

# The Economist

Breaking China's rare-earths chokehold

Climate tipping-points

AI and the one-person unicorn

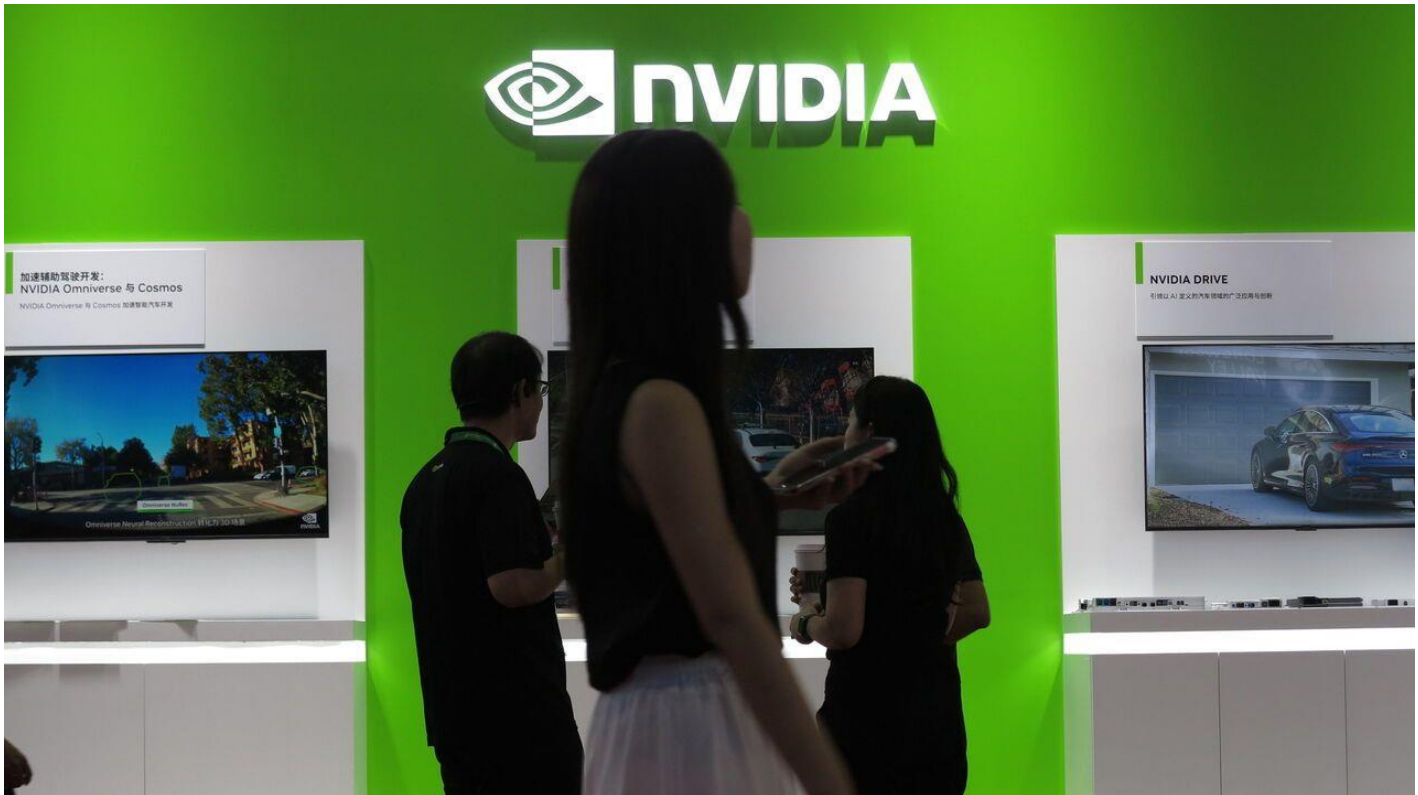
The glory of Pompeii

AUGUST 16TH-22ND 2025

## HOW TO WIN AT FOREIGN POLICY



## Business



Photograph: Reuters

America and China suspended the imposition of retaliatory tariffs for another 90 days as they continue to work towards a trade deal. November 10th is the new deadline. Meanwhile, the White House confirmed that Nvidia and AMD have agreed to hand over 15% of the revenues they receive from selling chips in China to the American government. It is thought to be the first time that any company has come to such an arrangement to obtain export licences. Separately, the Chinese government has urged domestic firms not to use Nvidia's H20 chips, according to reports, but has stopped short of an outright ban.

### **Wham, bam, thank you Tan**

Mr Trump backed off from his call for Lip-Bu Tan to resign as chief executive of Intel. Mr Trump's attack came after Tom Cotton, the chairman of the Senate Intelligence Committee, questioned Mr Tan's links to Chinese companies, as well as "security and integrity" at Intel. Mr Tan, who dismissed the concerns, recently suggested that Intel may quit the higher end of chipmaking if its next-generation

semiconductors do not gain enough business. But after a hastily arranged meeting, Mr Trump praised Mr Tan's "success".

Mr Tan was not the only corporate boss to take heat from Mr Trump this week. The president suggested that David Solomon should stand down as the boss of Goldman Sachs because of the bank's "bad prediction" on the impact of tariffs. Mr Solomon should "focus on being a DJ", he said, a reference to the bank executive's erstwhile pastime.

The British government breathed a sigh of relief as new data showed that Britain's economy grew by 0.3% in the second quarter compared with the first quarter (or by 1.2% on an annual basis). The figure was better than expected; weak output was recorded in April and May, but GDP rebounded in June. Higher employer taxes came into effect during the quarter, which was also marked by uncertainty over trade.

Australia's central bank reduced its benchmark interest rate by a quarter of a percentage point, to 3.6%, as inflation eases in the country. The cut was widely expected. The bank stunned markets in July by holding the rate steady.

Consumer prices in America rose by 2.7% in July on a 12-month basis, the same as June. The headline inflation rate was subdued by a dip in energy and food prices. Excluding those items, core inflation accelerated to 3.1%, mostly because of increases in the cost of services. Airline fares rose by 4%, for example, month on month.



Chart: The Economist

Stockmarkets cheered the inflation data, which raises the probability of the Federal Reserve cutting interest rates in September. The S&P 500 and the Nasdaq Composite both hit new all-time highs. In Japan the Nikkei 225 and Topix broke records amid optimism about trade and speculation that the government will expand fiscal stimulus. SoftBank's share price surged to new peaks after its quarterly profit beat expectations amid its big bets on AI.

