

THE
LITTLE
BOOK
OF
DATA

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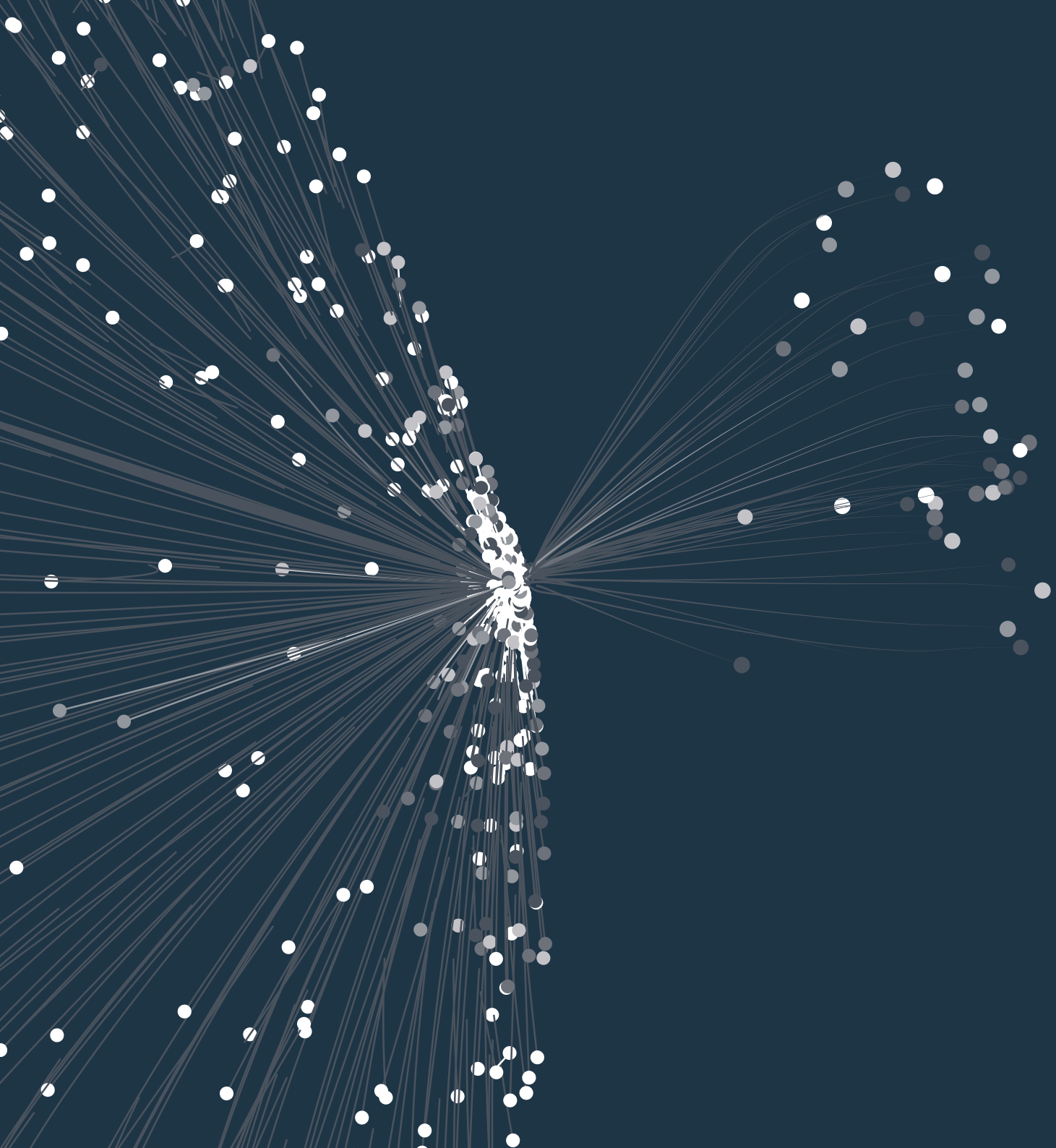


AVIVA
INVESTORS



The Little Book of Data

December 2021



Foreword

“Ten more Bristols.” So went the first line of a *Financial Times* article a few years ago.¹ Hugo Cox, the journalist responsible for the memorable three words, hit on a creative way of unlocking insight. Rather than simply describing the UK’s housing shortfall in straight numerical terms (i.e. five million), he made the figure more relatable so that readers would grasp the problem more readily.

Although most people would not see it this way, Cox was practising a form of data visualisation – it just requires us to imagine the visual. The power of visualising data in innovative ways cannot be understated. Part art, part science, it requires an expert instinct for understanding what matters most; the skill being as much in what you leave out as what you present.

In investing, as data and information expand at an ever-increasing rate, the importance of visualising data accurately and engagingly will only grow. Not only does it help drive efficiency and reduce cognitive load (by helping people understand important trends and concepts more quickly), it can also help create entirely new perspectives.

As with the last three editions of *The Little Book of Data*, we have curated some of the best and most informative charts over the last 12 months; the ones that, as well as being visually arresting, speak to the most pressing issues of the day. We cover key global trends, COVID’s ongoing influence on our lives, sustainability, macro and market trends and much, much more. It is not exhaustive, but we hope it helps inform your thinking about what lies ahead.

Enjoy.

