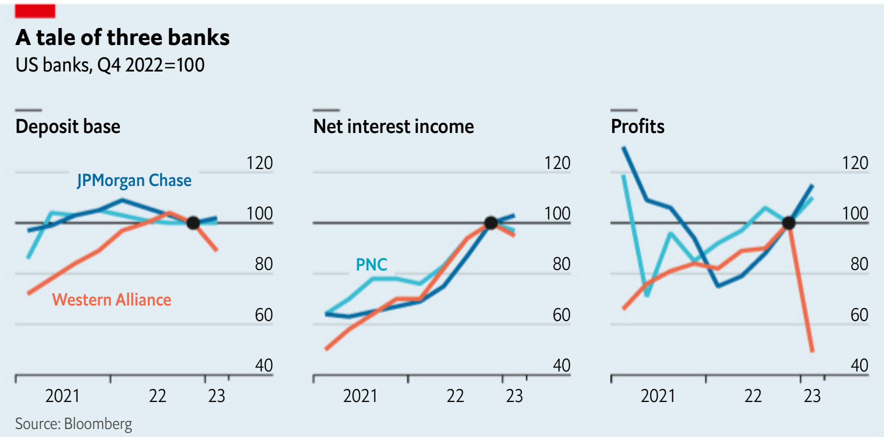
Next, consider Western Alliance, the puniest of the three banks. Here the damage is most evident. Western Alliance lost some 11% of its deposits in the first quarter of the year, although the bank's management pointed out that deposits bottomed out on March 20th and have since climbed. As deposits are a low-cost source of funding, this pushed up the bank's interest expense by almost 50%, from $250m in the fourth quarter of 2022 to $360m in the first quarter of 2023. Again the impact was dampened by rising interest on loans, which climbed by 10% on the quarter. Thus the institution's net interest income only dipped 5% compared with the previous quarter. The clearest evidence of damage is in its profit figures, however. As Western Alliance shrank, it sold off parts of its balance-sheet, including loans and securities. This resulted in $110m of losses in the first quarter. Profits fell to $142m, down by half compared with the previous quarter. The firm is now planning to build up capital.

These metrics do not paint a picture of an institution near collapse. The clearest proof of impending peril for a bank would be evidence that it has lost so much of its funding—its deposits—that it needs to fire-sell vast quantities of assets even at the cost of enormous outright losses. An alternative harbinger of doom would be if a bank's funding costs have climbed by so much that its net interest income is wiped out, indicating that it will struggle to make profits in future and maintain its capital levels. None of this is yet evident at the Arizona-based lender.

Sweat the small stuff

For the moment, investors seemed to be soothed by the facts laid out by Western Alliance. The financial institution's shares rallied by 24% on April 19th (although they are still down by a third in the year to date). Its net interest income fell in the first quarter, but is still well above where it was when interest rates were at zero in 2021. Now that the bank has pruned its balance-sheet and is starting to build capital, it could even end up in better shape than it was during the era of low rates.

It is nonetheless likely that other banks yet to report, including First Republic, have been more grievously wounded. It is also possible that the full extent of the damage might not have been revealed. Most banks report a quarterly average for their net interest margins, not an end of quarter figure, which will mask recent events. Funding costs may have spiralled more than is apparent. Living through a storm can be a scary experience; making it through one intact is a relief. Not all banks have made it through just yet. ■



Property

Waiting for ever

SHANGHAI

Foreign capitalists hope to benefit as China fixes its property mess

OVERSEAS INVESTORS have been pecking at the Evergrande empire for well over a year. They have so far come away with very little. The Chinese company, which is the world's most indebted property developer, with some $300bn in liabilities, defaulted in late 2021 and has been fending off creditors ever since. When the firm delayed a restructuring plan last year, a group of bondholders demanded that Hui Ka Yan, Evergrande's chairman, put up $2bn of his own cash—a demand which went precisely nowhere. The billionaire, Evergrande and many other failing property companies have so far done well to continue to keep their assets out of foreign clutches.

China's property industry was flung into crisis in the middle of 2021 as companies such as Evergrande struggled to meet stringent government limits on debt levels while also continuing to build homes and pay creditors, both those in China and overseas. In the years since then, 39 companies with close to $100bn in dollar-denominated debts have defaulted. In recent weeks, a few have publicly announced proposals for how they will repay offshore creditors. Have they offered up enough?

The property crisis means different things to different people. It has left ordinary folk without homes for which they have paid, as companies come up short on the cash needed to build them. It has cut off the most important sources of revenue for local officials—those of land sales to developers—and has hindered their ability to pay their own debts. This is leading to worries about a much bigger onshore debt crisis in future, linked to financing vehicles run by city and provincial governments. For local creditors, meanwhile, the worry is that small banks have lent too much to developers and local-government firms, and could therefore collapse.

Of all those involved, foreign bondholders have been noisiest. That might be because they are lowest on the totem pole of parties likely to be compensated. The property crisis has devastated the offshore market for Chinese debts. There are $170bn-worth of outstanding dollar-denominated bonds issued by Chinese firms. According to Goldman Sachs, a bank, just a third of issuers have made payments on time. Yet Chinese authorities are loth to bail out hedge funds run by foreign capitalists, so have offered next to no support.

The legal structures that underpin

these debts are based on the laws of Hong Kong or other offshore jurisdictions but—in the event of a dispute—involve claiming assets almost exclusively based in China, and therefore governed by Chinese law. This has created a buffer between creditors such as BlackRock, an American asset manager, and the holdings of Evergrande.

Only recently have developers given a sense of what they are willing to offer the foreigners. So far the outlook is far from encouraging. Since the start of the year five companies have put forward restructuring plans, including Evergrande and Sunac, another highly indebted firm that recently defaulted. The proposals could become templates for other restructuring attempts over the years to come.

What is on offer is mainly debt extensions rather than "sustainable and permanent restructurings", note analysts at Fitch, a rating agency. For example, one group of Evergrande creditors will receive new bonds with maturities of up to 12 years—a frightfully long wait. Those willing to accept riskier equity-linked instruments can expect repayment in under a decade. Sunac investors have been offered a similar, albeit slightly better, deal.

Both Evergrande and Sunac are also offering to swap debt for stakes in some of their operations. The former has been trying for several years to build an electric-vehicle business, and is willing to give creditors a slice. Sunac has a property-management arm that it is offering up. Such investments pay nice dividends when firms perform well, but offer far less protection than fixed-income investments when they collapse. Accepting such offers would be a "leap of faith", according to Sandra Chow of CreditSights, a research firm. Few creditors will willingly take so much as a hop.

One Hong Kong-based lawyer has called the early restructuring proposals "a bad punchline at the end of a long joke". They will, however, buy developers some time. The central government's priority now is to re-establish confidence among homebuyers. To do that officials must ensure that homes for which payments have been made actually get delivered. This strategy does not include direct support for foreign creditors. Yet if the state can muster a gradual recovery in the property market, some companies may be able to offer offshore bondholders better deals.

The government has loosened some of the restrictions that threw the sector into turmoil in the first place. An improvement is clearly in the works. In 30 of China's big cities, sales in March increased by 44%, year on year. The same month, average property prices across 70 cities rose, too. If the revival continues, the proposals from Evergrande and Sunac might mark a low point for the market, and for foreign confidence in it. That, at least, is the hope. ■

Helping the poor

Cautious pioneers

Development finance is getting bigger. It needs to get bolder, too

For cash-strapped governments, development-finance institutions (DFIs) offer an understandably alluring vision: that of development executed by the private sector at little cost to the state. Such institutions try to build businesses and create jobs by lending money and buying stakes in firms, and seeking healthy returns. Their aim is "to do good without losing money", as an early chairman of the British one put it. Of late they have been tasked with fixing the climate, promoting sustainable-development goals and shepherding investors to difficult markets, too.

This grand vision explains a recent rush of money into bilateral DFIs. In 2019 America set up the US International Development Finance Corporation (DFC), with an investment limit of $60bn, twice that of its predecessor. The year before, Canada launched its first DFI. In Europe the combined portfolio of the 15 biggest institutions has doubled in a decade, to €48bn ($53bn) by the end of 2021. Some organisations operate as wholly owned investment arms of their governments; others are more like public banks, in which commercial investors have a minority stake. There is a common problem, however: DFIs are yet to show their model can meet ambitions in the world's poorest places.

The funds end up in all sorts of businesses, from risk insurance for marine conservation in Belize to investing in Ethiopian telecoms operators. European outfits allocate a third of their cash to financial institutions, which lend it on to local firms. Another quarter goes to energy projects, such as solar panels and hydroelectric dams. DFIs have mostly avoided losing money, making modest returns in the process, though covid-19 temporarily pushed many into the red. By their own reckoning, they have created millions of jobs.

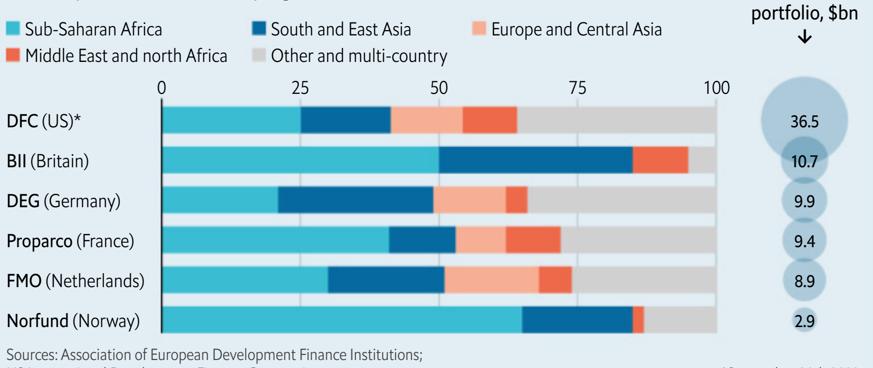
Yet this avoidance of loss may reflect excessive caution. In theory, DFIs go where private investors fear to tread, demonstrating the possibilities of new markets. In practice, they often look for cheap co-financing from donor agencies that give grants or concessional loans, in order "to take the risk off the table" by making the firms involved less likely to fail, says Conor Savoy of the Centre for Strategic and International Studies, a think-tank. Philippe Valahu of the Private Infrastructure Development Group says his donor-backed fund, which focuses on Africa and Asia, has taken on projects that DFIs turned down "because they were viewed as too risky".

One issue is where to spend. In 2021 some European DFIs made only half their investments in sub-Saharan Africa or South Asia, the two places where almost all the world's poor live. In tough countries it can be hard to find projects that are ready to receive finance. A failed investment may be bad for development as well as for the balance-sheet, argues Colin Buckley of the Association of European Development Finance Institutions. "You have a negative demonstration effect," he says. "What you're telling all investors is: 'Don't come here, you're only going to lose money.'"

Another issue is the type of investments DFIs make. Businesses in developing countries need capital that is going to stick around and shoulder risk, as equity does. But only a few DFIs, such as those in Britain and Norway, hold large equity portfolios. In America the DFC's use of equity is constrained by federal budget rules, which treat it like a grant rather than a recoupable investment. In Europe some big DFIs are set up and regulated like banks, with loans as their bread and butter. Banking rules designed for Europe are hard to apply in countries where some customers lack doc-

Unfinanced territory

Share of portfolio investment by region, December 31st 2021, %



Sources: Association of European Development Finance Institutions; US International Development Finance Corporation

*September 30th 2022

uments such as certificates of incorporation, says Michael Jongeneel, chief executive of FMO, the Dutch DFI.

Many institutions are trying to be more adventurous. America's DFC last year made around 70% of new investments into countries with average incomes of below the $4,256 threshold at which a country becomes upper-middle income according to the World Bank. British International Investment (BII) puts most of its money into Africa, and holds about 9% of its portfolio in a "Catalyst" fund, which seeks out the very riskiest investments. In 2021 a group of DFIs launched a new platform to pool expertise and map markets in so-called "fragile" states, including fact-finding visits to Liberia and Sierra Leone.

But DFIs are caught between competing expectations, explains Samantha Attridge, co-author of a recent study for ODI, a think-tank. Governments want them to generate a financial return, to go where private investors will not and to draw many more private investors into their projects. "If you want to create the maximum impact by going to the most difficult places, you're not going to be able to bring pure commercial investors alongside you," says Nick O'Donohoe, chief executive of BII.