Following billions of dollars in losses at its electric-vehicle division, Ford announced a big shake-up of the business, which includes a \$5bn investment in factories in Louisville and Michigan. Ford will switch to a new "universal EV platform" production system that will build a "breakthrough" low-cost electric pickup truck starting at \$30,000. It expects to start selling the pickup in 2027. Some analysts think this could be a make-or-break moment for the carmaker.

Perplexity, one of the best-known AI-driven search tools on the web, made a surprise offer to buy Google's Chrome web browser for \$34.5bn. In a letter to Alphabet, Google's parent company, Perplexity said it was positioning itself as a potential buyer if Google is eventually ordered to sell Chrome in an antitrust case.

Orsted, the world's biggest developer of offshore wind farms, lost a third of its stockmarket value after announcing that it would have to raise 60bn Danish kroner (\$9bn) in a rights issue to boost its finances. The Danish company blamed "material adverse developments" in the American market, where the Trump administration is hostile towards renewable energy.

The long-awaited roll-out of GPT-5, OpenAI's latest model, didn't quite go according to plan. After social media were flooded with complaints from users, Sam Altman, the startup's boss, admitted that its autoswitcher, which guides queries to the most suitable model, had broken for a large part of the launch day, so that GPT-5 "seemed way dumber". With the fixes now in place, GPT-5 could be the world's best model in areas such as software engineering.

## **Web crawler**

AOL, an internet pioneer from the 1990s, quietly announced that it would stop offering its dial-up service to customers. Around 160,000 Americans still use dial-up rather than broadband. AOL's decision was seen as a historic moment by some; others scratched their heads in disbelief that its dial-up service still existed.



## Finance & economics

# Growth-loving authoritarians are failing on their own terms

In Asia, East Africa and the Gulf leaders now face an unpleasant choice

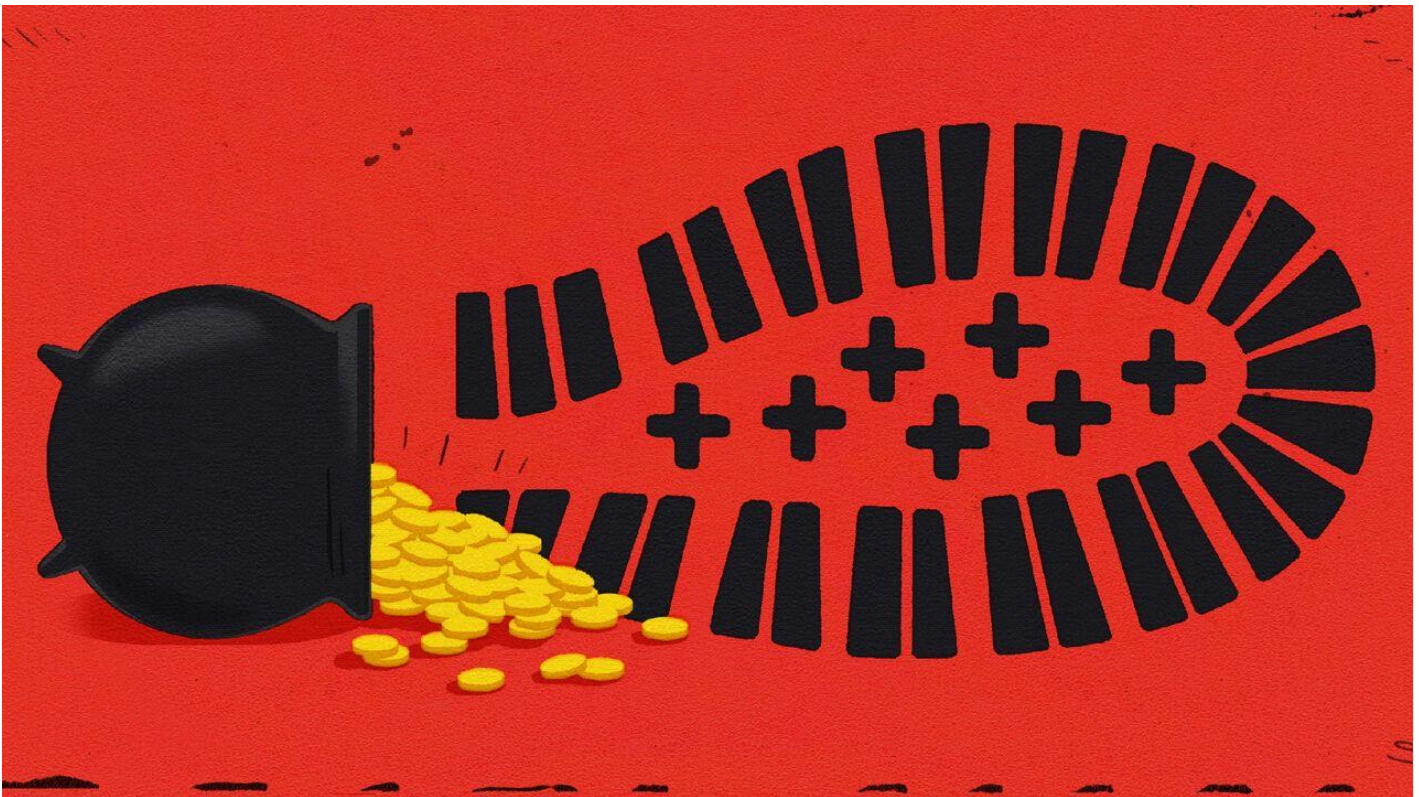


Illustration: Pete Ryan

Muhammad bin Salman is one of the world's most secure autocrats. He has no need to pay off rivals or buy elections. Yet by 2030 his government will have spent almost \$3trn on Vision 2030, a plan to transform Saudi Arabia's economy. Officials are backing man-made islands, luxury hotels and electric-vehicle factories. "They will take anything that has the smallest chance of creating economic growth, even if it is in decades," says a megaproject executive, "even fantasies and failures."

MBS is one of several autocrats fixated on economic growth. Gulf monarchs, East African leaders, strongmen in (just about) democratic countries—all are inspired by China and Singapore, which

managed to combine authoritarian rule with economic success. Many are willing to adopt orthodox policy. They see growth as a source of legitimacy, seeking to enrich their populations, rather than just elites. As such, they employ skilled technocrats to set policy, try to lure investors with promises of stability and engage in lavish industrial policy. And yet, despite all this, they are increasingly struggling to deliver growth.