Mark Versey
CEO, Aviva Investors

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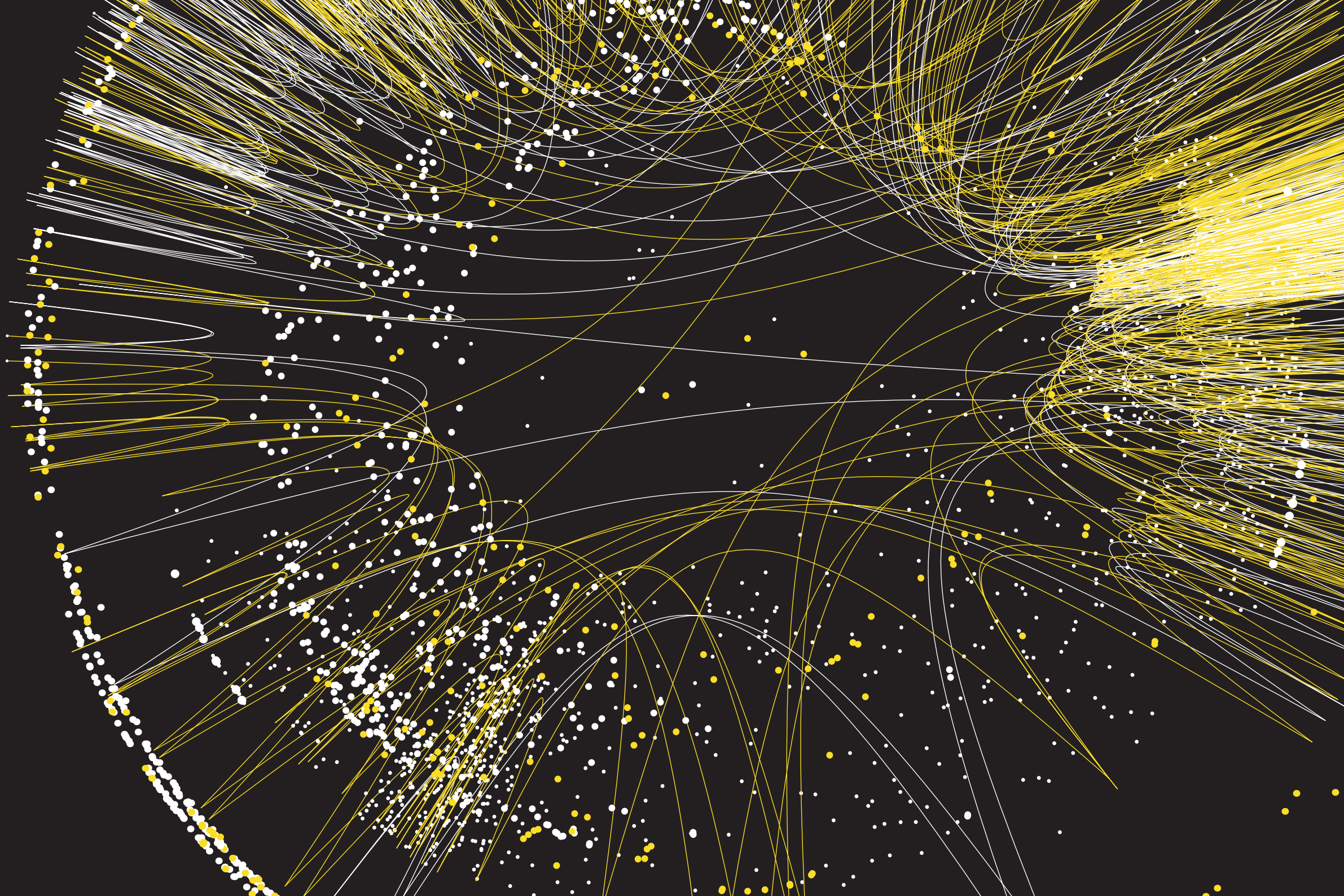
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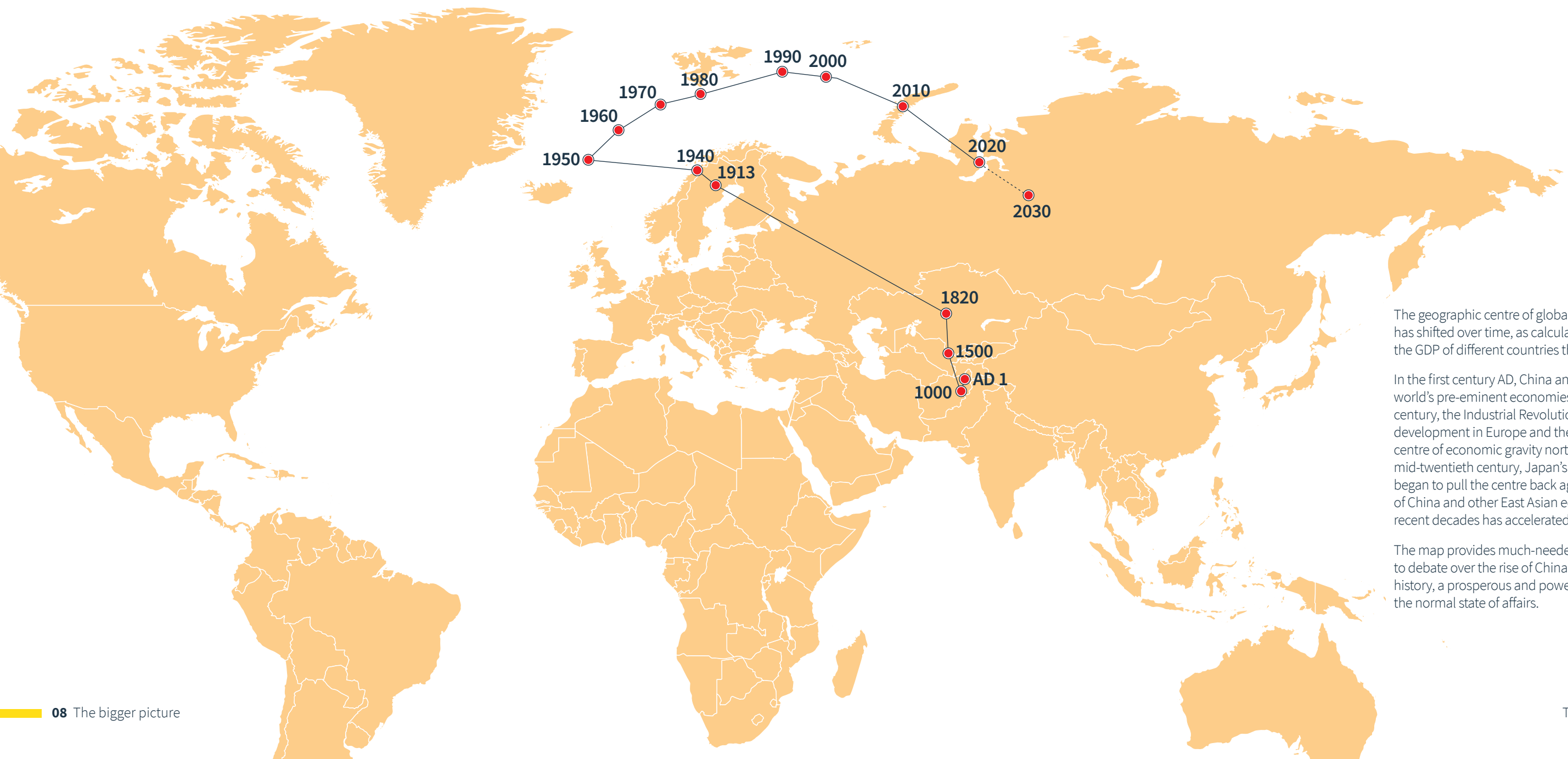
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The bigger picture



Asia rises (again)

The world's centre of economic gravity



The geographic centre of global economic power has shifted over time, as calculated by estimating the GDP of different countries through history.

In the first century AD, China and India were the world's pre-eminent economies. In the nineteenth century, the Industrial Revolution led to rapid development in Europe and the US, pushing the centre of economic gravity north and west. In the mid-twentieth century, Japan's post-war boom began to pull the centre back again – and the rise of China and other East Asian economies over recent decades has accelerated the eastwards shift.

The map provides much-needed historical context to debate over the rise of China – for much of human history, a prosperous and powerful China has been the normal state of affairs.

Waves of sickness

The global impact of COVID-19

For a global pandemic, the regional effects of COVID-19 have varied significantly over time. In the first and second peaks, the death toll in Europe and the US was disproportionately higher, despite the severity of measures taken by governments to control its spread.

By contrast, other regions – particularly Africa and Asia – recorded relatively few COVID-19 deaths. In the case of the latter, particularly in East Asia, perhaps the experience of dealing with epidemics in the past two decades proved vital in determining a quick and effective response.