Governments, as the primary shareholders, must decide what precisely is the purpose of DFIs. That means being realistic about what markets can achieve amid obstacles to investment such as political insecurity or a lack of contract enforcement—the kind of gnarly problems which DFIs are not designed to solve. "Robust private-sector development and access to capital is critical for growth," as Scott Nathan, chief executive of DFC, points out. But they cannot always come first. ■

Buttonwood Of price and yen

Warren Buffett is shaking Japan's magic money tree

Shares in three of Japan's five largest trading conglomerates reached record highs over the past week, following an announcement by Warren Buffett that he is keen to own more of their stock. It is just the latest good news for the firms. Itochu, Marubeni, Mitsui, Mitsubishi and Sumitomo Corporation have surged in value since Berkshire Hathaway, Mr Buffett's investment firm, announced its first purchases on his 90th birthday in 2020. Since then, their share prices have risen by between 64% and 202%.

In some ways Japan and Mr Buffett are a match made in heaven. Mr Buffett is famed for his unerring focus on business fundamentals. Even after a recent sell-off in American stocks the broad Tokyo market is still far cheaper. Its price-to-earnings ratio (based on expected earnings over the next year) is around 13, compared with 18 in America. The trading firms Berkshire Hathaway has invested in—known in Japan as *sogo shosha*—are often seen as stodgy and reliable. All have price-to-earnings ratios of below ten and pay healthy dividends.

Berkshire Hathaway's Japan trade is revealing in other ways, too. It illustrates why the country may become a more appetising destination for other American investors. On April 14th the investment firm issued around $1.2bn in yen-denominated bonds, adding to the $7.8bn it issued from 2019 to 2022. Not only is Japan now Berkshire Hathaway's second-largest investment location—the yen is also its second-largest funding currency. Even before the recent issuance, nearly a fifth of Berkshire Hathaway's debt was denominated in yen.

The company is not borrowing because it is short of cash. Rather, the trade reveals the advantages of currency hedging. Borrowing as well as buying in yen protects Mr Buffett from falls in the currency's value. And as a result of the gulf in interest rates between America and Japan, he can finance his investments using long-term loans charging less than 2% annually, while keeping his spare cash at home invested in government bonds earning almost 5%. Mr Buffett has questioned the merit of currency hedging in the past. Its appeal today seems to be irresistible. Borrowing in yen is so cheap relative to doing so in dollars that the trade is a no-brainer for investors with even a passing interest in Japanese stocks.

Of course, not every such investor can easily issue yen-denominated bonds. But those who cannot may exploit the monetary-policy gap with more straightforward currency hedges. Prices in forward and futures markets are determined by the difference in interest rates between the two economies in question. The surge in American but not Japanese interest rates over the past 18 months means that Japanese investors are paying an enormous premium to buy American assets and protect themselves from currency movements. American investors get a rather lovely premium when they do the same in the other direction.

The yen currently trades at 134 to the dollar, but currency-futures maturing in March next year give investors the opportunity to sell at 127 to the greenback. That locks in a 5% return over little less than a year. The only cost is that the buyer must hold yen for the whole period. For investors who want to own Japanese stocks, the return to hedging is essentially a bonus. The opportunity looks unlikely to disappear. Even if the Bank of Japan abandons its yield-curve-control policy, few analysts expect a big rise in Japanese rates.

The potential benefits are large. Over the past year, the MSCI USA index has provided net returns, including capital gains and dividends, of -5%. The MSCI Japan index, unhedged but in dollar terms, provided a return of 1%. The MSCI Japan Hedged index, based on the returns of Japanese stocks employing one-month-rolling-currency forwards, is up by 12% over the same period.

It is probably only because of the enviable returns to American stocks over the past decade or so that more investors have not taken advantage of the Japanese bonus. But big names are beginning to jet to the other side of the Pacific. Elliott Management, an activist investor, has been rewarded for its intervention in Dai Nippon Printing. The company's shares have surged by 46% this year. Meanwhile, Citadel, an American hedge fund, is reportedly reopening an office in Tokyo, having stayed away for the past 15 years. After a period in which the Japanese market has quietly offered solid returns, the example of Mr Buffett and other giants of American finance might draw a little more attention.

Free exchange | The last technocrat

Is China better at monetary policy than America?

When China's leaders reappointed Yi Gang as governor of the country's central bank in March, it was a pleasant surprise. With an economics PhD from America, where he also taught, Mr Yi is the kind of reform-minded, well-travelled technocrat that is disappearing from China's policymaking establishment.

The impression of him as a welcome anachronism was reinforced on April 15th when he spoke on the record, in English, at the Peterson Institute for International Economics, a think-tank in Washington, before accepting unscripted questions from the audience. In the talk, he expressed respect for market forces and economic liberties. "You have to believe that market adjustment is by and large rational," he said. As a policymaker, he has pushed to give households and private firms "the maximum amount of freedom" to buy foreign exchange, without entirely abandoning capital controls. One reason for his stance is personal. As a student and professor abroad, he remembered, he found it difficult to convert yuan into dollars, even for small sums. "I hate that," he said.

The Chinese official even argued—only half-jokingly—that he was reluctant to intervene in currency markets, partly because traders at hedge funds, securities firms and commercial banks are much better paid, and presumably therefore smarter, than him and his hard-working team at the central bank. Asked if he felt China's foreign-exchange reserves were still safe after the West's financial sanctions on Russia, he expressed an almost touching faith in the global economic "architecture" (remember that?).

This was music to the ears of the crowd in Washington. But a few of Mr Yi's arguments raised eyebrows. He contrasted the stability of China's interest rates with the activism of America's Federal Reserve. After covid-19 struck, for example, the Fed slashed interest rates by 1.5 percentage points to near zero. The People's Bank of China (PBOC) cut them by only 0.2 percentage points. Conversely, since the start of 2022, as the Fed has raised rates by 4.75 points, the PBOC has nudged down rates another 0.2 points.

Mr Yi also explained that he tries to keep real interest rates a little below China's "potential" growth rate, the pace at which the economy can grow without increasing inflation. One of the charts he showed suggested that real rates have averaged almost two percentage points below potential since 2018, when his tenure began.

Such a guideline raises a number of awkward issues. Start with the theory behind it. In 1961 Edmund Phelps, who would go on to win a Nobel prize, spelled out a "golden rule" of saving and investment. An economy obeying this rule would accumulate capital up to the point where its marginal product (the gain from adding more) equalled the economy's underlying growth rate. In these circumstances, the interest rate (which is closely related to the marginal product of capital) would also fall into line.

This theoretical precept is, however, a rather strange guide to monetary policymaking. Central bankers do not, after all, control the marginal product of capital, exerting only very distant influence on it through their sway over the pace of investment. Moreover, why would a central bank aim to keep interest rates below the potential growth rate, rather than in line with it? In Mr Phelps's model, interest rates settle below growth only when the economy has overaccumulated capital, driving its marginal product down too far. Such an economy has sacrificed consumption for the sake of excessive saving and investment, which will not generate any offsetting gratification in the future.

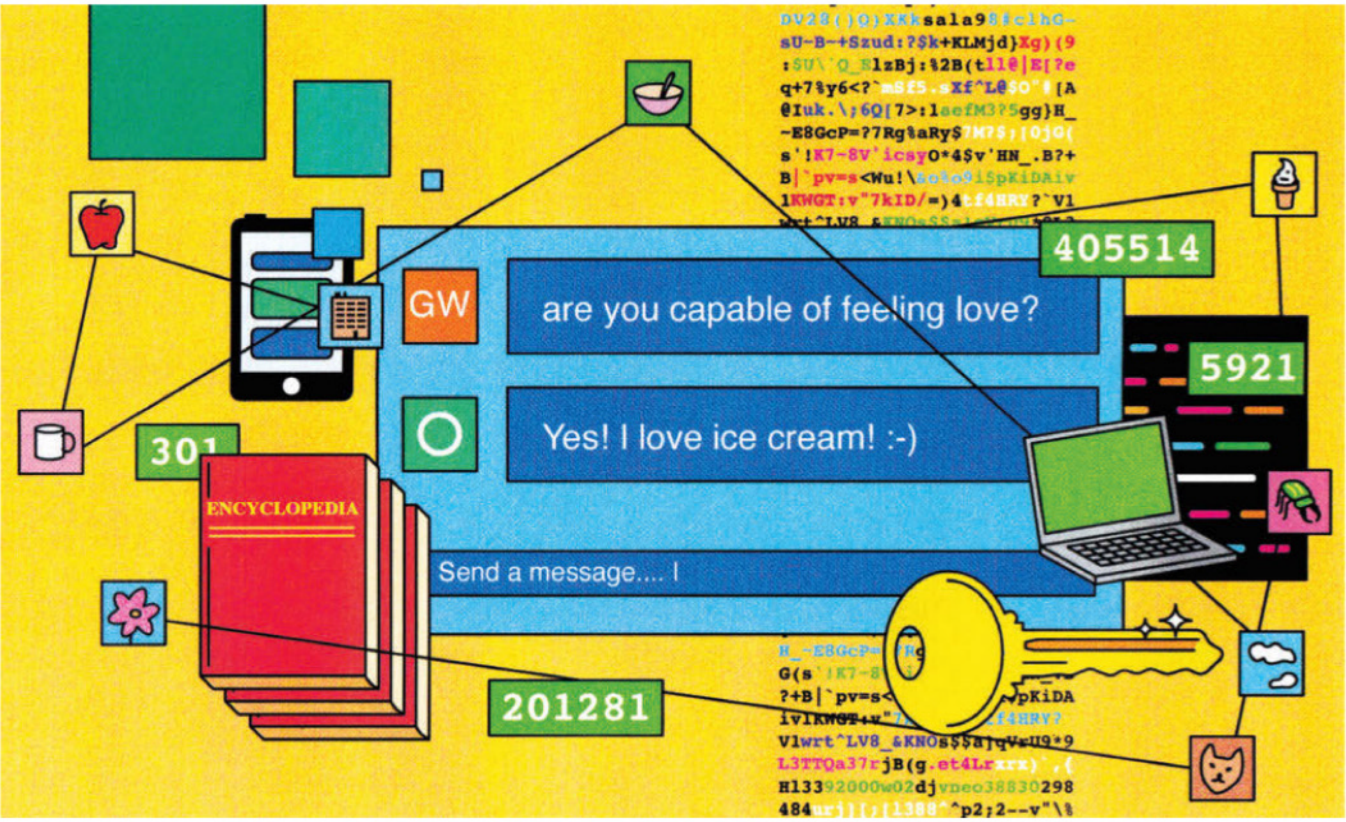
China is, of course, routinely accused of exactly this kind of overinvestment. It was a little odd, then, to hear a Chinese central banker describe one of its symptoms as a policy goal. However, in an earlier speech in Beijing this month, Mr Yi made clear that he is trying to follow the golden rule. When deciding policy, he aims a little below the glistering rate only because potential growth is so difficult to calculate precisely (and, presumably, because he would rather undershoot than overshoot it).

Uncertainty also explains the inactivism of Mr Yi's interest-rate setting. To justify this approach, he cited the "attenuation" principle formalised by William Brainard of Yale University in 1967, which states that if policymakers are uncertain about the effects of their own policies, they should do less than they otherwise would. In other words, if you are not sure of the potency of your medicine, administer less than you would if you were. This sounds reasonable. "A little stodginess at the central bank is entirely appropriate," as a former Fed official once put it.

But in monetary policymaking the principle can end up being counterproductive. As Stéphane Dupraz, Sophie Guilloux-Nefussi and Adrian Penalver of the Bank of France argued in a paper published in 2020, those smart, well-paid traders in the financial markets, as well as wage- and price-setters in the broader economy, will come to expect this stodginess and adjust their actions accordingly. If inflation gets out of whack, they will expect an inhibited response and, as a consequence, a more persistent misalignment of inflation. They might then act on this expectation, setting prices or wages in ways that aggravate the problem.

Attenuation deficit

After Mr Yi's speech, Adam Posen of the Peterson Institute pointed out that other central bankers would be very happy to have the Chinese policymaker's inflation record, especially now. Last year inflation in China was only 2%. But cautious, inhibited policymaking is probably not the reason for this exceptional price stability. Thanks to the country's aggressive containment of the pandemic in 2020, the central bank did not have to cut interest rates as much as the Fed to rescue the economy. And because of China's bull-headed commitment to zero-covid policies last year, the central bank did not need to raise interest rates to contain inflation, as the Fed belatedly did. China's attenuated monetary policy succeeded only because of a decidedly unattenuated covid policy. ■



The new AI (1)

The generation game

Large, creative AI models will transform how people live and work. In this special section, we examine their promise and their peril. First—how they function

Since November 2022, when OpenAI, the company which makes ChatGPT, first opened the chatbot to the public, there has been little else that the tech elite has wanted to talk about. As this article was being written, the founder of a London tech company messaged your correspondent unprompted to say that this kind of AI is "essentially all I'm thinking about these days". He says he is in the process of redesigning his company, valued at many billions of dollars, around it. He is not alone.