China and Singapore are an inspiration for a reason—they stand out. Autocrats have tended to pursue growth haphazardly at best. Kevin Grier of Texas Tech University and Michael Munger of Duke University have found that, from 1950 to 2006, those who managed a decade or more in power produced growth of 1% a year, a measly amount. The worst treated policy as a means of personal enrichment. More often the likes of Suharto in Indonesia and Myanmar's junta ran the economy in such a manner as to placate elites, apportioning profits to allies while repressing citizens.

The new breed of rulers was first identified in 2015 by Hilary Matfess of the Council on Foreign Relations, a think-tank. She termed them “developmental authoritarians”. Paul Kagame has courted investors by opening Rwanda's capital account, promising subsidies and sending roadshows across the world. In Ethiopia Abiy Ahmed, who came to power after Ms Matfess's paper, has scrapped capital controls and floated the birr. In the Gulf ruling families are trying to reduce their dependence on oil. Vietnam may already be South-East Asia's fastest-growing economy, but To Lam, its new ruler, wants to up the pace.

After all, under Park Chung-hee's authoritarian rule, which ran from 1963 to 1979, the average South Korean's income went from that of a sub-Saharan African to that of an eastern European. And whereas South Korea became a democracy, Deng Xiaoping in China showed that there was nothing inevitable about such a transition. Instead, he oversaw strong economic growth and cemented his party's rule while doing so. Today everyone from Mr Kagame to Indermit Gill, the World Bank's chief economist, professes admiration for China's and Singapore's achievements.

The change of approach reflected demographic trends. In the 2000s economists talked of “authoritarian bargains”, in which despots compensated for the general unpleasantness of life without political rights with handouts. Today populations are too large and too young for such deals. The Gulf is racing against the depletion of oil funds; Ethiopia's population is forecast to grow by 90m from 2020 to 2050.

### **From the Kennedy School to Kuwait**

Melding pro-growth policy to an authoritarian political economy means ceding control. The Rwandan government has provided venture capital for everything from milk production to peat mining. It then sells stakes in successful ventures to private investors (part of a telecommunications firm recently went to T-Mobile, an American giant, for instance). One of Mr Lam's first policies in Vietnam was to

exempt small businesses from corporate tax. Two years ago, for those putting more than \$50m into the country, Bahrain got rid of almost all the paperwork foreign investors usually require. MBS's latest reforms, introduced in February, seek to bring employment practices into line with America.



Chart: The Economist

Well-run, relatively efficient state-owned conglomerates also attract foreign investors. They crave stability and a young, popular autocrat is less likely to rip up commitments than a cast of leaders in a democracy. Why, ask state-sponsored salespeople who tour investment conferences, take the risk? Abiy is 48 and MBS is 39; they make plans in decades. Alongside Saudi Arabia's Vision 2030 (published in 2016), there is Bahrain's Vision 2030 (published in 2008) and Ethiopia's Growth and Transformation Plan (lasting until 2030).

Despite the alluring pitch, in recent years flaws have emerged. Foreign businesspeople complain of micromanagement. State-owned firms crowd out private ventures: so ambitious are the government's plans, Saudi Arabia suffers from a shortage of construction materials; the IMF has warned Ethiopia its banks are too busy lending to the state to support local businesses. In some places, when goals are not met, officials may fiddle the figures to avoid reprisals. Indeed, an IMF official suggests that the true Rwandan GDP growth rate is a couple of percentage points below the official one. Ethiopia appears to be overstating its wheat production.

Although many of the plans are long-term, they have been in place for long enough to start to make judgments. We have picked four measures: foreign investment and economic growth reflect core ambitions; GDP per person and health spending, the extent to which benefits are trickling down. Most regimes are failing to meet their own lofty goals. In 2000 Mr Kagame said he wanted Rwanda to be a middle-income country by 2020—a target he is still to meet. Non-oil portions of Gulf economies are growing more slowly than the upper-middle-income average. Since 2015 the average income of someone under a growth-fixated autocrat has risen by 14%, against 23% in comparable countries.

This is not to say that growth is meagre everywhere. Ethiopia's economy grew by over 7% last year, four percentage points above the African average. Rwanda managed a similar pace, according to official figures. Saudi Arabia was thought to be among the most sluggish. But on August 4th the IMF revised its calculations, looking at more industries. Its non-oil growth estimate for 2023 rose from 3.8% to 5.8%.