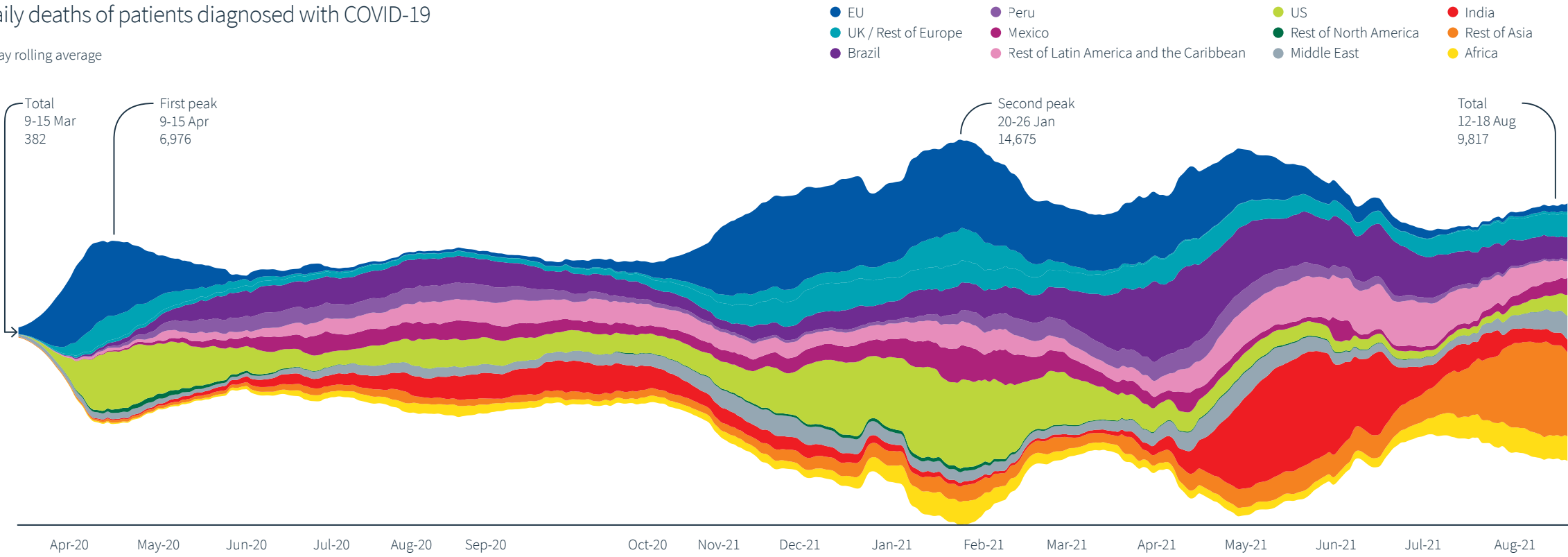
Over the course of 2021, the overall picture changed as the rollout of vaccination programmes in Europe and the US led to a sharp decline in deaths – even during periods where case numbers spiked.

In other parts of the world, where the speed of vaccinations has been slower, COVID-19 deaths saw a sharp increase. Notable examples of the hardest hit countries include India and Brazil, whose president Jair Bolsonaro has described the coronavirus as “a little flu” and told people to “stop whining about it” – comments that were eerily similar to another outspoken (former) president before the pandemic took hold.

But what will the picture look like in 2022 and beyond? Will the global race to vaccinate get a grip on the pandemic, or will new variants emerge to pose further challenges for economies and societies?

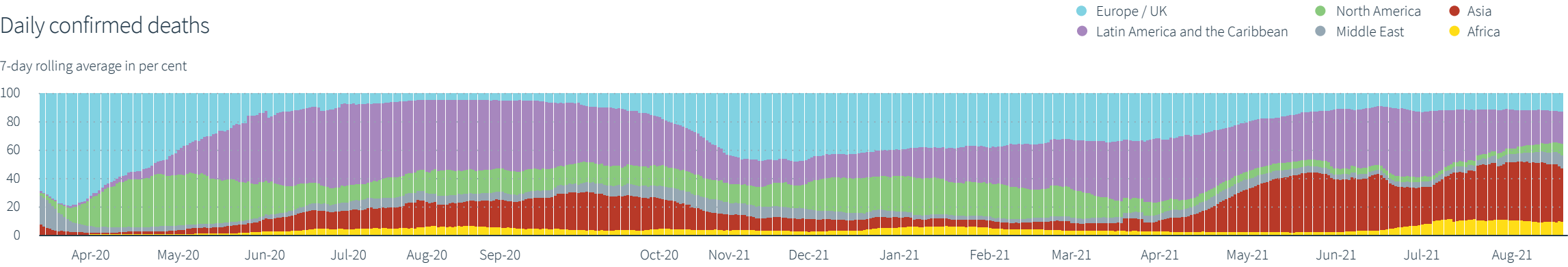
Daily deaths of patients diagnosed with COVID-19