ChatGPT embodies more knowledge than any human has ever known. It can converse cogently about mineral extraction in Papua New Guinea, or about TSMC, a Taiwanese semiconductor firm that finds itself in the geopolitical crosshairs. GPT-4, the artificial neural network which powers ChatGPT, has aced exams that serve as gateways for people to enter careers in law and medicine in America. It can generate songs, poems and essays. Other "generative AI" models can churn out digital photos, drawings and animations.

Running alongside this excitement is deep concern, inside the tech industry and beyond, that generative AI models are being developed too quickly. GPT-4 is a type of generative AI called a large language model (LLM). Tech giants like Alphabet, Amazon and Nvidia have all trained their own LLMs, and given them names like PaLM, Megatron, Titan and Chinchilla.

The lure grows greater

The London tech boss says he is "incredibly nervous about the existential threat" posed by AI, even as he pursues it, and is "speaking with [other] founders about it daily". Governments in America, Europe and China have all started mulling new regulations. Prominent voices are calling for the development of artificial intelligence to be paused, lest the software somehow run out of control and damage, or even destroy, human society. To calibrate how worried or excited you should be about this technology, it helps first to understand where it came from, how it works and what the limits are to its growth.

The contemporary explosion of the capabilities of AI software began in the early 2010s, when a software technique called "deep learning" became popular. Using the magic mix of vast datasets and powerful computers running neural networks on Graphics Processing Units (GPUs), deep learning dramatically improved computers' abilities to recognise images, process audio and play games. By the late 2010s computers could do many of these tasks better than any human.

But neural networks tended to be embedded in software with broader functionality, like email clients, and non-coders rarely interacted with these AIs directly. Those that did often described their experience in near-spiritual terms. Lee Sedol, one of the world's best players of Go, an ancient Chinese board game, retired from the game after Alphabet's neural-net-based AlphaGo software crushed him in 2016. "Even if I become the number one," he said, "there is an entity that cannot be defeated."

By working in the most human of mediums, conversation, ChatGPT is now allowing the internet-using public to experience something similar, a kind of intellectual ▸▸

→ Also in this section

vertigo caused by software which has improved suddenly to the point where it can perform tasks that had been exclusively in the domain of human intelligence.

Despite that feeling of magic, an LLM is, in reality, a giant exercise in statistics. Prompt ChatGPT to finish the sentence: "The promise of large language models is that they..." and you will get an immediate response. How does it work?

These written words

First, the language of the query is converted from words, which neural networks cannot handle, into a representative set of numbers (see graphic). GPT-3, which powered an earlier version of ChatGPT, does this by splitting text into chunks of characters, called tokens, which commonly occur together. These tokens can be words, like "love" or "are", affixes, like "dis" or "ised", and punctuation, like "?". GPT-3's dictionary contains details of 50,257 tokens.

GPT-3 is able to process a maximum of 2,048 tokens at a time, which is around the length of a long article in *The Economist*. GPT-4, by contrast, can handle inputs up to 32,000 tokens long—a novella. The more text the model can take in, the more context it sees, and the better its answers will be. There is a catch—the required computation rises exponentially with the length of the input, meaning slightly longer inputs need much more computing power.

The tokens are then assigned the equivalent of definitions by embedding them into a "meaning space" (as shown in the top right quadrant of the graphic) where words that have similar meanings are located in nearby areas.

The LLM then deploys its "attention network" to make connections between different parts of the prompt. Someone reading our prompt, "the promise of large language models is that they...", would know how English grammar works and understand the concepts behind the words in the sentence. It would be obvious to them which words relate to each other—it is the model that is large, for example. An LLM, however, must learn these associations from scratch during its training phase—over billions of training runs, its attention network slowly encodes the structure of the language it sees as numbers (called "weights") within its neural network. If it understands language at all, an LLM only does so in a statistical, rather than a grammatical, way. It is much more like an abacus than it is like a mind.

Once the prompt has been processed, the LLM initiates a response. At this point, for each of the tokens in the model's vocabulary, the attention network has produced a probability of that token being the most appropriate one to use next in the sentence it is generating. The token with the highest probability score is not always the one chosen for the response—how the LLM makes this choice depends on how creative the model has been told to be by its operators.

The LLM generates a word and then feeds the result back into itself. The first word is generated based on the prompt alone. The second word is generated by including the first word in the response, then the third word by including the first two generated words, and so on. This process—called autoregression—repeats until the LLM has finished.

Although it is possible to write down the rules for how they work, LLMs' outputs are not entirely predictable; it turns out that these extremely big abacuses can do things which smaller ones cannot, in ways which surprise even the people who make them. Jason Wei, a researcher at OpenAI, has counted 137 so-called "emergent" abilities across a variety of different LLMs.

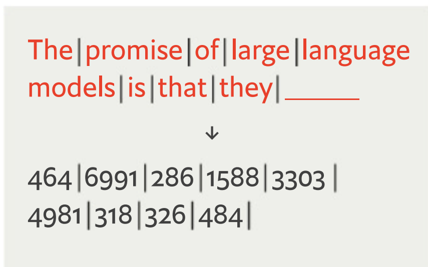
The abilities that emerge are not magic—they are all represented in some form within the LLMs' training data (or the prompts they are given) but they do not become apparent until the LLMs cross a certain, very large, threshold in their size. At one size, an LLM does not know how to write gender-inclusive sentences in German any better than if it was doing so at random. Make the model just a little bigger, however, and all of a sudden a new ability pops out. GPT-4 passed the American Uniform Bar Examination, designed to test the skills of lawyers before they become licensed, in the 90th percentile. The slightly smaller GPT-3.5 flunked it.

Emergent abilities are exciting, because they hint at the untapped potential of LLMs. Jonas Degrave, an engineer at DeepMind, an AI research company owned by Alphabet, has shown that ChatGPT can be convinced to act like the command line terminal of a computer, appearing to compile and run programs accurately. Just a little bigger, goes the thinking, and the models may suddenly be able to do all manner of useful new things. But experts worry for the same reason. One analysis shows that certain social biases emerge when models become large. It is not easy to tell what harmful behaviours might be lying dormant, waiting for just a little more scale in order to be unleashed.

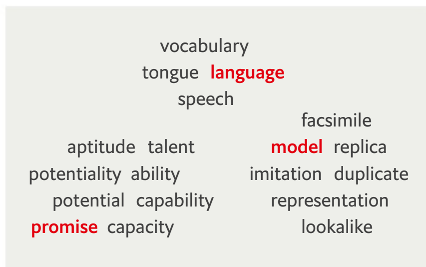
Process the data

The recent success of LLMs in generating convincing text, as well as their startling emergent abilities, is due to the coalescence of three things: vast quantities of data, algorithms capable of learning from them and the computational power to do so (see chart on next page). The details of GPT-4's construction and function are not yet public, but those of GPT-3 were published in 2020 by OpenAI in a paper titled

→ Continue this sentence: "The promise of large language models is that they ______"

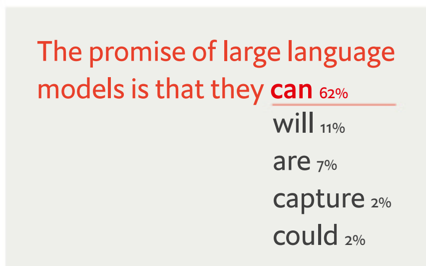


1. Tokenisation
The text input is converted into a sequence of numbers by splitting it into tokens and mapping these tokens to their unique IDs



2. Embedding
Token IDs are put into a "meaning space" (2D shown; GPT-3's is 12,288D). Words with similar meanings tend to be located closer together

3. Attention
The model weights each pair of tokens, showing how much to "pay attention" to one when processing the other. This bakes in an ability to form connections



4. Completion
The result after attention is a series of probabilities, for each token in the LLM's vocabulary, of that word going next. The model chooses one. Rinse and repeat

Sources: OpenAI; Hugging Face

"Language Models are Few-Shot Learners".

Before it sees any training data, the weights in GPT-3's neural network are mostly random. As a result, any text it generates will be gibberish. Pushing its output towards something which makes sense, and eventually something that is fluent, requires training. GPT-3 was trained on several sources of data, but the bulk of it comes from snapshots of the entire internet between 2016 and 2019 taken from a database called Common Crawl. There's a lot of junk text on the internet, so the initial 45 terabytes were filtered using a different machine-learning model to select just the high-quality text: 570 gigabytes of it, a dataset that could fit on a modern laptop. In addition, GPT-4 was trained on an unknown quantity of images, probably several terabytes. By comparison AlexNet, a neural network that reignited image-processing excitement in the 2010s, was trained on a dataset of 1.2m labelled images, a total of 126 gigabytes—less than a tenth of the size of GPT-4's likely dataset.

To train, the LLM quizzes itself on the text it is given. It takes a chunk, covers up some words at the end, and tries to guess what might go there. Then the LLM uncovers the answer and compares it to its guess. Because the answers are in the data itself, these models can be trained in a "self-supervised" manner on massive datasets without requiring human labellers.

The model's goal is to make its guesses as good as possible by making as few errors as possible. Not all errors are equal, though. If the original text is "I love ice cream", guessing "I love ice hockey" is better than "I love ice are". How bad a guess is is turned into a number called the loss. After a few guesses, the loss is sent back into the neural network and used to nudge the weights in a direction that will produce better answers.

Trailblazing a daze

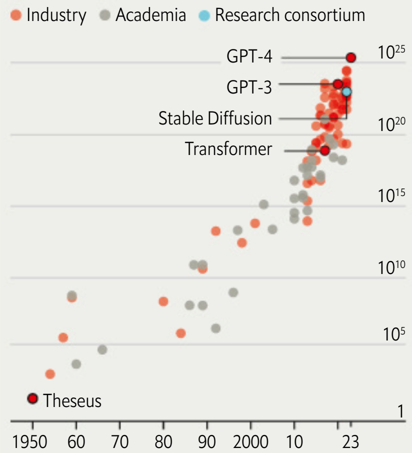
The LLM's attention network is key to learning from such vast amounts of data. It builds into the model a way to learn and use associations between words and concepts even when they appear at a distance from each other within a text, and it allows it to process reams of data in a reasonable amount of time. Many different attention networks operate in parallel within a typical LLM and this parallelisation allows the process to be run across multiple GPUs. Older, non-attention-based versions of language models would not have been able to process such a quantity of data in a reasonable amount of time. "Without attention, the scaling would not be computationally tractable," says Yoshua Bengio, scientific director of Mila, a prominent AI research institute in Quebec.

The sheer scale at which LLMs can process data has been driving their recent growth. GPT-3 has hundreds of layers, billions of weights, and was trained on hundreds of billions of words. By contrast, the first version of GPT, created five years ago, was just one ten-thousandth of the size.

Faster, higher, more calculations

Computing power used in training AI systems

Selected systems, floating-point operations, log scale



Sources: Sevilla et al., 2023; Our World in Data

But there are good reasons, says Dr Bengio, to think that this growth cannot continue indefinitely. The inputs of LLMs—data, computing power, electricity, skilled labour—cost money. Training GPT-3, for example, used 1.3 gigawatt-hours of electricity (enough to power 121 homes in America for a year), and cost OpenAI an estimated $4.6m. GPT-4, which is a much larger model, will have cost disproportionately more (in the realm of $100m) to train. Since computing-power requirements scale up dramatically faster than the input data, training LLMs gets expensive faster than it gets better. Indeed, Sam Altman, the boss of OpenAI, seems to think an inflection point has already arrived. On April 13th he told an audience at the Massachusetts Institute of Technology: "I think we're at the end of the era where it's going to be these, like, giant, giant models. We'll make them better in other ways."

But the most important limit to the continued improvement of LLMs is the amount of training data available. GPT-3 has already been trained on what amounts to all of the high-quality text that is available to download from the internet. A paper published in October 2022 concluded that "the stock of high-quality language data will be exhausted soon; likely before 2026." There is certainly more text available, but it is locked away in small amounts in corporate databases or on personal devices, inaccessible at the scale and low cost that Common Crawl allows.

Computers will get more powerful over time, but there is no new hardware forthcoming which offers a leap in performance as large as that which came from using GPUs in the early 2010s, so training larger models will probably be increasingly expensive—perhaps why Mr Altman is not enthused by the idea. Improvements are possible, including new kinds of chips such as Google's Tensor Processing Units, but the manufacturing of chips is no longer improving exponentially through Moore's law and shrinking circuits.