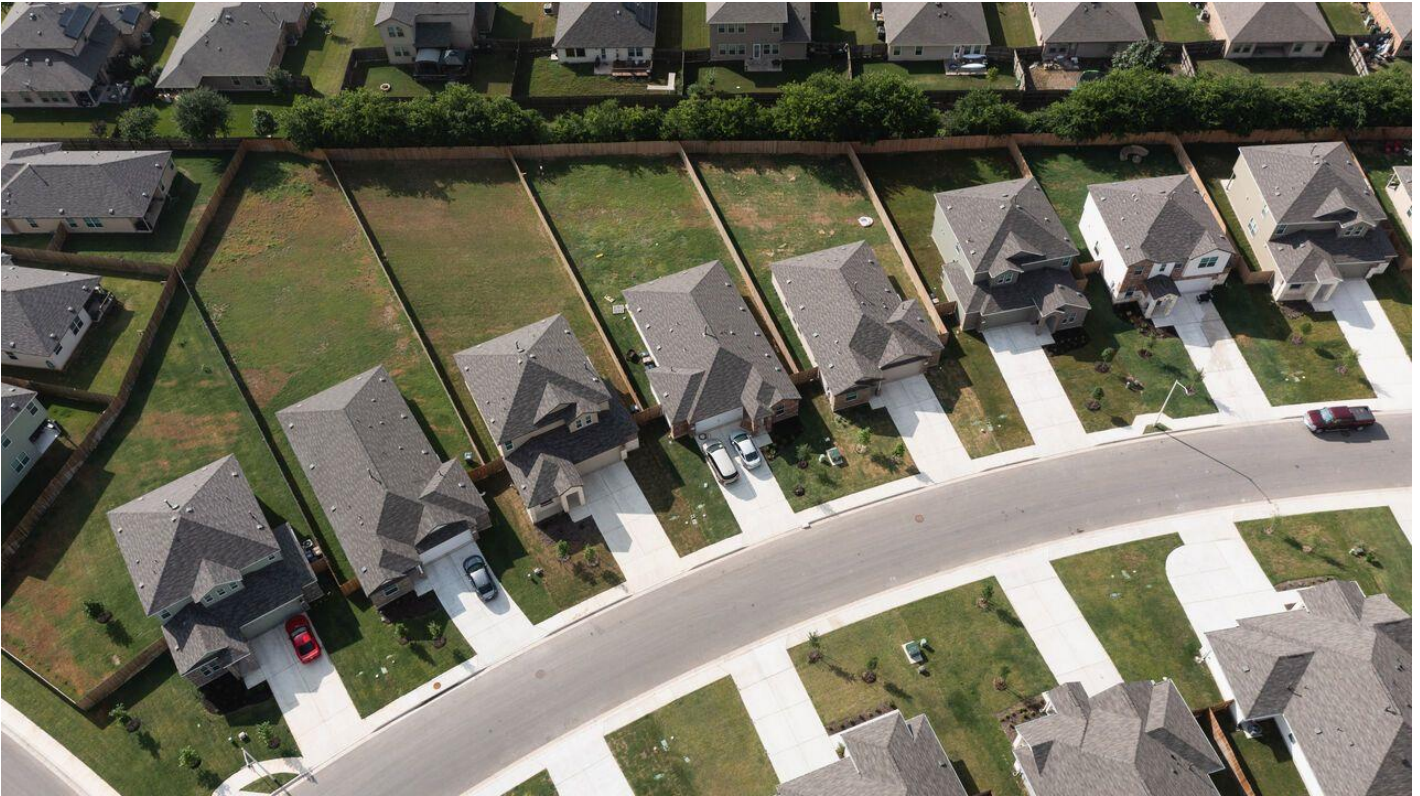
In many cases, though, growth relies on state spending. The Public Investment Fund, Saudi Arabia's wealth fund, is responsible for a tenth of non-oil GDP. Last year over half Rwanda's investment came from state-owned firms. Foreign private-sector cash would indicate a true capitalist boom. Last year Saudi Arabia received less than the average country in the region as a share of GDP; Bahrain, less than Nicaragua. Trade balances have hardly improved. Saudi Arabia imports three times more non-oil goods and services than it exports.



All told, growth has not been sufficient to satisfy ballooning populations, nor to boost tax revenues. In 2023 Saudi Arabia collected less tax, as a share of GDP, than an average low-income country. Fiscal pressure is building and IMF economists reckon the country's non-oil growth will stay below 3.5% for the next two years. Rwanda's debts will force Mr Kagame to cut back. Although technocratic policy has delivered better outcomes, and some measure of popularity, leaders may soon face a choice: properly liberalise, turn to even nastier methods of securing acquiescence or try to buy popularity with handouts in tighter times. How deep does their commitment to economic change run?

# America's housing market is shuddering

For the country's homeowners, the good times are coming to an end



Photograph: Getty Images

Few pandemic-era bets will have paid off quite as nicely as nabbing a house in a boomtown such as Atlanta, Austin or Miami with a two-point-something-per-cent mortgage rate—and holding on as its value soared in the subsequent years. People wanted sun, space and an escape from covid killjoys. These cities offered it.

Now, though, the good times are coming to an end. America's housing market is flagging. Across the country, prices have drifted down in the first half of the year, with most cities seeing falls in the past three months (see chart 1). Tight monetary policy has kept interest rates high. And this is feeding through to the property market, just as President Donald Trump's tariffs are chipping away at the economic growth that had been keeping sales strong.

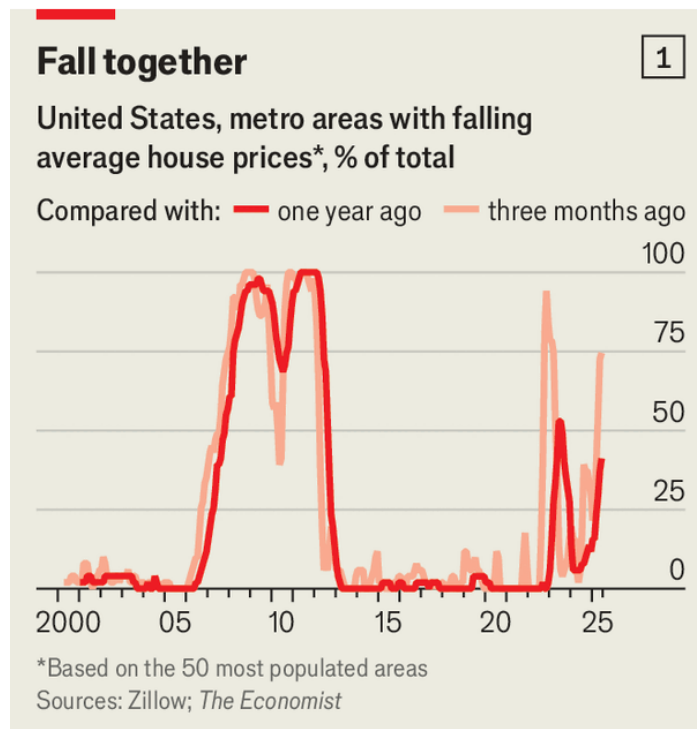
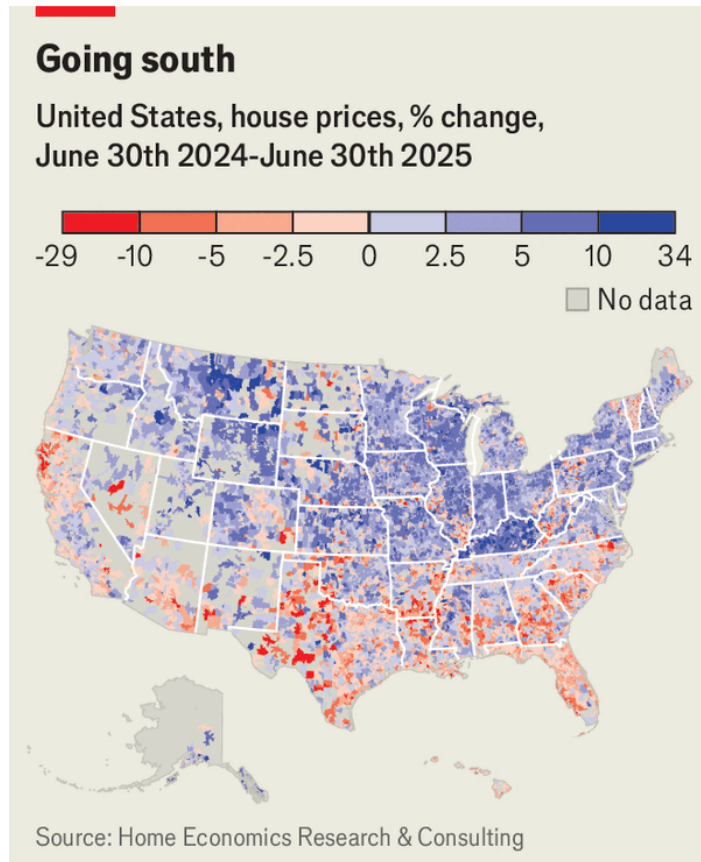