7-day rolling average



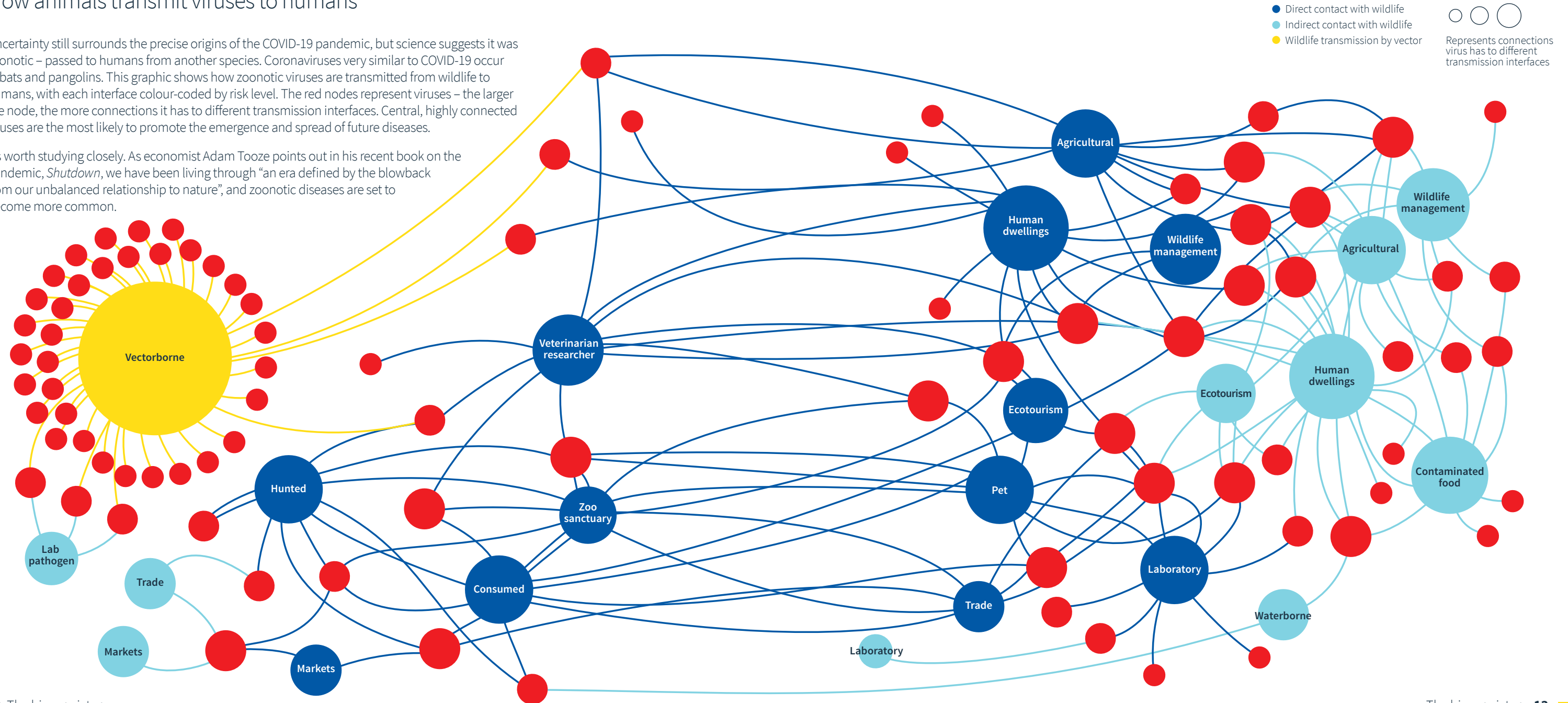
Daily confirmed deaths

7-day rolling average in per cent



How animals transmit viruses to humans

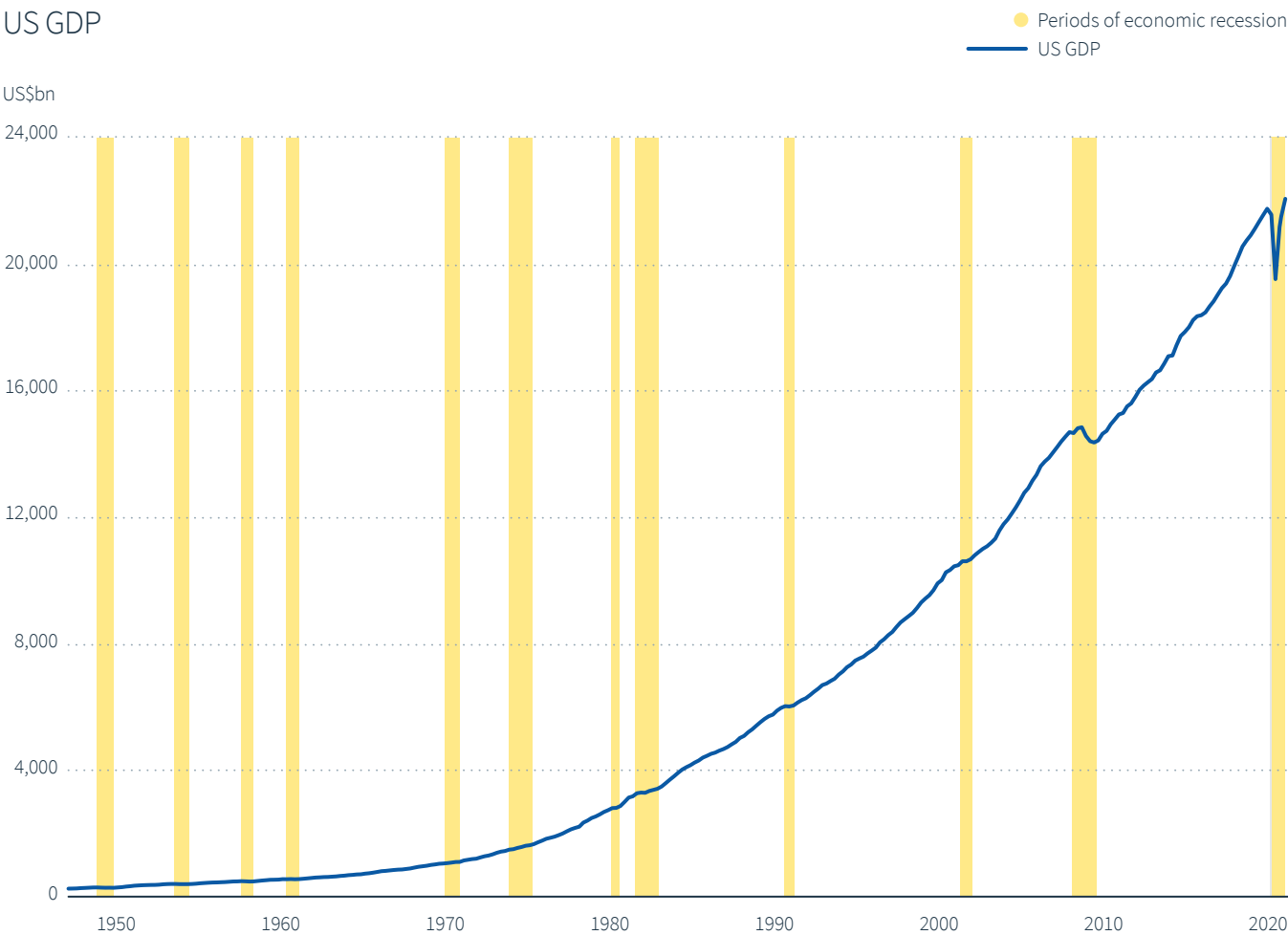
It's worth studying closely. As economist Adam Tooze points out in his recent book on the pandemic, *Shutdown*, we have been living through “an era defined by the blowback from our unbalanced relationship to nature”, and zoonotic diseases are set to become more common.



Economies bounce back

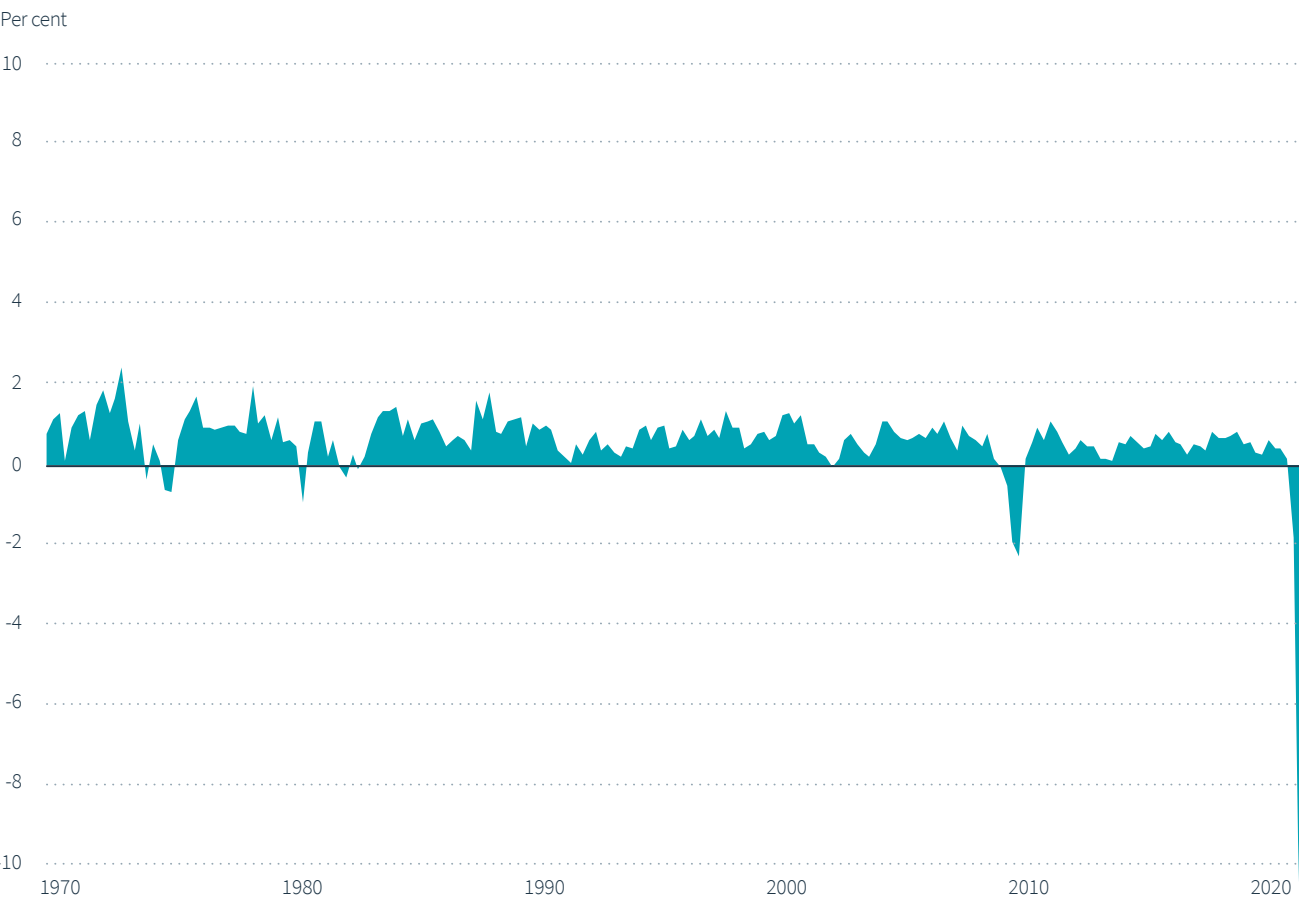
The COVID impact in context

Sometimes you need to zoom out a little to gain perspective. In the case of US economic growth, the steady march upwards since the 1950s is impressive, with the many recessions along the way being reduced to mere wrinkles in the data when viewed in absolute growth terms. The global financial crisis in 2007-09 is clearly evident.