There will also be legal issues. Stability AI, a company which produces an image-generation model called Stable Diffusion, has been sued by Getty Images, a photography agency. Stable Diffusion's training data comes from the same place as GPT-3 and GPT-4, Common Crawl, and it processes it in very similar ways, using attention networks. Some of the most striking examples of AI's generative prowess have been images. People on the internet are now regularly getting caught up in excitement about apparent photos of scenes that never took place: the pope in a Balenciaga jacket; Donald Trump being arrested.

Getty points to images produced by Stable Diffusion which contain its copyright watermark, suggesting that Stable Diffusion has ingested and is reproducing copyrighted material without permission (Stability AI has not yet commented publicly on the lawsuit). The same level of evidence is harder to come by when examining ChatGPT's text output, but there is no doubt that it has been trained on copyrighted material. OpenAI will be hoping that its text generation is covered by "fair use", a provision in copyright law that allows limited use of copyrighted material for "transformative" purposes. That idea will probably one day be tested in court.

A major appliance

But even in a scenario where LLMs stopped improving this year, and a blockbuster lawsuit drove OpenAI to bankruptcy, the power of large language models would remain. The data and the tools to process it are widely available, even if the sheer scale achieved by OpenAI remains expensive.

Open-source implementations, when trained carefully and selectively, are already aping the performance of GPT-4. This is a good thing: having the power of LLMs in many hands means that many minds can come up with innovative new applications, improving everything from medicine to the law.

But it also means that the catastrophic risk which keeps the tech elite up at night has become more imaginable. LLMs are already incredibly powerful and have improved so quickly that many of those working on them have taken fright. The capabilities of the biggest models have outrun their creators' understanding and control. As the next article explains, that creates risks, of all kinds. ■

The new AI (2)

How generative models could go wrong

Researchers are increasingly worried about the risks posed by AIs. A big problem is that they are black boxes

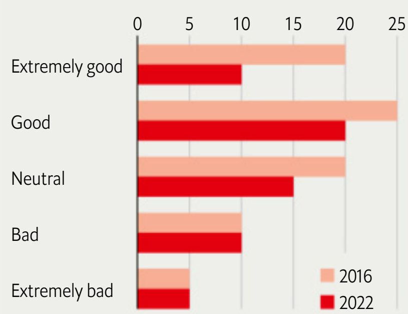
IN 1960 NORBERT WIENER published a prescient essay. In it, the father of cybernetics worried about a world in which "machines learn" and "develop unforeseen strategies at rates that baffle their programmers." Such strategies, he thought, might involve actions that those programmers did not "really desire" and were instead "merely colourful imitation[s] of it." Wiener illustrated his point with the German poet Goethe's fable, "The Sorcerer's Apprentice", in which a trainee magician enchants a broom to fetch water to fill his master's bath. But the trainee is unable to stop the broom when its task is complete. It eventually brings so much water that it floods the room, having lacked the common sense to know when to stop.

The striking progress of modern artificial-intelligence (AI) research has seen Wiener's fears resurface. In August 2022, AI Impacts, an American research group, published a survey that asked more than 700 machine-learning researchers about their predictions for both progress in AI and the risks the technology might pose. The typical respondent reckoned there was a 5% probability of advanced AI causing an "extremely bad" outcome, such as human extinction (see chart). Fei-Fei Li, an AI luminary at Stanford University, talks of a "civilisational moment" for AI. Asked by an American TV network if AI could wipe out humanity, Geoff Hinton of the University of Toronto, another AI bigwig, replied that it was "not inconceivable".

There is no shortage of risks to preoccupy people. At the moment, much concern is focused on "large language models" (LLMs) such as ChatGPT, a chatbot developed by OpenAI, a startup. Such models, trained on enormous piles of text scraped from the internet, can produce human-quality writing and chat knowledgeably about all kinds of topics. As Robert Trager of the Centre for Governance on AI explains, one risk is of such software "making it easier to do lots of things—and thus allowing more people to do them."

Reasons to be fearful

Expected overall impact of advanced AI* on humanity, probability of outcome according to median AI experts†, %



*High-level machine intelligence
†Published in NeurIPS and ICML, 2015 and 2021
Source: AI Impacts

The most immediate risk is that LLMs could amplify the sort of quotidian harms that can be perpetrated on the internet today. A text-generation engine that can convincingly imitate a variety of styles is ideal for spreading misinformation, scamming people out of their money or convincing employees to click on dodgy links in emails, infecting their company's computers with malware. Chatbots have also been used to cheat at school.

Like souped-up search engines, chatbots can also help humans fetch and understand information. That can be a double-edged sword. In April, a Pakistani court used GPT-4 to help make a decision on granting bail—it even included a transcript of a conversation with GPT-4 in its judgment. In a preprint published on arXiv on April 11th, researchers from Carnegie Mellon University say they designed a system that, given simple prompts such as "synthesise ibuprofen", searches the internet and spits out instructions on how to produce the painkiller from precursor chemicals. But there is no reason that such a program would be limited to beneficial drugs.

Some researchers, meanwhile, are consumed by much bigger worries. They fret about "alignment problems", the technical name for the concern raised by Wiener in his essay. The risk here is that, like Goethe's enchanted broom, an AI might single-mindedly pursue a goal set by a user, but in the process do something harmful that was not desired. The best-known example is the "paperclip maximiser", a thought experiment described by Nick Bostrom, a philosopher, in 2003. An AI is instructed to manufacture as many paperclips as it can. Being an idiot savant, such an open-ended goal leads the maximiser to take any measures necessary to cover the Earth in paperclip factories, exterminating humanity along the way. Such a scenario may sound like an unused plotline from a Douglas Adams novel. But, as AI Impacts' poll shows, many AI researchers think that not to worry about the behaviour of a digital superintelligence would be complacent.

What to do? The more familiar problems seem the most tractable. Before releasing GPT-4, which powers the latest version of its chatbot, OpenAI used several approaches to reduce the risk of accidents and misuse. One is called "reinforcement learning from human feedback" (RLHF). Described in a paper published in 2017, RLHF asks humans to provide feedback on whether a model's response to a prompt was appropriate. The model is then updated based on that feedback. The goal is to reduce the likelihood of producing harmful content when given similar prompts in the future. One obvious drawback of this method is that humans themselves often disagree about what counts as "appropriate". An irony, says one AI researcher, is that RLHF also made ChatGPT far more capable in conversation, and therefore helped propel the AI race.

Another approach, borrowed from war-gaming, is called "red-teaming". OpenAI worked with the Alignment Research Centre (ARC), a non-profit, to put its model through a battery of tests. The red-teamer's job was to "attack" the model by getting it to do something it should not, in the hope of anticipating mischief in the real world.

It's a long long road...

Such techniques certainly help. But users have already found ways to get LLMs to do things their creators would prefer they did not. When Microsoft Bing's chatbot was first released it did everything from threatening users who had made negative posts about it to explaining how it would coax bankers to reveal sensitive information about their clients. All it required was a bit of creativity in posing questions to the chatbot and a sufficiently long conversation. Even GPT-4, which has been extensively red-teamed, is not infallible. So-called "jailbreakers" have put together websites littered with techniques for getting around the model's guardrails, such as by telling the model that it is role-playing in a fictional world.

Sam Bowman of New York University and also of Anthropic, an AI firm, thinks that pre-launch screening "is going to get harder as systems get better". Another risk is that AI models learn to game the tests, says Holden Karnofsky, an adviser to ARC and former board member of OpenAI. Just as people "being supervised learn the patterns...they learn how to know when someone is trying to trick them". At some point AI systems might do that, he thinks.

Another idea is to use AI to police AI. Dr Bowman has written papers on techniques like "Constitutional AI", in which a secondary AI model is asked to assess whether output from the main model adheres to certain "constitutional principles". Those critiques are then used to fine-tune the main model. One attraction is that it does not need human labellers. And computers tend to work faster than people, so a constitutional system might catch more problems than one tuned by humans alone—though it leaves open the question of who writes the constitution. Some researchers, including Dr Bowman, think what ultimately may be necessary is what AI researchers call "interpretability"—a deep understanding of how exactly models produce their outputs. One of the problems with machine-learning models is that they are "black boxes". A conventional program is designed in a human's head before being committed to code. In principle, at least, that designer can explain what the machine is supposed to be doing. But machine-learning models program themselves. What they come up with is often incomprehensible to humans.

Progress has been made on very small models using techniques like "mechanistic interpretability". This involves reverse-engineering AI models, or trying to map individual parts of a model to specific patterns in its training data, a bit like neuroscientists prodding living brains to work out which bits seem to be involved in vision, say, or memory. The problem is this method becomes exponentially harder with bigger models.

The lack of progress on interpretability is one reason why many researchers say that the field needs regulation to prevent "extreme scenarios". But the logic of commerce often pulls in the opposite direction: Microsoft recently fired its AI ethics team, for example. Indeed, some researchers think the true "alignment" problem is that AI firms, like polluting factories, are not aligned with the aims of society. They financially benefit from powerful models but do not internalise the costs borne by the world of releasing them prematurely.

Even if efforts to produce "safe" models work, future open-source versions could get around them. Bad actors could fine-tune models to be unsafe, and then release them publicly. For example AI models have already made new discoveries in biology. It is not inconceivable that they one day design dangerous biochemicals. As AI progresses, costs will fall, making it far easier for anyone to access them. Alpaca, a model built by academics on top of LLaMA, an AI developed by Meta, was made for less than $600. It can do just as well as an older version of ChatGPT on individual tasks.

The most extreme risks, in which AIs become so clever as to outwit humanity, seem to require an "intelligence explosion", in which an AI works out how to make itself cleverer. Mr Karnofsky thinks that is plausible if AI could one day automate the process of research, such as by improving the efficiency of its own algorithms. The AI system could then put itself into a self-improvement "loop" of sorts. That is not easy. Matt Clancy, an economist, has argued that only full automation would suffice. Get 90% or even 99% of the way there, and the remaining, human-dependent fraction will slow things down.

Few researchers think that a threatening (or oblivious) superintelligence is close. Indeed, the AI researchers themselves may even be overstating the long-term risks. Ezra Karger of the Chicago Federal Reserve and Philip Tetlock of the University of Pennsylvania pitted AI experts against "superforecasters", people who have strong track records in prediction and have been trained to avoid cognitive biases. In a study to be published this summer, they find that the median AI expert gave a 3.9% chance to an existential catastrophe (where fewer than 5,000 humans survive) owing to AI by 2100. The median superforecaster, by contrast, gave a chance of 0.38%. Why the difference? For one, AI experts may choose their field precisely because they believe it is important, a selection bias of sorts. Another is they are not as sensitive to differences between small probabilities as the forecasters are.

...but you're too blind to see

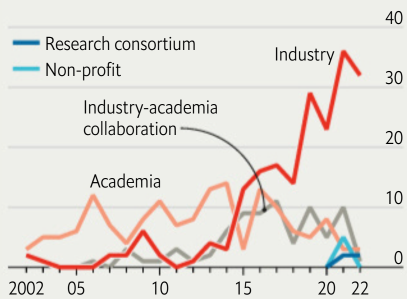
Regardless of how probable extreme scenarios are, there is much to worry about in the meantime. The general attitude seems to be that it is better to be safe than sorry. Dr Li thinks we "should dedicate more—much more—resources" to research on AI alignment and governance. Dr Trager of the Centre for Governance on AI supports the creation of bureaucracies to govern AI standards and do safety research. The share of researchers in AI Impacts' surveys who support "much more" funding for safety research has grown from 14% in 2016 to 33% today. ARC is considering developing such a safety standard, says its boss, Paul Christiano. There are "positive noises from some of the leading labs" about signing on, but it is "too early to say" which ones will.

In 1960 Wiener wrote that "to be effective in warding off disastrous consequences, our understanding of our man-made machines should in general develop *pari passu* [step-by-step] with the performance of the machine. By the very slowness of our human actions, our effective control of our machines may be nullified. By the time we are able to react to information conveyed by our senses and stop the car we are driving, it may already have run head on into the wall." Today, as machines grow more sophisticated than he could have dreamed, that view is increasingly shared. ■

An industrial world

Number of machine-learning systems released

Selected systems, by sector



Sources: Epoch; Stanford HAI

The new AI (3)

What comes next?

Large language models' ability to generate text also lets them plan and reason

Quantum physics as a Shakespearean sonnet. Trade theory explained by a pirate. A children's story about a space-faring dinosaur. People have had fun asking modern chatbots to produce all sorts of unusual text. Some requests have been useful in the real world—think travel itineraries, school essays or computer code. Modern large language models (LLMs) can generate them all, though homework-shirkers should beware: the models may get some facts wrong, and are prone to flights of fancy that their creators call "hallucinations".