Chart: The Economist

Prices are still creeping up in the north-east and the mid-west, but the west and, in particular, the south are hurting (see map). Pity the homeowner in Dallas or Phoenix who bought last year. They are carrying a beefy mortgage rate of 7% or so and the value of their house is already down a few percentage points in nominal terms, or more after accounting for inflation.

Such cities face a number of difficulties. Fewer Americans are moving to the sunbelt than during the pandemic, when internal migration jumped (see chart 2). Mr Trump's border crackdown may be making a difference, too, by reducing international arrivals. Housebuilding boomed in these cities when demand was high and rates were low. Although it has slowed, many covid-era constructions are only just hitting the market. Worse, public perception of the cities has changed. Austin and Miami failed to attract enough superstar firms when they were in favour; few tech bros today tout them as the new Silicon Valley.



Map: The Economist

For similar reasons, some of the worst-performing markets in the north-east are holiday towns. Prices are falling in Nantucket and Martha's Vineyard and on the coast of Maine. Big-city suburbs, another pandemic winner, do seem to be faring better—whereas dialling into Zoom from the beach house doesn't quite work, hybrid work schedules perhaps make adding 15 or 30 minutes to the commute viable.

The state that fares worst of all combines these trends and adds a few peculiarities of its own. It is Florida, where prices have fallen by 4% in the past year. Aziz Sunderji, an independent analyst, points to high and rising home-insurance premiums owing to climate change (\$11,000 or so a year in Florida, versus \$2,400 nationwide). Other reasons are a sharp drop-off in demand from rich Canadians (a surprising number of whom flee cold winters to Florida) and expensive new safety rules that came in after a condominium in Surfside, a Miami suburb, collapsed in 2021.



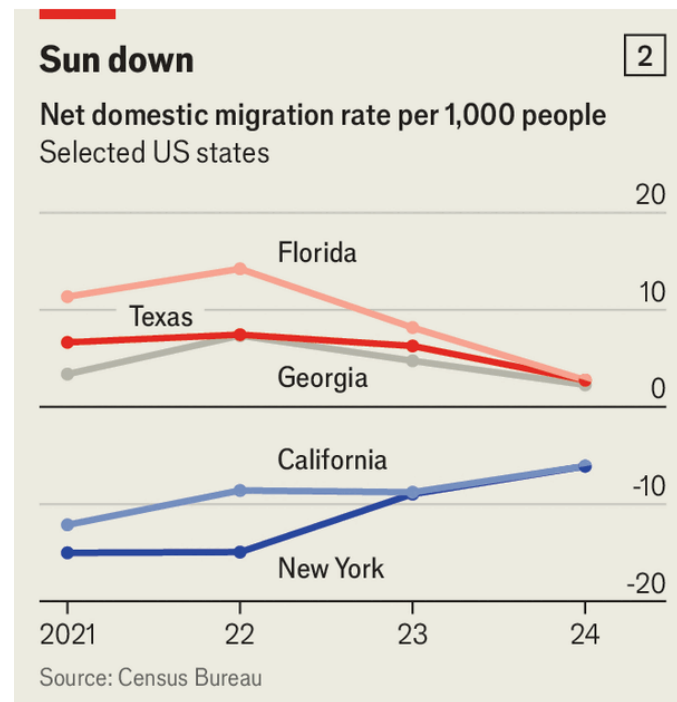


Chart: The Economist

What does the market say about America's economy? Historically, housing has been one of the most interest-rate-sensitive sectors; buyers lever up to make purchases, and are less likely to do so when borrowing is expensive, dampening sales and construction. The industry both helps drive economic growth—housing employs lots of people and homes are a slug of families' wealth—and is worth watching to see where the economy is heading.

The current slowdown is partly deliberate: the Fed is keeping policy tight to squeeze out the last of America's above-target inflation. Other parts of the economy are cooling, too: real private consumption and investment rose at an annualised rate of just 1.2% in the second quarter of 2025, having run at or above 2% for most of the past few years.

Yet relief for the housing market, in the form of much looser monetary policy, may not be on the horizon (even if the Fed does look likely to lower rates a bit in the months ahead). Tariffs have complicated the job for policymakers, as they may cause inflation to spike. At the same time, a colossal build-out of artificial-intelligence infrastructure, data centres and the like is helping buoy growth. Capital spending by the "magnificent seven" big technology companies now accounts for over 1% of GDP, and has near doubled in just a few years, according to Renaissance Macro Research, reducing the need to stimulate the economy. The past decade has been very kind to America's homeowners. Perhaps aspiring buyers are due a break.

# Who will win from Trump's tariffs?

Forget your trip to the dentist. A new check-up is required



Photograph: Reuters

One question looms for a manufacturer working out where to build a factory: how big is a potential location's tariff gap with China? President Donald Trump's latest levies, which took effect on August 7th, have shaken things up. Despite his fighting words, China appears to have a better deal than before, at least compared with other countries: the gap between tariffs applied to it and the rest of the world has shrunk. Mr Trump also promises a clampdown on "transshipment", which would curb firms' ability to tariff-hop.

As a consequence, some now suggest that he has delivered a mighty blow to "China plus one"—a strategy which led firms to build production hubs outside China, particularly in India and South-East Asia. By creating economically meaningful tariff differentials between China and its neighbours, Mr Trump's first trade war in 2018 supercharged the trend. From shoemaking in Vietnam to car assembly

in Thailand, foreign investment poured into alternatives to China. Now with the gap between China and the rest of the world shrinking, will the trend go into reverse?