This context makes the recent COVID impact on growth all-the-more eye-watering. But equally impressive is the speed of the global bounce back, both in the US and across the member countries that make up the Organisation for Economic Cooperation and Development (OECD), as seen in the chart below.

OECD quarterly growth



Deep cuts

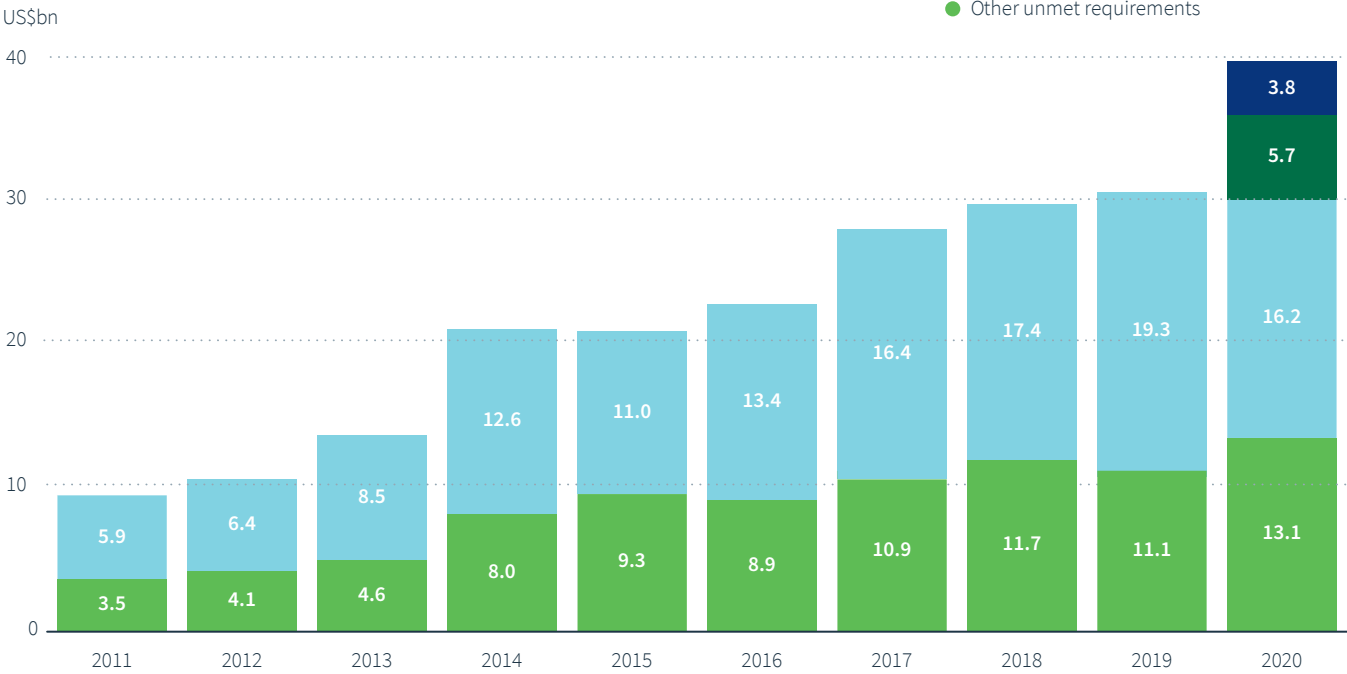
The growing humanitarian aid crisis

Economic, environmental and health crises have a disproportionate effect on developing countries, which often lack the financial means to address the issues. Historically, humanitarian aid from developed countries, multilateral organisations, NGOs and the private sector has played an important role in meeting the shortfall. However, the gap between the aid provided and the required level of support has widened dramatically over the past decade – a situation exacerbated by COVID-19.

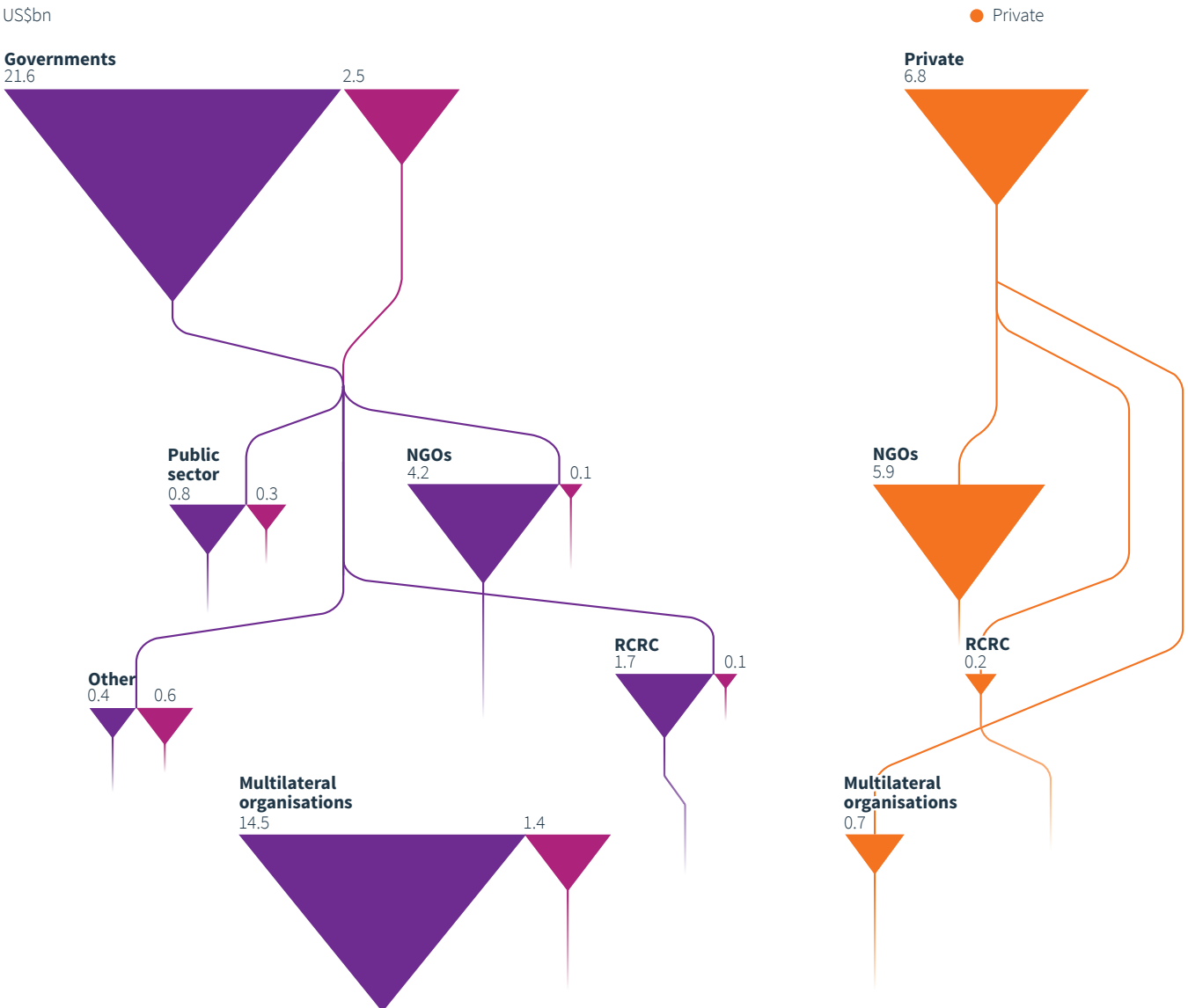
Recent cuts in aid spending by some governments couldn't have come at a worse time. But this is not a short-term problem – the relative contributions of richer nations have fallen well below their commitments for many years.