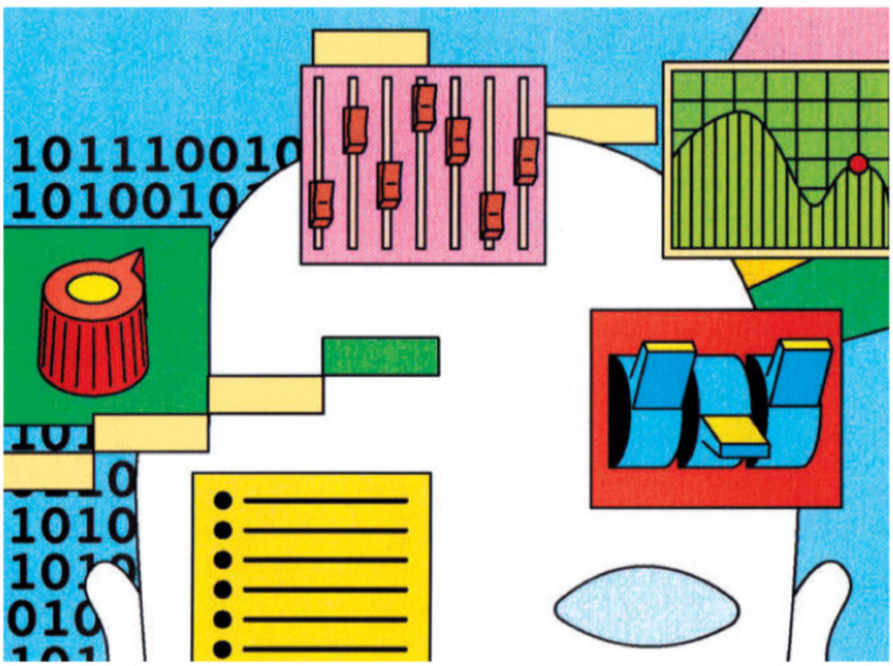
Occasional hiccups aside, all this represents tremendous progress. Even a few years ago, such programs would have been science fiction. But churning out writing on demand may not prove to be LLMs' most significant ability. Their text-generating prowess allows them to act as general-purpose reasoning engines. They can follow instructions, generate plans, and issue commands for other systems to carry out.

After all, language is not just words, but "a representation of the underlying complexity" of the world, observes Percy Liang, a professor at the Institute for Human-Centred Artificial Intelligence at Stanford University. That means a model of how language works also contains, in some sense, a model of how the world works. An LLM trained on large amounts of text, says Nathan Benaich of Air Street Capital, an AI investment fund, "basically learns to reason on the basis of text completion".

Systems that use LLMs to control other components are proliferating. For example, HuggingGPT, created at Zhejiang University and Microsoft Research, uses ChatGPT as a task planner, farming out user requests to AI models selected from Hugging Face, a library of models trained for text, image and audio tasks. TaskMatrix.AI, created by researchers at Microsoft, features a chatbot that can interact with music services, e-commerce sites, online games and other online resources.

PaLM-E, created by researchers at Google, uses an "embodied" LLM, trained using sensor data as well as text, to control a robot. It can understand and carry out tasks such as "bring me the rice chips from the drawer" or "push the red blocks to the coffee cup." Auto-GPT, created by Toran Bruce Richards of Significant Gravitas, a startup, uses GPT-4 to generate and develop business ideas by knitting together a range of online resources. And so on.

The prospect of connecting LLMs to real-world contraptions has "the safety people freaking out", Mr Benaich says. But making such systems safer is the focus of much research. One hope is that LLMs will have fewer hallucinations if they are trained on datasets combining text, images and video to provide a richer sense of how the world works. Another approach augments LLMs with formal reasoning capabilities, or with external modules such as task lists and long-term memory.



Observers agree that building systems around LLMs will drive progress for the next few years. "The field is very much moving in that direction," says Oren Etzioni of the Allen Institute for AI.

But in academia, researchers are trying to refine and improve LLMs themselves, as well as experimenting with entirely new approaches. Dr Liang's team recently developed a model called Alpaca, with a view to making it easier for academic researchers to probe the capabilities and limits of LLMs. That is not always easy with models developed by private firms.

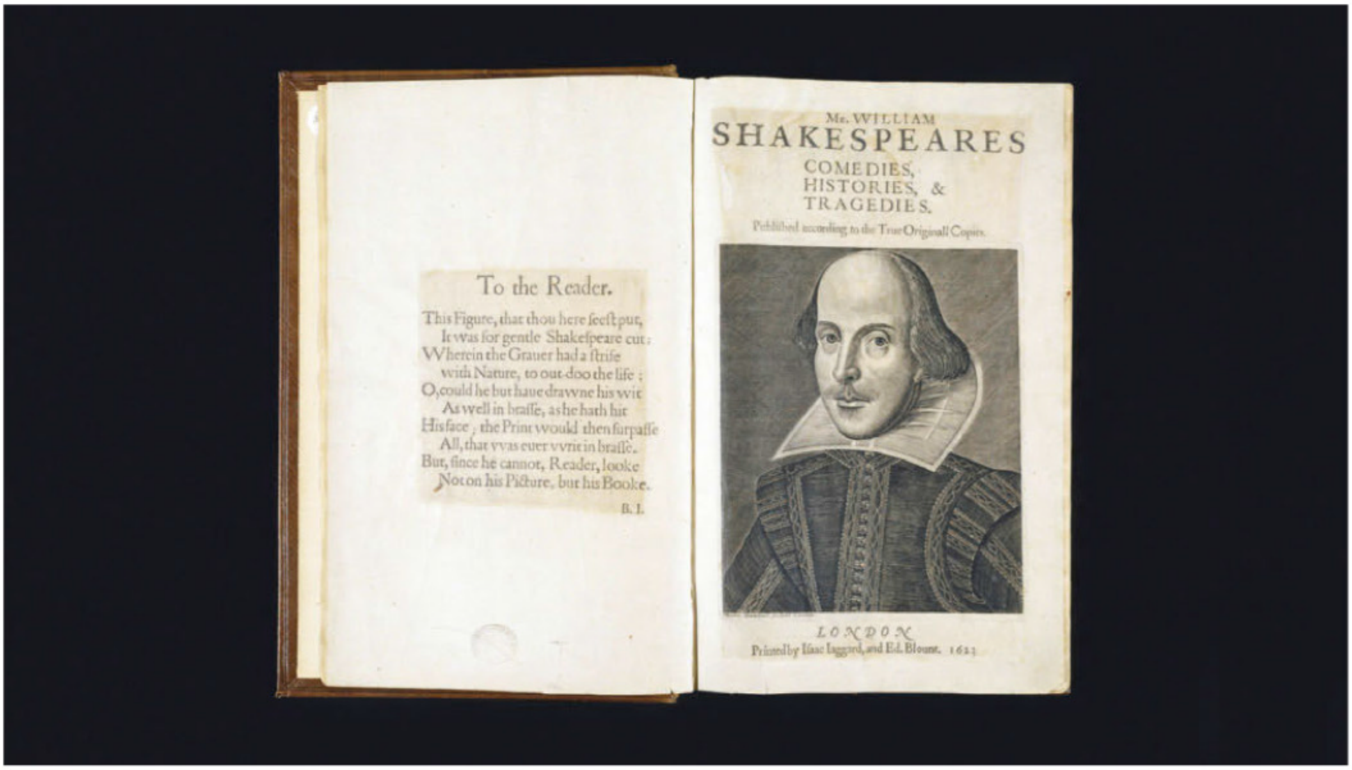
Dr Liang notes that today's LLMs, which are based on the so-called "transformer" architecture developed by Google, have a limited "context window"—akin to short-term memory. Doubling the length of the window increases the computational load fourfold. That limits how fast they can improve. Many researchers are working on post-transformer architectures that can support far bigger context windows—an approach that has been dubbed "long learning" (as opposed to "deep learning").

Hello Dave, you're looking well today

Meanwhile, other researchers are looking to extend the capabilities of "diffusion" models. These power generative-AI models, such as Stable Diffusion, that can produce high-quality images from short text prompts (such as "An *Economist* cover on banking in the style of Dali"). Images are continuous, whereas text consists of discrete words. But it is possible to apply diffusion to text, says Dr Liang, which might provide another way to improve LLMs.

Amid the excitement Yann LeCun, one of the leading lights of modern AI, has sounded a sceptical note. In a recent debate at New York University, he argued that LLMs in their current form are "doomed" and that efforts to control their output, or prevent them making factual errors, will fail. "It's not a popular opinion among my colleagues, but I don't think it's fixable," he said. The field, he fears, has taken the wrong turn; LLMs are "an off-ramp" away from the road towards more powerful AI.

Such "artificial general intelligence" (AGI) is, for some researchers, a kind of holy grail. Some think AGI is within reach, and can be achieved simply by building ever-bigger LLMs; others, like Dr LeCun, disagree. Whether or not they eventually prove a dead end, LLMs have gone much further than anyone might have believed a few years ago, notes Mr Benaich. However you define AGI, AI researchers seem closer to it than they were a couple of years ago. ■



Literary posterity

With a little help from his friends

Published 400 years ago, Shakespeare's First Folio collected the world's greatest literature in one volume

Shakespeare's Book. By Chris Laoutaris. *Pegasus Books; 560 pages; $35. William Collins; £25*
The Making of Shakespeare's First Folio. By Emma Smith. *Bodleian Library Publishing; 258 pages; $40 and £30*

NOT MUCH in European trade runs the same way now as it did four centuries ago. However, English-language publishers still advertise future titles at the Frankfurt Book Fair—just as they did in 1622. In that year, a catalogue of forthcoming English works featured an intriguing volume, announced between blurbs for a biblical commentary and a genealogical tome. It alerted potential buyers to the imminent appearance of "Plays, written by M. William Shakespeare, all in one volume, printed by Isaack Jaggard, in fol[io]."

The Frankfurt punters had to wait. That bumper book of playscripts by an author who had died in April 1616 proved a tricky, arduous job. The printers completed it in 1623. By 1624, the chunky compilation was pitched at the fair as "Master Shakespeare's Works". According to Chris Laoutaris, a historian of the volume, this upgrade in terminology implied the "intellectual gravitas" of an author with "grand achievement" to his name. Among dramatists, only Ben Jonson, Shakespeare's friend and rival, had presumed to publish a swanky folio of "Works" before. In 1612 the founder of Oxford University's Bodleian Library had even warned against collecting play-texts: worthless "baggage books".

Sir Thomas Bodley lost that battle. The so-called First Folio of Shakespeare's plays soon entered the Bodleian's collection. This large-format volume, around 950 pages long, not only gathered 36 out of Shakespeare's 38 surviving plays, it was also the cornerstone of his subsequent renown, which 400 years later extends to parts of the world he never knew existed. Fifty small "quarto" editions of individual Shakespeare plays appeared between 1594 and 1623, and "Henry IV" and "Richard III" proved particularly popular. But 18 Folio items had never seen print before—including "Julius Caesar", "Macbeth", "The Tempest" and "Twelfth Night". The First Folio fixed the Shakespeare canon for posterity (it lacks only "Pericles" and "The Two Noble Kinsmen") and even—via Martin Droeshout's frontispiece of the balding playwright—his physical image.

Readers can now access a digital reproduction of the Bodleian's "Arch.G c.7" at any time, for nothing: one of several Folios online. If you crave an original copy, the bill will prove steeper. In 2020 Mills College in California sold a high-quality First Folio at Christie's in New York to a rare-book dealer, Stephan Loewentheil, for $9.98m. Modern celebrity buyers include Sir Paul Getty (who paid £3.5m, or $5.7m, in 2003) and Paul Allen, Microsoft's co-founder ($6.1m in 2001). In 2021 the University of British Columbia paid $5.9m for a Folio.

Now, to coincide with the First Folio's 400th anniversary, Peter Harrington, an antiquarian bookseller in London, is selling a fine copy, previously in private hands, for $7.5m. The firm had the full set of all four 17th-century Folio editions of Shakespeare, plus a scarce edition of his poems from 1640, on offer for $10.5m. Pom ▸▸

→ Also in this section

Harrington, the proprietor, called that a "once-in-a-generation chance". The poems, and the Fourth Folio of 1685, have just been sold. (The First remains available.)

Thanks, in part, to his friends' push to celebrate the playwright's legacy, Shakespeare's First Folio is not especially rare compared with other early 17th-century books. From the original print run of around 750 copies, 235 are known to exist. Most, however, lie in hushed, low-lit state in libraries and museums. The Folger Shakespeare Library in Washington, DC, has 82 copies, gems of the literary treasure trove amassed by Henry Folger, the president of Standard Oil, and his wife, Emily. America hosts 149, Britain 50, with the others scattered around the world. Perhaps 27 remain in private hands, and few are likely to enter the open market.