Perhaps not. For the China-plus-one strategy is not just a way to dodge tariffs. It is also a way to avoid rising Chinese labour costs, political crackdowns and American export controls. On top of this, headline tariff rates are misleading. The fentanyl-related tariffs America imposes on China cover many more products than the “reciprocal” duties it imposes on most countries. According to data from Fitch, a rating agency, when these are taken into account, the gap between China’s tariff rate and the rest of Asia’s has in fact swollen.

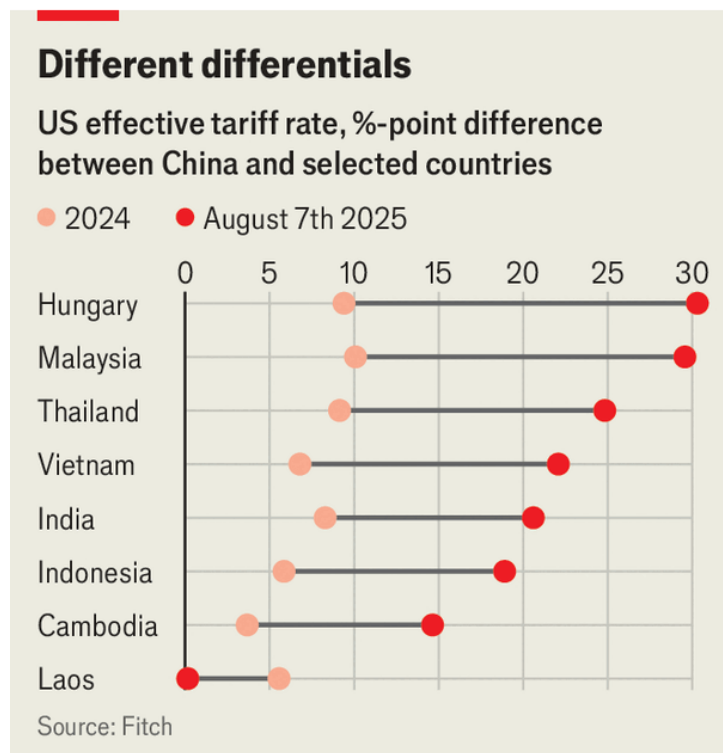


Chart: The Economist

Thus “China plus one” will live on, but in a new form. Previous winners have seen big rises in their effective tariff rates, too, even if not by nearly as much as the region’s superpower. One new winner is Malaysia; the effective rate applied to it has risen from under 1% last year to a (comparatively) modest 12% today. As a result, the China-Malaysia effective-tariff differential has shot up, from ten to 30 percentage points. Meanwhile, the likes of Cambodia and Indonesia have made up less ground.

Which country is most exposed to a transshipment crackdown? America has yet to specify what this will mean in practice, but Chinese-made goods sent via third countries to its shores appear to be in Mr

Trump's sights. We have previously identified such locations, ranking them by the extent of suspected transshipment, using American and Chinese customs data to examine products where there have been simultaneous increases in imports from China and exports to America. By this measure, we found that most re-routing happened in India, Thailand and Vietnam. For the time being, Cambodia, Indonesia and (once again) Malaysia seem most likely to avoid American retribution.

In the event of a crackdown, countries will seek to sell to big markets other than America. Cambodia and Vietnam, which each send a third of exports to America, may struggle. India, Indonesia and Malaysia rely less on Uncle Sam, who attracts less than a fifth of their exports. Some 40% of Indonesia's sales already go to Australia, China, Europe and Japan; just 10% head for America. In preparation for what may be to come, Indonesia's prawn farmers, whose main market is America, have recently stepped up marketing efforts in China.

Across the three measures, Malaysia is best positioned if levies stay put. It has favourable tariff differentials, limited transshipment and less reliance on American demand. Firms have noticed: "It puts Malaysia in a good light for investments," cheered Datuk Seri Wong Siew Hai of the country's semiconductors association. Some countries outside Asia also look well-placed. Hungary, which has so far acted as China's gateway to Europe, faces effective American tariffs 30 percentage points lower than China does.

There is a tension, though. If Malaysia's tariff gap with China and lower risk of a transshipment crackdown leads more firms to set up shop there to sell to America, its dependence on American demand will rise, making it more vulnerable. Something similar happened last time round. In 2024 Malaysia sent 13% of its exports to America, up from 9% before Mr Trump's first trade war. And President Joe Biden targeted the country's solar-panel industry for facilitating Chinese tariff-dodging. In the new China-plus-one regime, it will be hard for even winners to feel secure.