Back in 1970, 24 OECD nations (a number that has since swelled to 30) – collectively known as the Development Assistance Committee – committed to providing the equivalent of 0.7 per cent of their national income in foreign aid. By 2020, only six countries were achieving that target, while the average contribution was only 0.4 per cent. With the climate crisis likely to pose acute financial as well as environmental challenges in the years ahead, the prospects of a resolution to the humanitarian funding crisis look bleak.

The gap between aid provided and funding required (UN-coordinated appeals)



The main sources of humanitarian aid



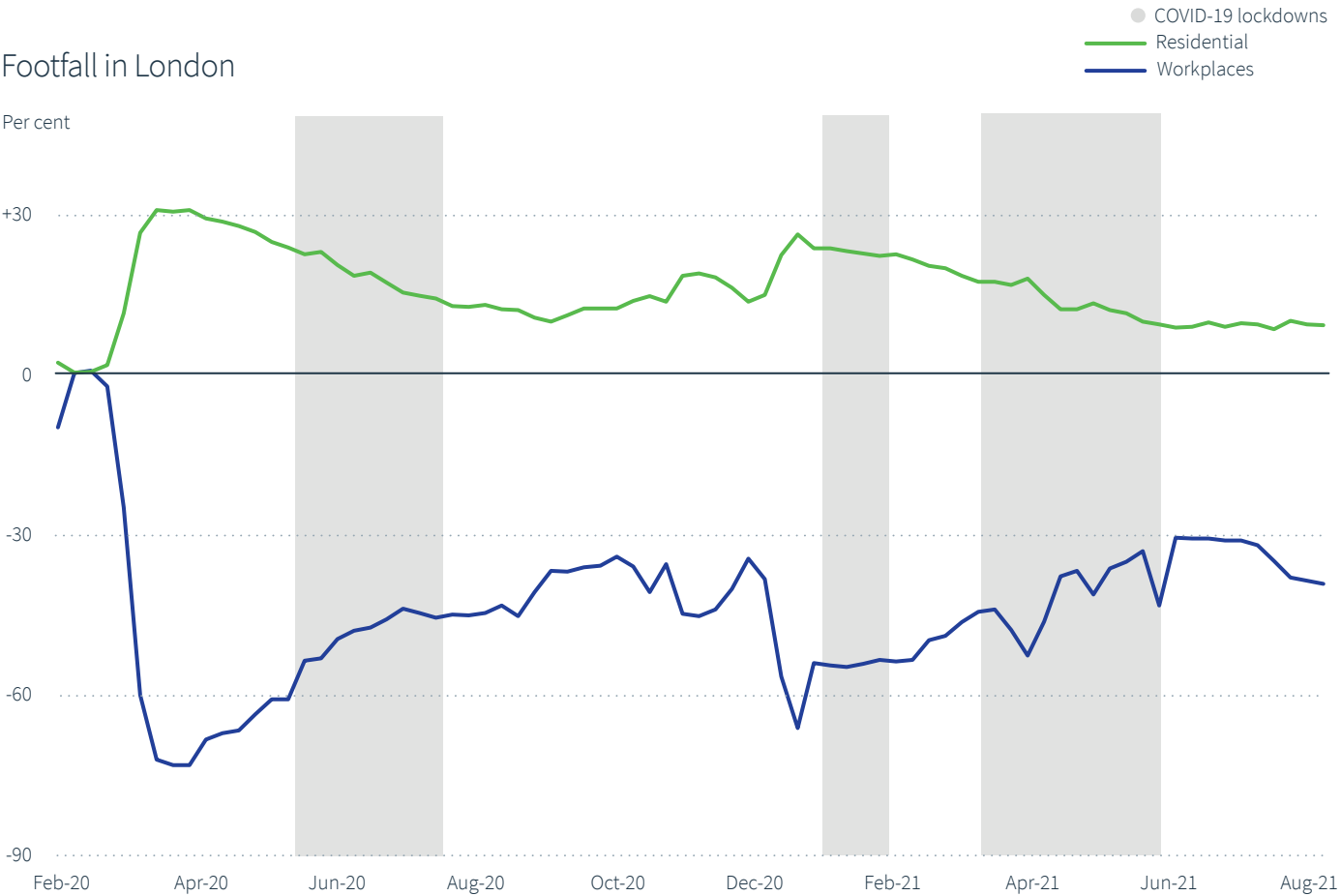
Ghost towns

How COVID-19 reshaped our cities

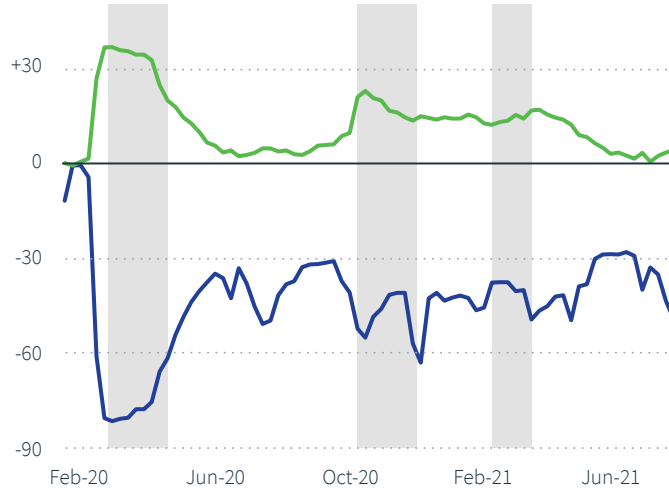
Cities have been the lifeblood of commercial and economic activity for millennia. From their origins as trading hubs, often located on the coast or on a river, they have relied on people, ideas and materials interacting with one another.

The global pandemic stifled all this, confining people to their homes. These charts, derived from Google mobility data, show how city districts emptied during lockdowns. As COVID-19 measures ease, and memories and anxieties fade, cities will start to come alive again. Whether their total footfall will ever truly be the same remains to be seen. However, not every meeting, innovation or idea lends itself to a Zoom call.