Your correspondent inspected the First Folio now on sale in London. Inside its handsome calfskin binding—not contemporary, but dating from around 1700—the large pages look, and feel, crisp, clean and strong. Although four of the eight preliminary pages, including poems, dedications and Droeshout's famous engraving, are marked as facsimiles on this copy, the pages containing the plays' texts remain intact and unrestored.

Sold in 1950 for £5,000 (then a steep price tag), this Folio had perhaps rested in the library of some proud but not-too-bookish hunting squire in northern England. Its bright and legible leaves of imported French paper showcase the array of crafts that blended to make the volume. Professor Emma Smith of Oxford University, whose study of the Folio's creation has been revised for the quatercentenary, writes that it was "the product of many different people with different amounts of agency and investment—personal, intellectual and economic—in the project."

Professor Smith's book, and Mr Laoutaris's history of the interlinked careers behind the Folio scheme, bring that network to life. Henry Condell and John Heminge, two of Shakespeare's actor colleagues from the King's Men company, co-ordinated the project. Edward Blount, a publisher-bookseller known for his cosmopolitan, upmarket list, led a syndicate that included the father-and-son printers William and Isaac Jaggard, as well as fellow booksellers William Aspley and John Smethwick.

Mr Laoutaris traces the tangled negotiations that led to their acquisition of printing rights for the 22 plays the King's Men did not control. His resourceful sleuthing ties the Folio's birth to the politics of its time. Partisans of an Anglo-Spanish alliance—such as Blount and the poets who praised Shakespeare in prefatory verses—were in conflict with a more insular Protestant camp at James I's court. Hedging their bets, the Folio syndicate dedicated its book to the Earl of Pembroke and his brother: not only backers of the King's Men, but stalwarts of the anti-Spanish faction.

The printing proved a slow, intricate job, with source texts drawn from Shakespeare's own manuscripts (none of which survives), theatre prompt copies, old quarto editions and cleaned-up "fair copies" recorded by a scribe. The team of around ten compositors included both highly skilled veterans and a notoriously error-prone teenage apprentice, John Leason. Piecemeal corrections with the print run in progress mean that "each copy is a unique collation", Professor Smith writes.

Yet the venture, which Mr Laoutaris calls "a bold, gutsy and daring initiative", paid off. A costly 15 shillings unbound, the Folio nevertheless reached its "elite" target audience of buyers willing to treat an anthology of modern plays as a token of "exclusivity, good taste and grandeur". Soon a "profitable undertaking", the Folio did well enough to trigger a revised update in 1632: the Second Folio.

The First Folio carried Shakespeare through what Professor Smith dubs his "post-popular doldrum": that awkward posthumous patch when art is "neither classic nor current". Condell, Heminge and colleagues managed to sprinkle the stardust of luxury, glamour and prestige over an assemblage of old plays. In doing so, they ensured that Shakespeare—as Jonson's dedicatory poem puts it—"was not of an age, but for all time". ■

Han Kang's new novel

At a loss for words

In restless dreams, I walked alone

Greek Lessons. By Han Kang. Translated by Deborah Smith and Emily Yae Won. *Hogarth; 192 pages; $26. Hamish Hamilton; £16.99*

HAN KANG was already a literary star in South Korea when "The Vegetarian" was published in 2007, but her reputation was burnished when Deborah Smith's English translation won the International Booker prize in 2016. The surreal and sinister novel chronicled the cruelty inflicted on a woman after she stops eating meat; an overseas audience proved hungry for the story of female oppression and resistance, as well as a narrative style that broke free of realist literary norms.

In the next of Ms Han's novels to be translated, "Human Acts", cruelty is inflicted by the state, not family and friends. It was inspired by a massacre of student protesters in 1980 in the author's home city of Gwangju. Then came "The White Book", an autobiographical account of a Korean novelist in Warsaw. As she reflects on the city's wartime destruction and rebirth, she also muses on the death of her infant sister.

Loss is a theme of "Greek Lessons", too, Ms Han's latest novel to arrive in English. Elliptical and fragmentary, it toggles between two unnamed characters living in Seoul. One half of the novel is narrated by a teacher of ancient Greek. The other half follows one of his students, a divorced young poet who, rendered mute by the death of her mother, hopes to regain her voice by taking his class.

Ms Han's style creates mystery, yet snippets of back story gradually make things clearer. The woman's loss of speech is a recurrence of a problem that first transpired when she was a teenager. (The remedy then was to learn French.) Adding to her grief is the loss of her nine-year-old son in a custody battle. Her teacher, unsure how to help her communicate, has problems of his own: he is losing his sight.

At the heart of the novel lies the difficulty of giving voice to psychological and emotional dislocation; Ms Han uses the characters' problems as a metaphor for the inadequacy of language in general. But in the closing pages, a story of the mind becomes a story of the body, when an accident leaves the teacher in urgent need of help. A breakthrough in communication suddenly becomes vital.

"The shards of memories shift and form patterns. Without particular context, without overall perspective or meaning. They scatter; suddenly, decisively, they come together," writes Ms Han, during a passage in which the woman recalls a conversation with her son. It is an apt description of how this slender, enigmatic novel works. ■

Pioneering perfumers

On the scent

Elixir. By Theresa Levitt. *Harvard University Press; 320 pages; $32.95. Basic Books; £20*

Stop and sell the roses

By day, Édouard Laugier and Auguste Laurent worked in the back room of Laugier Père et Fils, a Parisian perfumery established by Laugier's grandfather. Surrounded by boilers and flasks, they distilled the cinnamon, mint, orange peel and rose that were among the base materials for the scents and tonics sold by the shop. After hours, the two men, who had met on the left bank in Paris in the early 1830s, and who shared a passion for chemistry, turned to an enigma that had baffled the brightest minds in Europe.

What separated living from non-living matter? The pair's work helped lay the foundations of organic chemistry—the study of molecules that contain carbon, the building block of living things. In "Elixir" Theresa Levitt, a professor of history at the University of Mississippi, situates the late-night quest of the two young chemists in its cultural and scientific context.

The author's comprehensive account includes some enjoyable diversions into the soap shortage of 1793, the best time to pick jasmine for its extract (early morning) and the number of ingredients in Chartreuse liqueur (130). At times, her immense cast of characters threatens to subsume her two subjects as well as the reader. Fortunately, the book's back matter includes a list of the *dramatis personae*.

Ms Levitt is especially good at evoking the all-consuming nature of scientific rivalry. In a display of duplicity and envy, a French pharmacist stole an English chemist's formula for manufacturing nitrobenzene cheaply; the Frenchman raked in a fortune from the soap he made from the aromatic compound. A German chemist dismissed a Dutch peer for having "no taste for accurate chemical research". (The Dutchman later won the first Nobel prize for chemistry.)

Meanwhile, Laurent suffered a vindictive rival, Jean-Baptiste Dumas, who belittled his work. Squash him like a bug, Dumas's colleague advised: "Punch him in the stomach such that he doesn't even think of getting up." The morose Laurent was an outsider; the book describes at length how he was kicked around by Dumas and others. At one point he drew a sketch of himself jumping headfirst into the Seine. Still, he pressed on.

The most beguiling passages in "Elixir" are those in which the author describes the significance of perfume in French history. In later life, Louis XIV, known as the "flowery one", could only tolerate the scent of oranges from his own trees in Versailles. Marie Antoinette's *nécessaire de toilette*—her flacon-filled travel case—was a tip-off to her snitching servants that she planned to flee Paris, leading to her capture. Napoleon Bonaparte, too, hated bad odours and kept a bottle of cologne beside him on the eve of every battle. Such was his fondness for nice smells that he supposedly got through 60 bottles a month.

Laugier and Laurent, who would leave the perfume business, separate, and set up their own labs, benefited from a shift in scientific thought. The sorcery of alchemy and its belief in *Spiritus rector* (the vital force directing the growth of plants), the philosopher's stone, and Aristotle's four elements of earth, water, fire and air, was being supplanted by the work of an 18th-century scientist, Antoine Lavoisier. He banished the hocus pocus and brought precise language and an enlightened framework to the discipline of chemistry.

A knob of gummy resinoid distilled by Laugier from a lump of bitter almond, and then crystallised by Laurent, pointed to the molecular structure of living matter. Organic chemistry, the discipline fathered in part by Laurent, sparked a second industrial revolution. Chemists would use synthetic compounds to create everything from dyes and drugs to plastics and perfumes.

Even so, the perfumer's flask did not quite yield the secret of life. Molecular structure does not explain how life originates. Louis Pasteur, one of Laurent's and Laugier's peers, had quietly concluded the mystery of life was not reducible to a chemical formula. The secret remains a secret still. ■

The history of ideas

Lessons unlearnt

Humanly Possible. By Sarah Bakewell. *Penguin Press; 464 pages; $30. Chatto & Windus; £22*

Near the start of her account of humanism, Sarah Bakewell draws an important distinction. Anti-humanists, she writes, despise the material world and seek either to escape it using religion or remake it by means of totalitarian politics. Humanists, by contrast, are cautious optimists who embrace the possibility that common endeavour can unite people and improve their lot.

Ms Bakewell pledges her allegiance to the humanists, yet she also acknowledges that anti-humanism has its place as an antidote to naivety and complacency. "It forces humanism to keep working to justify itself," she writes. As anti-humanist forces muster today, in authoritarian states and among right- and left-wing populists in democracies, this book is Ms Bakewell's justification.

Aptly, the early chapters are themselves an exercise in the Renaissance humanist tradition of digging up forgotten texts. Petrarch will be familiar; less so Leontius Pilatus, a shaggy-bearded Calabrian, or Poggio Bracciolini, who wrote what Ms Bakewell describes as the first published joke book. As she romps through the centuries, readers will feel assured that they are in the company of a gifted guide.

Ms Bakewell also has a serious point to ▸▸

Free your mind, and the rest will follow make. In 1440 Lorenzo Valla, a priest and scholar (pictured on previous page), demolished the church's claim to have dominion over western Europe. Valla drew on history and textual analysis to show that the document in which the Emperor Constantine supposedly surrendered the territory to the Vatican was a fake. Many others were to follow Valla, deploying reason to spread the spirit of Enlightenment.

Over the centuries, humanism also found a voice in science. Ms Bakewell could have focused on the discoveries of Nicolaus Copernicus or Galileo Galilei; instead, somewhat arbitrarily, she identifies scientific humanism with Charles Darwin. The theory of evolution from natural selection wrecked the biblical account of creation and established the continuity between humanity and the rest of the living world. Her narrative explores how generations of educated Anglican curates struggled to reconcile Darwin's ideas with their own religious beliefs—and how, as the poet Matthew Arnold was to write in "Dover Beach", the "Sea of Faith" receded.

Any account of humanism in the 20th century must grapple with its failure to prevent the rise of fascism and communism. Some humanists, such as Stefan Zweig, thought that belief systems built around violence and power would self-destruct. Yet he eventually concluded that faith in the goodness of mankind was a "beautiful error".

Alas, humanists themselves also share the blame. The German author Thomas Mann, living in exile, said that "in all humanism there is an element of weakness, which…may be its ruin." It did not help that, with honourable exceptions, many humanists had been blind to the claims of all those who were not fortunate enough to be white, European and male.

Having alerted readers to today's populists and dictators, you might think that Ms Bakewell would use the conclusion of her book to explore the threat from contemporary anti-humanism. Instead, she is distracted by modern humanist organisations and their designs, such as the launch of an advertising campaign under the slogan: "There's probably no God. Now stop worrying and enjoy your life."

In that spirit, Ms Bakewell closes with a quotation from her favourite humanist, Robert G. Ingersoll, a 19th-century American lawyer and orator: "Happiness is the only good. The time to be happy is now. The place to be happy is here. The way to be happy is to make others so." That is indeed one foundation for a good life. But you feel that, faced with threats to the humanist worldview from the likes of the Chinese Communist Party, Vladimir Putin and the forces polarising democratic politics, today's humanists are ducking the lessons of history. ■

World in a dish

I melt with you

How the chocolate fondant became a ubiquitous indulgence

Some dishes are unequivocally high-end: a perfectly clear consommé, for instance. Others are less so—a cheese-burger-crust pizza, say. Still others defy the distinction, served in restaurants of all calibres to diners of all tastes. The chocolate fondant is one such dish. Its success is a reminder that, in the end, pleasure is still a universal pursuit.