## Tecnology

# Earth's climate is approaching irreversible tipping points

Scientists are racing to work out just how close they might be

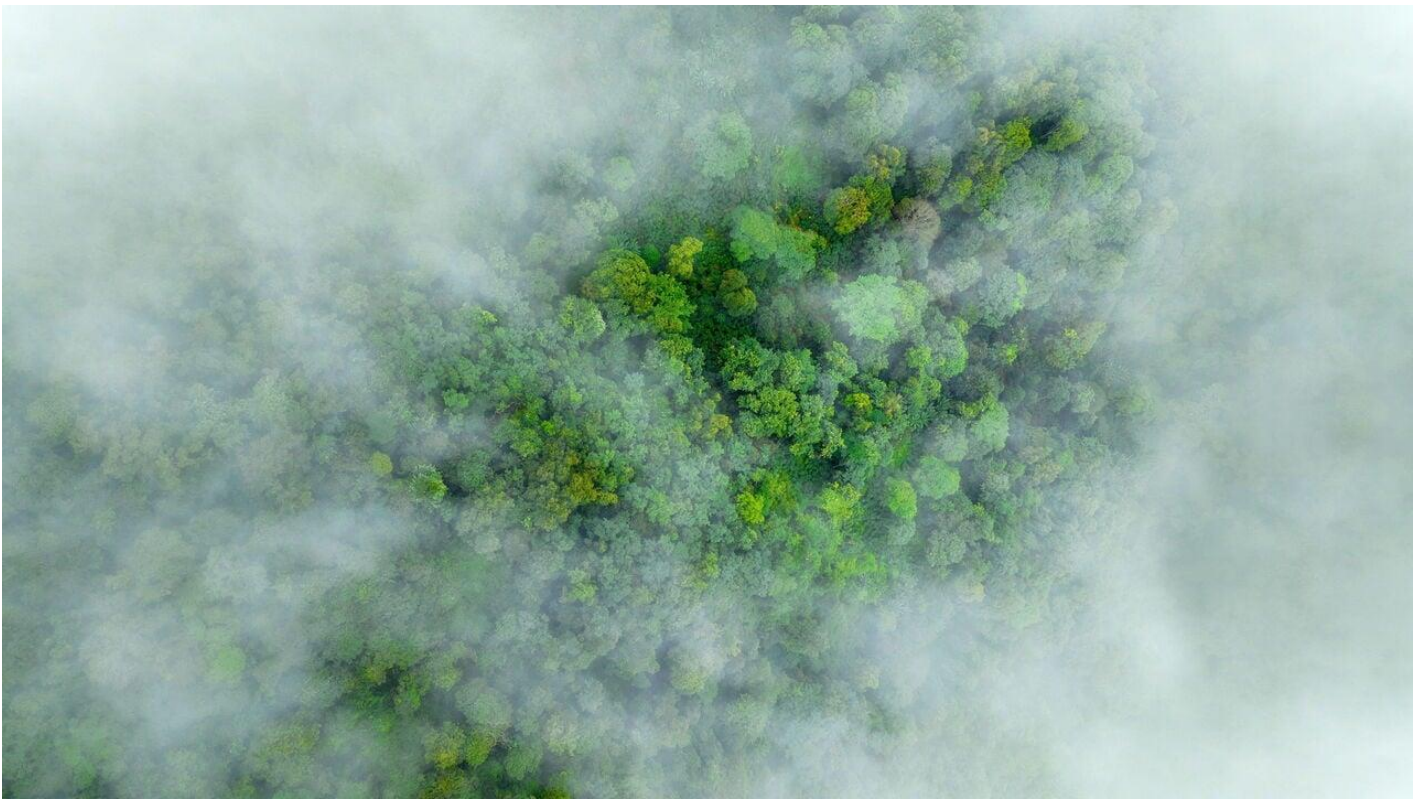


Image: Alamy

The Amazon rainforest is so big that it makes its own climate. As they photosynthesise and transpire, its billions of trees collectively produce enough moisture to form clouds. These, by some estimates, are responsible for at least a third of the rainforest's life-sustaining rainfall. But climate change is disrupting this circular process. The build-up of greenhouse gases in the atmosphere has raised regional temperatures, worsened droughts and increased the risk of fires. All kill trees.

Fewer trees means less rainfall, higher temperatures and yet more fires. Climate-change-induced deforestation therefore risks becoming self-perpetuating. And the more humans with chainsaws do to help things along, the sooner the dire day will come when the forest has shrunk so far that nothing can

be done to restore it. Much of the basin will turn into a dry savannah, and the tens of billions of tonnes of carbon dioxide stored there will be released into the atmosphere, further heating the planet.



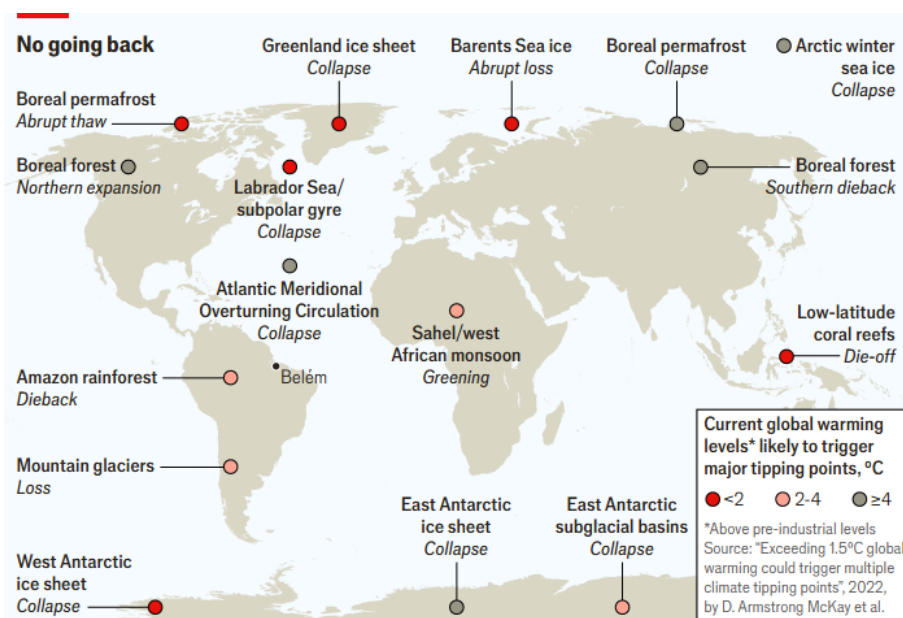
Image: Getty



“Amazon dieback”, as this grim scenario is known, is just one example of what climate scientists refer to as a tipping point: a threshold beyond which self-sustaining processes irreversibly push a part of Earth’s climate system from one state into another. Those who study them think there are many other examples. These include the breakdown of the vast Greenland ice sheet, which would raise global sea levels by more than seven metres, and the collapse of the Atlantic Meridional Overturning Circulation (AMOC), the powerful system of heat-distributing ocean currents that keeps northern Europe reasonably temperate. Should AMOC collapse, temperatures and rainfall levels could fall dramatically across Europe, greatly damaging the continent’s ability to grow crops.

In the 20-odd years since this way of thinking about the climate became formalised, the scientists involved reckon they have arrived at a decent—though not perfect—understanding of which parts of the climate system are most vulnerable to tipping, and why. Now they, along with politicians and business leaders, are trying to answer other, increasingly pressing questions: how to tell if a tipping point is actually being crossed, for one, and how to prepare for the consequences if it is.

The exact level of warming required to trigger any specific tipping point is not clear. Earth’s climate is governed by myriad interconnected processes, many of which—like the dynamics governing ice-sheet disintegration, or the potentially cooling effects of wildfires—are only poorly understood. Others, such as the formation of light-reflecting clouds, occur at scales too small to be properly incorporated into planetary models. To further complicate things, one tipping point can trigger another, domino-style. The fresh water released into the oceans from a collapsing Greenland ice sheet, for example, would weaken AMOC, further reducing rainfall over the Amazon.