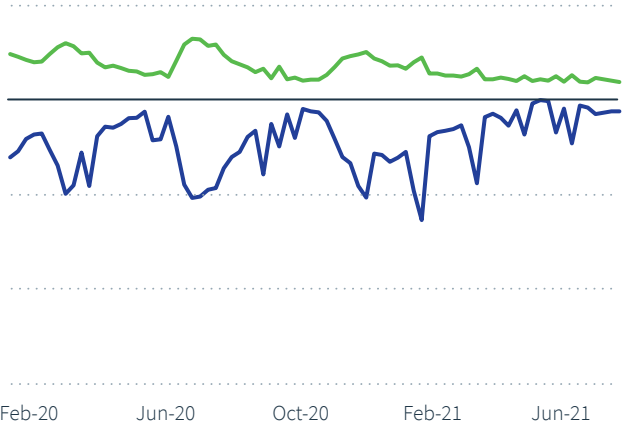
Footfall in London



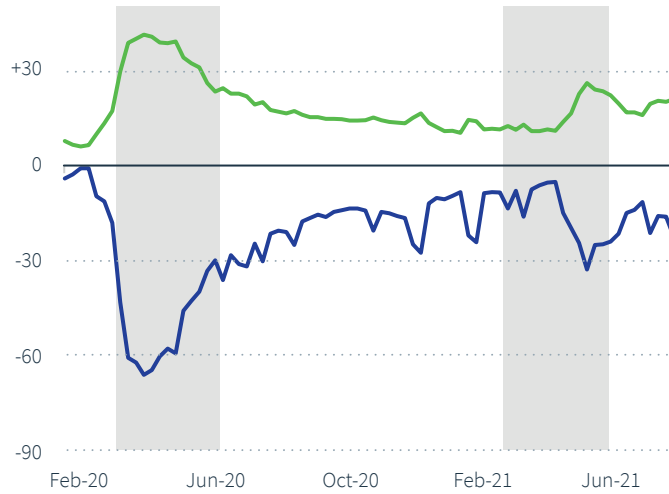
Paris



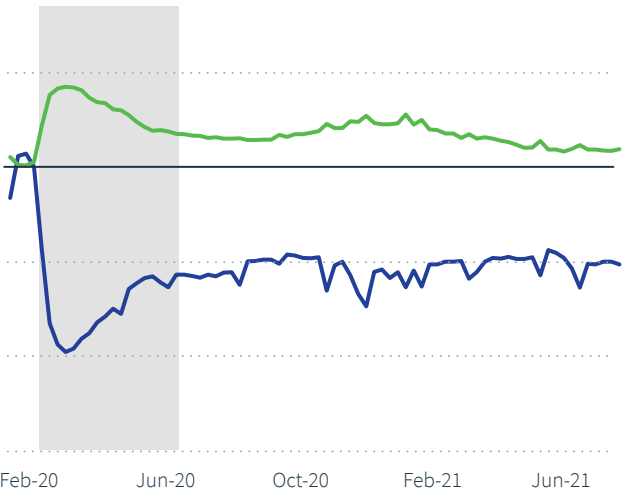
Hong Kong



Singapore



New York



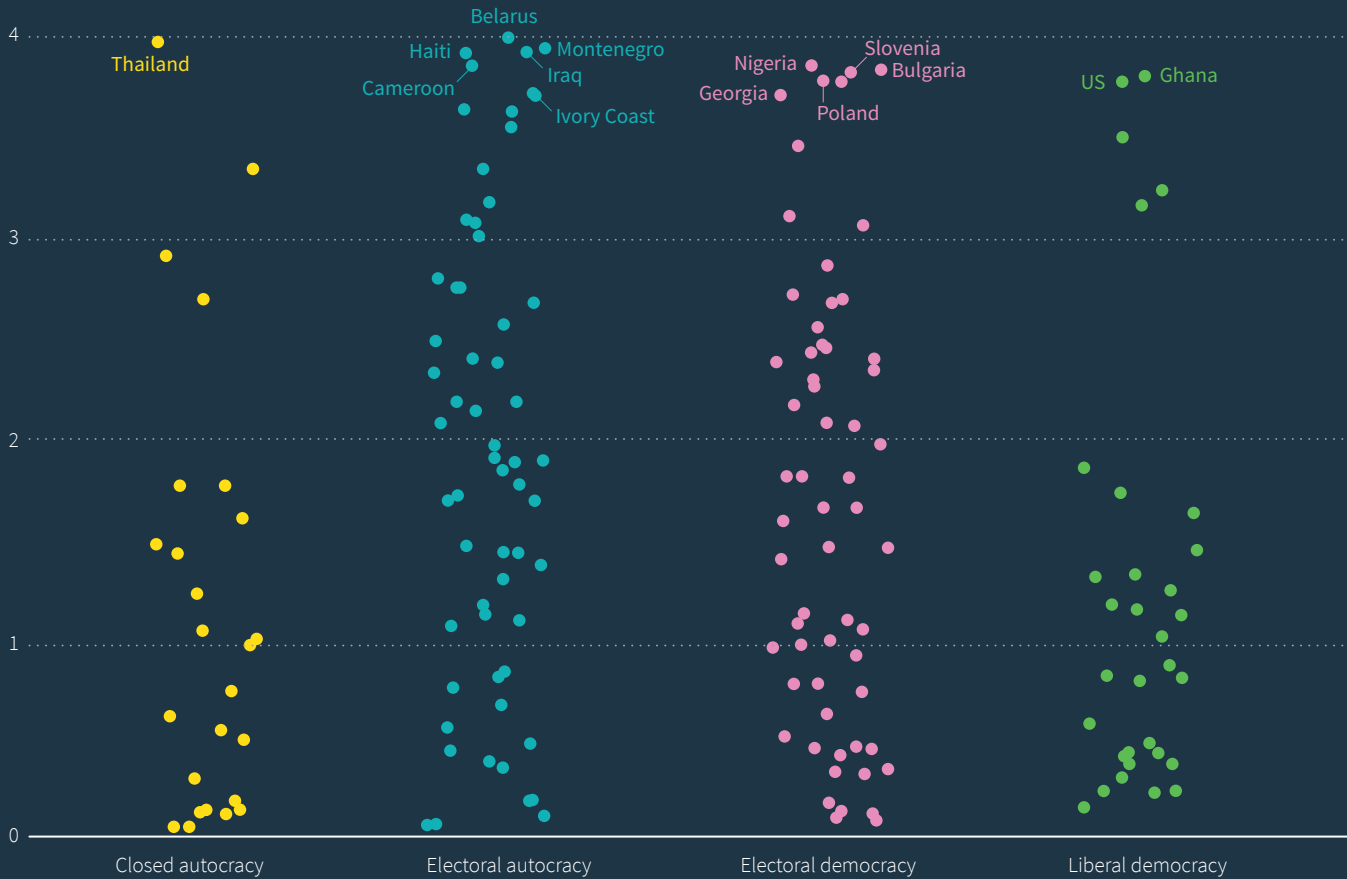
The fight for rights

Freedom around the world

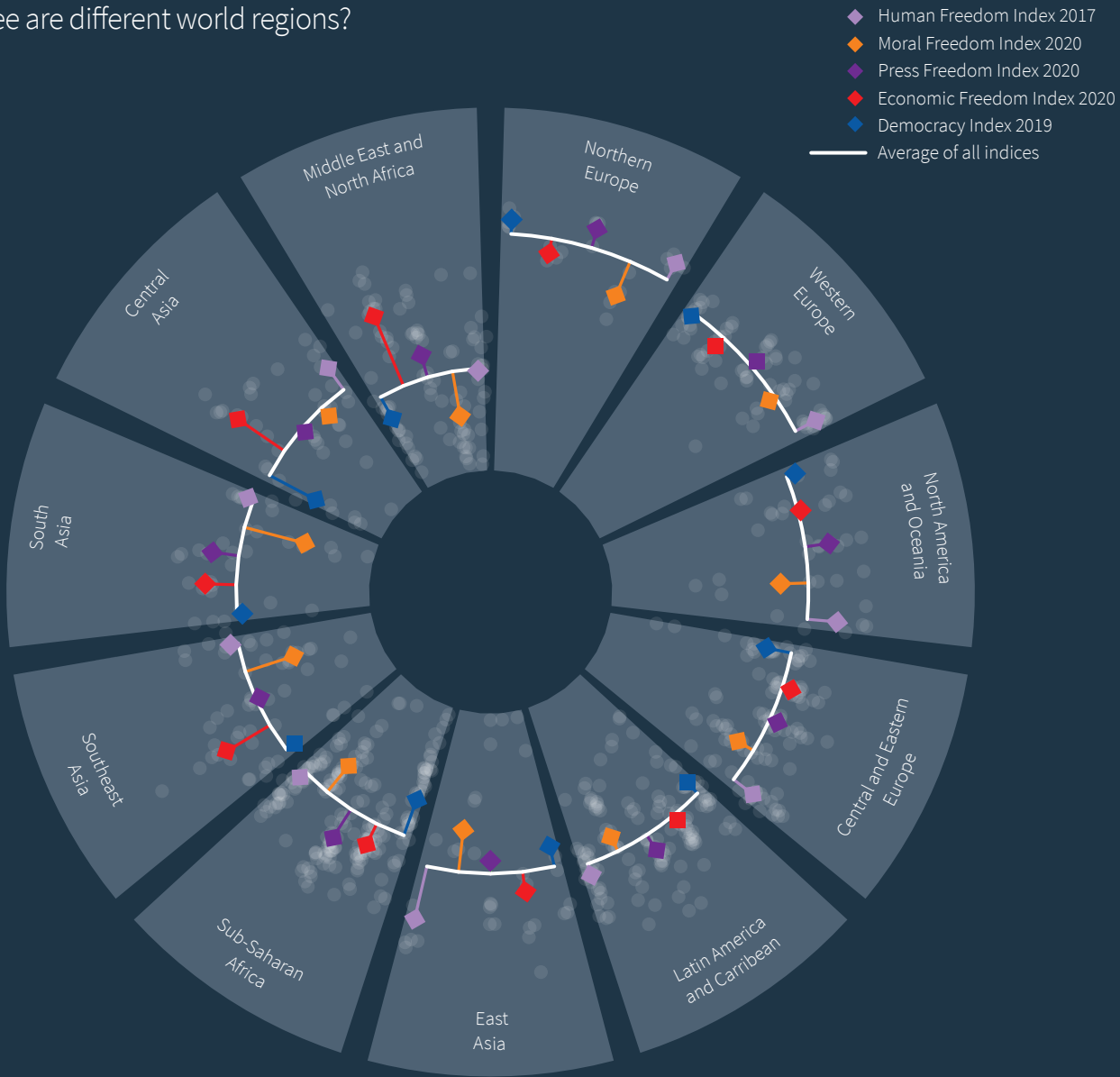
In 1989, political scientist Francis Fukuyama declared “the end of history”, by which he meant the triumph of liberal democracy. But three decades on, much of the world’s population still live under repressive regimes. Over recent months, citizens in authoritarian states such as Belarus have bravely marched for freedom. In the West, the Black Lives Matter protests illustrate that democracies, too, have much work to do to guarantee freedom and human rights for every citizen.

Mobilisation for democracy, 2020