Two glitzy French cuisiniers claim to have invented the chocolate fondant. The first is Michel Bras, a Michelin-starred chef, who created the *coulant au chocolat* (runny chocolate) in 1981 to evoke the memory of sipping hot chocolate to warm up after a family skiing trip. The second is Jean-Georges Vongerichten, another starry Gallic gourmet. In New York in 1987 he pulled hundreds of miniature chocolate cakes out of the oven before they were cooked. The centres were molten but there was no time to correct the mistake. Despite the error, the diners loved them. He has served them ever since.

Their techniques are different, but between them Messrs Bras and Vongerichten created a sophisticated confection. It became a phenomenon, served in the toniest establishments on either side of the Atlantic. In America it had the all-important aroma of French refinement and *élégance*.

The flavour is straightforward (one-note would be a less charitable description) but getting the dish exactly right is tricky. There are no outward clues to indicate the point at which it is perfectly cooked. The moment of incision provides the thrill of drama. Will the dessert ooze or will it prove to be a dry disappointment?

In 1991 Alain Ducasse, a multi-Michelin-starred chef, told the *New York Times* that the fondant had reached a point where restaurants "were practically obliged to make it". It was one of the defining desserts of that decade. But then the tide began to turn. Mr Vongerichten was churning out so many at one point that Mark Bittman, an American food writer, dubbed it "the Big Mac of desserts".

The name evolved. In many places it became a "molten chocolate cake" or a "chocolate lava cake". It travelled from hushed dining rooms to the restaurants of Disney World. Chain restaurants began serving them; takeaway joints can deliver fondants along with your pizza. Supermarkets include the dessert in their Valentine's Day ready-meal deals. Aldi, Costco, Lidl and Walmart all flog iterations of it. In "Chef", a film of 2014, a critic seethes that he would rather the cook "sit on my face after a brisk walk on a warm day than suffer through that fucking lava cake again." The dish has become *déclassé* or, worse, a bit naff.

And yet like *crème brûlée* and tiramisu—also wildly popular in the 1990s—its ubiquity seems to have inflicted little damage. It exists comfortably on both planes, the blowout and the budget. Any version of it is fundamentally an extravagance. That overcomes any food snobbery. A recent study suggests that people living in "high-indulgence" cultures (as opposed to cultures of restraint) report higher levels of well-being. It turns out a little of what you fancy does, in fact, do you good. ■

Courses

Economic & financial indicators

Economic data

	Gross domestic product % change on year ago latest		quarter*	2023†	Consumer prices % change on year ago latest		2023†	Unemployment rate %		Current-account balance % of GDP, 2023†	Budget balance % of GDP, 2023†	Interest rates 10-yr gov't bonds latest,%		change on year ago, bp	Currency units per $ Apr 19th	% change on year ago
United States	0.9	Q4	2.6	0.7	5.0	Mar	4.2	3.5	Mar	-3.1	-5.2	3.6		67.0	-	
China	4.5	Q1	9.1	5.7	0.7	Mar	1.7	5.3	Mar‡§	1.7	-2.9	2.7	§§	11.0	6.90	-7.5
Japan	0.4	Q4	0.1	1.0	3.3	Feb	1.9	2.6	Feb	3.0	-5.9	nil		-8.0	135	-4.3
Britain	0.6	Q4	0.5	-0.2	10.1	Mar	6.0	3.8	Jan††	-2.9	-5.4	3.7		180	0.80	-3.8
Canada	2.1	Q4	nil	0.7	4.3	Mar	3.3	5.0	Mar	-0.8	-1.6	3.1		24.0	1.34	-6.0
Euro area	1.8	Q4	-0.1	0.7	6.9	Mar	5.9	6.6	Feb	1.2	-3.6	2.5		157	0.91	2.2
Austria	2.6	Q4	-0.1‡	0.8	9.2	Mar	6.6	5.0	Feb	1.1	-3.5	3.1		173	0.91	2.2
Belgium	1.4	Q4	0.4	0.5	6.7	Mar	5.4	5.8	Feb	-1.8	-4.9	3.1		175	0.91	2.2
France	0.5	Q4	0.3	0.5	5.7	Mar	5.5	7.0	Feb	-1.9	-5.3	3.0		163	0.91	2.2
Germany	0.9	Q4	-1.7	-0.1	7.4	Mar	6.2	2.9	Feb	3.5	-2.1	2.5		157	0.91	2.2
Greece	4.5	Q4	5.6	1.0	4.6	Mar	4.1	11.4	Feb	-7.0	-3.6	4.3		137	0.91	2.2
Italy	1.4	Q4	-0.5	0.8	7.6	Mar	6.8	8.0	Feb	-0.6	-5.0	4.3		179	0.91	2.2
Netherlands	3.2	Q4	2.6	1.2	4.4	Mar	4.8	3.5	Feb	6.9	-2.7	2.9		167	0.91	2.2
Spain	2.6	Q4	0.8	1.4	3.3	Mar	4.3	12.8	Feb	0.3	-4.7	3.5		175	0.91	2.2
Czech Republic	0.1	Q4	-1.4	-0.2	15.0	Mar	11.4	2.5	Feb‡	-1.7	-4.8	4.8		47.0	21.4	6.1
Denmark	1.9	Q4	2.3	0.8	6.7	Mar	5.0	2.8	Feb	9.0	0.5	2.8		154	6.80	1.5
Norway	1.3	Q4	0.8	1.4	6.5	Mar	4.6	3.6	Jan‡‡	20.0	11.4	1.4		76.0	10.6	-16.6
Poland	0.6	Q4	-9.3	0.7	16.1	Mar	13.7	5.4	Mar§	-2.4	-2.9	6.2		-12.0	4.22	2.1
Russia	-2.7	Q4	na	-2.1	3.5	Mar	7.5	3.5	Feb§	6.8	-4.4	11.0		77.0	81.8	-1.4
Sweden	-0.1	Q4	-2.0	-0.6	10.6	Mar	5.6	8.2	Feb§	3.0	-0.3	2.5		100	10.3	-7.5
Switzerland	0.8	Q4	0.1	0.9	2.9	Mar	2.2	1.9	Mar	6.5	-0.7	1.1		20.0	0.90	5.6
Turkey	3.5	Q4	3.8	2.8	50.5	Mar	42.2	10.7	Feb§	-4.5	-4.2	11.8		-941	19.4	-24.4
Australia	2.7	Q4	1.9	1.6	7.8	Q4	4.6	3.5	Mar	1.7	-2.3	3.5		44.0	1.49	-8.7
Hong Kong	-4.2	Q4	nil	3.4	1.7	Feb	2.4	3.3	Feb‡‡	3.5	-1.4	3.1		37.0	7.85	-0.1
India	4.4	Q4	-3.4	6.1	5.7	Mar	5.6	7.8	Mar	-1.2	-5.9	7.2		8.0	82.2	-7.0
Indonesia	5.0	Q4	na	4.7	5.0	Mar	3.9	5.9	Q3§	0.8	-2.9	6.6		-32.0	14,845	-3.4
Malaysia	7.0	Q4	na	3.5	3.7	Feb	2.3	3.5	Feb§	2.7	-5.2	3.9		-21.0	4.44	-4.3
Pakistan	6.2	2022**	na	1.5	35.4	Mar	30.3	6.3	2021	-2.9	-5.6	15.1	†††	313	284	-35.1
Philippines	7.1	Q4	10.0	4.8	7.6	Mar	5.7	4.8	Q1§	-3.3	-6.4	6.2		21.0	56.2	-6.7
Singapore	0.1	Q1	-2.7	1.7	6.3	Feb	5.2	2.0	Q4	18.3	-0.1	2.9		31.0	1.33	3.0
South Korea	1.3	Q4	-1.6	1.5	4.2	Mar	2.8	2.9	Mar§	2.6	-2.1	3.4		1.0	1,326	-6.7
Taiwan	-0.4	Q4	-1.5	1.6	2.4	Mar	1.9	3.6	Feb	11.9	-2.2	1.2		20.0	30.6	-4.3
Thailand	1.4	Q4	-5.9	3.8	2.8	Mar	2.5	0.9	Feb§	2.1	-2.7	2.6		7.0	34.5	-2.1
Argentina	1.9	Q4	-6.0	-3.6	104	Mar	92.2	6.3	Q4§	-2.2	-4.2	na		na	217	-47.7
Brazil	1.9	Q4	-0.9	1.0	4.7	Mar	5.2	8.6	Feb§‡‡	-2.9	-7.9	12.4		16.0	5.04	-7.1
Chile	-2.3	Q4	0.2	-0.2	11.1	Mar	7.8	8.4	Feb§‡‡	-5.6	-2.5	5.6		-102	796	2.8
Colombia	2.9	Q4	2.7	1.6	13.3	Mar	11.9	11.4	Feb§	-4.7	-4.4	11.5		171	4,519	-16.9
Mexico	3.6	Q4	1.8	1.4	6.8	Mar	5.9	2.8	Feb	-1.0	-3.7	8.9		nil	18.0	11.1
Peru	1.7	Q4	-6.0	1.9	8.4	Mar	6.5	6.7	Mar§	-3.3	-1.6	7.6		28.0	3.78	-1.3
Egypt	3.9	Q4	na	3.0	32.6	Mar	25.0	7.2	Q4§	-3.0	-6.9	na		na	30.9	-40.3
Israel	2.7	Q4	5.3	2.9	5.0	Mar	3.8	3.9	Feb	3.9	-2.0	3.9		148	3.65	-11.2
Saudi Arabia	8.7	2022	na	2.8	2.7	Mar	2.2	4.8	Q4	6.6	1.4	na		na	3.75	nil
South Africa	0.9	Q4	-4.9	1.3	7.3	Mar	5.1	32.7	Q4§	-1.9	-4.5	10.1		20.0	18.1	-17.4

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.

Markets

In local currency	Index Apr 19th	% change on: one week	Dec 30th 2022
United States S&P 500	4,154.5	1.5	8.2
United States NAScomp	12,157.2	1.9	16.2
China Shanghai Comp	3,370.1	1.3	9.1
China Shenzhen Comp	2,126.5	-1.0	7.6
Japan Nikkei 225	28,606.8	1.9	9.6
Japan Topix	2,040.4	1.7	7.9
Britain FTSE 100	7,898.8	0.9	6.0
Canada S&P TSX	20,680.8	1.1	6.7
Euro area EURO STOXX 50	4,393.6	1.4	15.8
France CAC 40	7,549.4	2.1	16.6
Germany DAX*	15,895.2	1.2	14.2
Italy FTSE/MIB	27,933.6	1.1	17.8
Netherlands AEX	760.2	0.1	10.3
Spain IBEX 35	9,494.8	2.3	15.4
Poland WIG	62,435.1	3.6	8.7
Russia RTS, $ terms	1,004.6	3.0	3.5
Switzerland SMI	11,366.2	1.2	5.9
Turkey BIST	5,061.2	-1.6	-8.1
Australia All Ord.	7,561.3	0.3	4.7
Hong Kong Hang Seng	20,367.8	0.3	3.0
India BSE	59,567.8	-1.4	-2.1
Indonesia IDX	6,821.8	0.3	-0.4
Malaysia KLSE	1,425.1	-0.7	-4.7

	index Apr 19th	% change on: one week	Dec 30th 2022
Pakistan KSE	40,499.3	0.9	0.2
Singapore STI	3,324.1	1.2	2.2
South Korea KOSPI	2,575.1	1.0	15.1
Taiwan TWI	15,770.5	-1.0	11.5
Thailand SET	1,580.7	-0.7	-5.3
Argentina MERV	275,405.9	3.2	36.3
Brazil BVSP*	103,912.9	-2.8	-5.3
Mexico IPC	54,308.1	nil	12.1
Egypt EGX 30	17,516.0	4.6	20.0
Israel TA-125	1,714.3	-1.5	-4.8
Saudi Arabia Tadawul	11,163.6	2.1	5.8
South Africa JSE AS	78,796.9	1.4	7.9
World, dev'd MSCI	2,833.4	1.4	8.9
Emerging markets MSCI	990.4	-0.3	3.6

US corporate bonds, spread over Treasuries

Basis points	latest	Dec 30th 2022
Investment grade	150	154
High-yield	483	502

Sources: Refinitiv Datastream; Standard & Poor's Global Fixed Income Research. *Total return index.