## Model muddle

Different models, therefore, rely on different approximations and make different projections of when tipping points will occur. Some models suggest, for instance, that the Greenland ice sheet could start to enter an irreversible decline once global temperatures are 0.8°C above pre-industrial levels—something that happened around the turn of the millennium. Others put the threshold at closer to 3°C—which might never be reached. Similarly, the Amazon’s decline is projected to become unstoppable somewhere between 2°C and 6°C of warming, though it could be greatly hastened if humans keep cutting down or burning trees at current rates.

It may thus be possible to defer the Amazon’s tipping point simply by reducing deforestation as much as possible. Averting others, though, depends on the bigger and more difficult task of limiting how much global temperatures rise. And, with the global average now 1.2°C above pre-industrial levels, and projected to breach 2°C by the end of the century, it is unclear how much time is left in which to do so. That makes it ever more important to get a sense of whether any of these tipping points are already being crossed.

In order to help answer that question, Britain’s Advanced Research and Invention Agency (ARIA) announced in February that it was going to fund systems that could produce and process the data needed for an “early warning system for tipping points”. ARIA’s initial five-year, £81m (\$109m) programme involves 26 teams focusing on two tipping points in particular: the breakdown of the Greenland ice sheet and the collapse of the subpolar gyre, a circulating current in the north Atlantic which helps power AMOC. If too much fresh water from melting ice flows into the gyre, it could be disrupted, increasing the odds of an AMOC collapse.

Kelly Hogan, a marine geophysicist at the British Antarctic Survey (which, despite its name, is functionally bipolar), is co-leading one of the teams focused on the Greenland ice sheet. They plan to use a fleet of small underwater drones to both map the shape of the ice face and measure properties such as salinity, temperature and the force of currents. These data will shed light on the way temperature and salinity change at the interface between ice and water—things scientists expect to influence melting. They will also deploy robots that can roam the surface of the ice taking measurements and drilled-in sensors for longer-term monitoring.





Image: Jonathan Nash, Oregon State University

Other teams are following a similar logic. Oshen, a British startup, intends to deploy small, self-sailing robots with solar-powered sensors in the subpolar gyre, where they will measure such things as sea and air temperature and wind speed. Marble, another British company, is developing drones that can monitor the position and size of icebergs, the location of the glacier front and the height of the Greenland ice sheet, three variables that are essential to accurately forecast melting.

Both Oshen and Marble say their work is only possible because smartphone technology has made sensors and processing power cheap. Control systems that once required proprietary software can now be run using free, open-source code. And widespread 4G coverage means that data can be transferred quickly. “We’re not inventing some new breakthrough laws in physics,” says Mathieu Johnsson, Marble’s CEO. “We’re exploiting a lot of technologies that have been there for a little while...it’s just that they haven’t been put together in the right way.” Meanwhile, several other ARIA-funded teams—including one led by Tim Lenton, a climate scientist at the University of Exeter and a pioneer of tipping-point research—are working out how these data might inform an early-warning system.

### What’s next?

For all this to be useful, says Dr Lenton, policymakers need to think more about the consequences of tipping points being crossed, and how societies must prepare for them. Laurie Laybourn, who leads the Strategic Climate Risks Initiative, a British think-tank, agrees. “The mental model of the climate threat among key people—particularly in senior parts of government—has yet to catch up with the fact

that the nature of the climate threat includes things like tipping points,” he says. In his view, no government is considering scenarios like ice-sheet collapse with the seriousness afforded to other high-impact risks, such as pandemics. In fact, Mr Laybourn reckons, with the possible exception of the Nordic countries, most governments have not really been thinking about them at all.

For some, talk of tipping points is a harmful distraction. In 2024 an international group of well-known scientists published an article in *Nature Climate Change* arguing that a focus on tipping points diverted attention from the more general need for climate mitigation and adaptation, around which the science is much more certain. Others worry about fostering a sense of fatalism, by framing some catastrophic changes as unavoidable.

Regardless, the concept is slowly but steadily gaining ground. In July a big conference on tipping points in Exeter attracted actuaries, insurers and pension funds as well as scientists and activists. Emergency services and humanitarian organisations are showing increasing interest, too. And so are the Brazilian organisers of COP30, this year’s United Nations climate summit, who are expected to place particular emphasis on the subject. The conference is being held in November in Belém, a city dubbed “the gateway to the Amazon”. The setting could scarcely be more apt.



# Smoke from boreal wildfires could cool the Arctic

But the damage such blazes cause outweighs their benefits



Much to reflect on  
Photograph: Getty Images

There are two things which climate scientists hate about “positive feedbacks”. One is that they are bad news. A positive feedback, in the science of complex systems, is an amplification; in climate change, this comes about when a consequence of rising temperatures drives a further rise in temperature. Such feedbacks are the sorts of things that drive tipping points.

The other problem is that they sound like good news. Negative feedbacks face the opposite problem. In a negative feedback, which need not be harmful, a change in the system produces a response that pushes the system back towards where it was. Think of an air conditioner’s temperature setting or a radiator’s thermostat.

A recent analysis by Edward Blanchard-Wrigglesworth of the University of Washington and colleagues suggests that a much more important negative feedback may now be operating in the Arctic, one which could curb the region's rapid temperature increase and markedly slow the decline in its sea ice. Indeed, it looks strong enough to have an effect on overall global average temperature.

This particular negative feedback is driven by the increasing frequency, size and intensity of wildfires in boreal forests. The climate models that scientists use to simulate warming over the coming century run on scenarios that assume these fires will continue more or less as they did in the 2000s and early 2010s. Since then, though, they have become considerably larger.

Where there is fire, there is smoke. Some is sooty and dark; some is lighter. Dr Blanchard-Wrigglesworth and his colleagues think that the brighter, more reflective smoke wins out, cooling the ground below. Taking the fire-trend into account, they reckon that, in the 2030s, the extent of sea-ice cover in the Arctic ocean will be at least 3m square kilometres more than it would be in a fire-trend-free model. Without the fire trend, an ice-free Arctic September would be expected in 2050. Fires delay its onset by over a decade.

None of this says that the fires are a good thing, or that they will avert catastrophes elsewhere. Fires are a massive shock to ecosystems, and smoke which reflects sunlight also harms humans and other animals. Moreover, the carbon that fires release will warm the entire planet for some time to come. That is clearly bad news.

**The Economist:** <https://www.economist.com>