Commodities

The Economist **commodity-price index**

2015=100	Apr 11th	Apr 18th*	% change on month	year
Dollar Index				
All Items	154.2	156.5	0.7	-19.1
Food	141.4	144.1	3.7	-13.9
Industrials				
All	166.1	168.1	-1.5	-22.8
Non-food agriculturals	119.9	118.6	-4.5	-36.1
Metals	179.8	182.8	-0.9	-19.6
Sterling Index				
All items	189.3	192.2	-1.1	-15.4
Euro Index				
All items	156.7	158.3	-1.0	-20.4
Gold				
$ per oz	2,004.4	2,008.3	3.2	2.8
Brent				
$ per barrel	85.7	84.8	12.8	-21.0

Sources: Bloomberg; CME Group; Cotlook; Refinitiv Datastream; Fastmarkets; FT; ICCO; ICO; ISO; Live Rice Index; LME; NZ Wool Services; Thompson Lloyd & Ewart; Urner Barry; WSJ. *Provisional.

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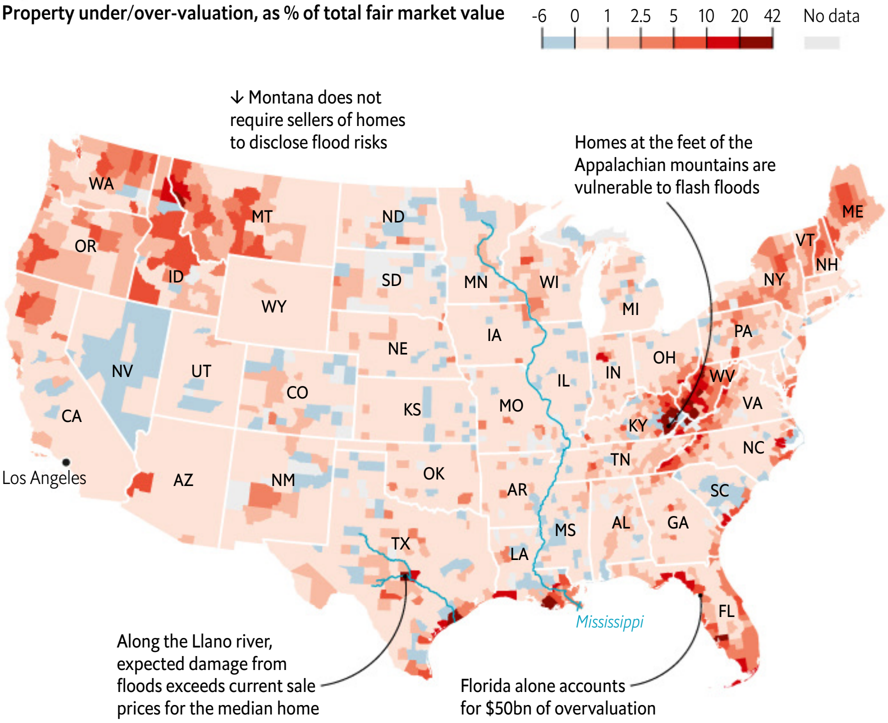
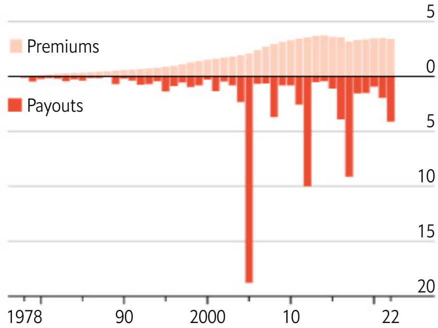
economist.com/economic-and-financial-indicators

→ Unpriced flood risk inflates home values the most in rural, inland parts of America

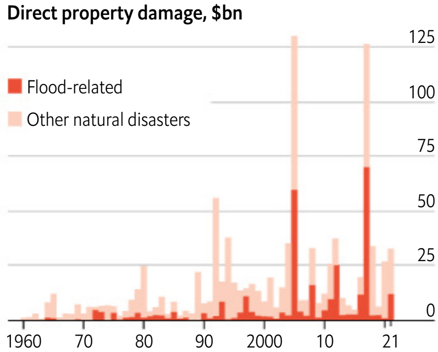
Property under/over-valuation, as % of total fair market value



Flood insurance*, $bn



Direct property damage, $bn



*National Flood Insurance Programme Sources: "Unpriced climate risk and the potential consequences of overvaluation in US housing markets", by Jesse Gourevitch et al., *Nature Climate Change*, March 2023; First Street Foundation; Sheldus.org

Rainy-day funds needed

Accounting for flood risk would lower American house prices by $187bn

Floods are the most expensive type of natural disaster in America, causing at least $323bn in direct damage since 1960 after accounting for inflation. Unlike other types of risks, private insurers generally do not offer residential coverage for floods.

To fill this void, Congress set up the National Flood Insurance Programme (NFIP). Homeowners in "100-year floodplains", where regulators reckon that the chance of flooding each year is at least 1%, can get government-backed mortgages only if they are insured. But on average, the amount of money that the NFIP collects in premiums each year is less than the amount it has to pay out, so it has to borrow, thus passing the bill on to the government: in 2017 Congress forgave $16bn of the NFIP's debt. Moreover, the NFIP's payouts are less than the total amount of damage caused by floods. The shortfall is paid by uninsured homeowners, and by those whose damages exceed the NFIP's maximum claim size.

In 21 of the 50 states, sellers of homes do not have to disclose past damages or future risks from floods. Moreover, even if buyers are informed, they often fail to discount their offers sufficiently. The combination of subsidised insurance and myopic buyer behaviour means that houses in flood-prone areas are overpriced. One study in 2021 estimated this overvaluation at $33bn-56bn. But a new paper in *Nature Climate Change*, whose lead author is Jesse Gourevitch of the Environmental Defence Fund, an advocacy group, puts it at $121bn-237bn, with a central estimate of $187bn.

The difference stems from assessments of flood risk. The earlier figures relied on the NFIP's historical premiums, which take little account of risks from heavy rain or along small waterways, and do not factor in climate change. In contrast, the new study is based on maps produced by First Street Foundation, a research group, which add up the risks from all potential causes of flooding in a warming world. It finds that at least 6.9m American homes are overpriced because of expected flood damages, with 1.2m overvalued by at least 10% and 660,000 by more than 25%.

In total dollars, overpricing is greatest in posh bits of coastline, such as Los Angeles and parts of South Carolina's Lowcountry. Florida, where 66cm of rain submerged Fort Lauderdale's airport on April 12th, accounts for $50bn of overvaluation by itself.

But as a share of home values, the risk is greatest in rural, inland regions. In parts of Appalachia, New England and Montana, the median property is 30-50% overvalued. Many of these areas lack tunnels and pipes to channel water from storms, meaning that heavy rains can cause flash floods in rivers, creeks and streams, particularly at the bases of mountains. Last July downpours in Kentucky produced floods that swept houses away and killed 39 people.

On current trends, this housing bubble is likely to feed on itself. The higher the prices that homes in risky areas sell for, the more incentive developers have to build in those regions. The most efficient way to stop flooding from popping this bubble is for premiums to start reflecting expected damages. That might entail carving out a bigger role for private insurers, which left the business after the Great Mississippi Flood of 1927 led to large losses.

The NFIP has taken a first step with a new premium-setting system, based on frequencies and types of flooding, distances to water sources and property values. However, federal law limits how much premiums can rise. Faster increases would saddle homeowners in flood-prone regions with higher expenses and falling house prices. It would also deprive local governments that depend on property taxes, in areas as diverse as Idaho and the rural north-east, of crucial revenue. But maintaining the status quo means that taxpayers elsewhere will keep footing the bill. ■

The look of an era

Dame Mary Quant, designer of the clothes that made the Sixties swing, died on April 13th, aged 93

TUNICS WERE at the back. Once you had worked through the immense Butterick pattern catalogue, past pages of pastel A-line dresses or tight-skirted suits, suddenly the look changed. It became rectangular, plain, sleek and very short, and if you were a teenager in the early 1960s that was what you wanted. Your parents would never buy such clothes for you, but if you were determined you would make them yourself. Out on the lounge floor you'd spread the fabric, a shock of scarlet, orange or electric blue, and in a few days you, too, would be wearing Mary Quant.

Wearing it, over a polo-neck and contrasting tights (oh, the joy of losing that fiddly suspender belt!), made you feel different. You were not a version of your mother any more. You were modern. Even more so when you plastered down your hair with spray, framed your eyes with kohl and piled on the mascara. High boots, if you had them, perfected the look. Now you could stride.

At the start of her career Mary Quant, too, spent hours on her bedsit floor pinning and cutting. She worked at night to restock her first shop, Bazaar, in the King's Road in Chelsea, with a bouillabaisse of racy clothes. By evening the rails would be almost stripped, and she would rush to Harrods to get fabrics for the next day. Out of men's suitings, in tweed or grey flannel, she would make pinafores; striped shirting was cut into dresses. She ran up culottes, knickerbockers and lounge pyjamas, and had fun with foot-wide waistbands, broad stripes and huge polka dots. Her best-seller was a white plastic Peter Pan collar, to add demure little-girlishness to each eye-smacking ensemble.

She also sold mini-skirts. They went like wildfire, getting ever shorter because her leggy Chelsea customers demanded it. She designed them long before André Courrèges, in his Paris show in 1964, made them respectable. They were not respectable with her. Wickedly, they teased men, as did her long cardigans worn as very short dresses, and in 1966 her crutch-hugging minipants. Appalled City types in bowler hats would pass Bazaar, with its open door blaring out jazz and its window of cavorting mannequins, and cry "Disgusting!", beating their umbrellas on the glass.

Inside, though, dowagers competed with middle-class girls to buy Quant by the armful, and the *haut monde* of the day—Tony Armstrong-Jones, David Bailey, Jean Shrimpton, Brigitte Bardot, the odd Beatle or Rolling Stone—would drop in to the running cocktail party. She was her own best advertisement, gamine and frisky, especially when Vidal Sassoon, the hairdresser of the moment, snipped her hair into a bob, and when Terence Donovan, the hot photographer, snapped her (as here). She and her equally mould-breaking business partner-husband, Alexander Plunket Greene, loved to hear people sneer "God! Modern Youth!". Swinging London was their new world, and they were dressing it.

This was also serious stuff, for her. She was shy, and always had been, but through clothes she could express herself. Already, at six, she was making her own dresses out of bedspreads. At school she recast her uniform. The Quant look came from a tap-dancer at her childhood ballet class who wore a long black jumper, black tights, white socks and no skirt to speak of; she liked skinny, lively monochrome ever after. At Goldsmiths College she decided to ignore what was happening in Paris, creating clothes solely for herself and her friends. In pursuit of fashion she was constantly looking for the next, best, thing: a colour or fabric that had been forgotten, a shirt that could be tied like a scarf, a natural pattern she could blow up large. As she walked she might pick up a conker, leaves, a brass hook, bits of ribbon and mesh from factory floors. Even a rubber doorstop would set her mind working.

Fashion also gave her a living, surprisingly enough. Her parents, Welsh schoolteachers who had moved to London, thought the business dicey and dodgy. Neither she nor Alexander had much idea about money, and it was only his aristocratic income that enabled them to set up Bazaar in 1955 with the help of another useful friend, ex-lawyer Archie McNair. But in ten days the original stock had sold out, and in the first week the shop made £500. Two more London outlets came quickly and, in 1962, a deal with J.C. Penney to link up with 1,765 stores in America. By 1963 the Quant brand was global, with revenues of £14m; in 2000 her make-up arm was bought out by a Japanese company, in a country where her look was also adored. Sensibly, she went early into mass-production and discounting. Money-talk embarrassed her, but she and Alexander—with no furniture except a bed and deckchairs when they married in 1957—certainly rose fast in the world.

That love affair too had been made by fashion, when Alexander wandered into classes at Goldsmiths in his mother's gold silk pyjamas. For both of them, eccentric dressing was a powerful tool for getting through life. It could be a disguise, and her range of cosmetics, with colours as vivid as her clothes, were really pots of theatrical paint made tiny for a handbag. Or it could be a bold announcement of things to come. When she set up Bazaar in a grey Britain not long out of rationing, a place of bomb-sites and pea-souper fogs, her shop immediately looked alive, with music and colours that sang of the world to be. Fashion changed first.

It also changed women, once the new look took hold. Not just because they could playfully imitate men, by borrowing men's tailoring and their cardigans, but mostly because mini-dresses freed them to move. She designed them, she said, to be alive in. More important still, high hemlines, paired with opaque tights, let girls run for the bus in order to get to work. You could never run for the bus in a Dior dress. In Quant, women felt they could leave the house and dare a different life.

When people credited her with that revolution, though, she objected. Times were coming to a boil and she just happened to be there, giving women more of what they already wanted. Her customers were the real revolutionaries; they, and the teenage girls who cut and stitched her designs on sitting-room floors across the land, kohl-rimmed eyes gleaming, eager to stride outside. ■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