V-Dem Institute Mobilisation for Democracy Indicator



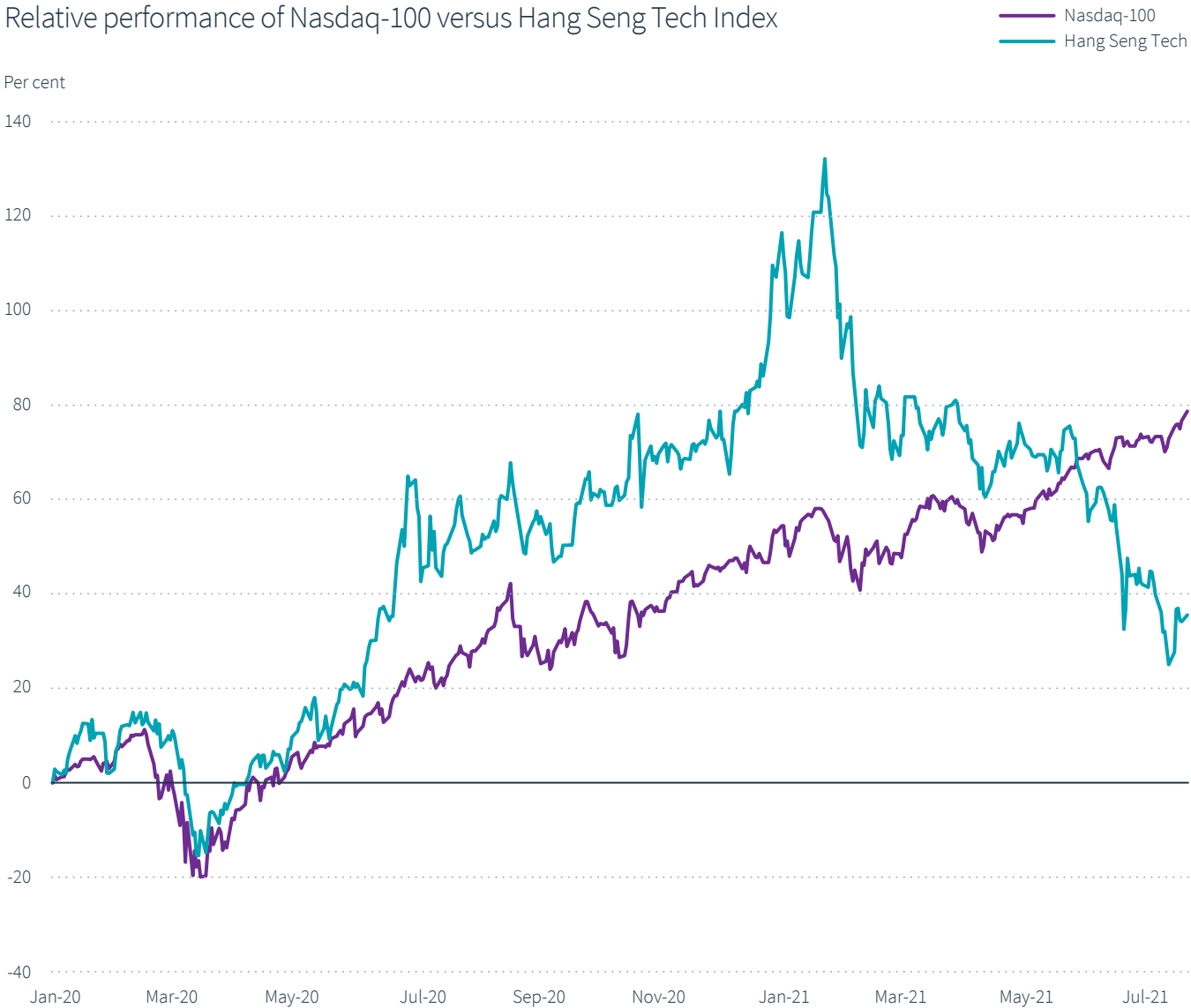
How free are different world regions?



The Party line

Beijing cracks down on tech as Silicon Valley soars

Relative performance of Nasdaq-100 versus Hang Seng Tech Index



In October 2020, China’s government dramatically intervened at the last minute to nix fintech company Ant Group’s blockbuster \$37 billion initial public offering. It was the opening gambit in an epic crackdown on the country’s tech sector.

Over recent months, Beijing has introduced a raft of new tech regulation, wiping billions off the value of major companies. Officials say they want to tackle monopoly power and firm up data protection in the interests of “common prosperity”. Meanwhile, US policymakers have talked tough on reining in Big Tech, but are yet to pass legislation with teeth.

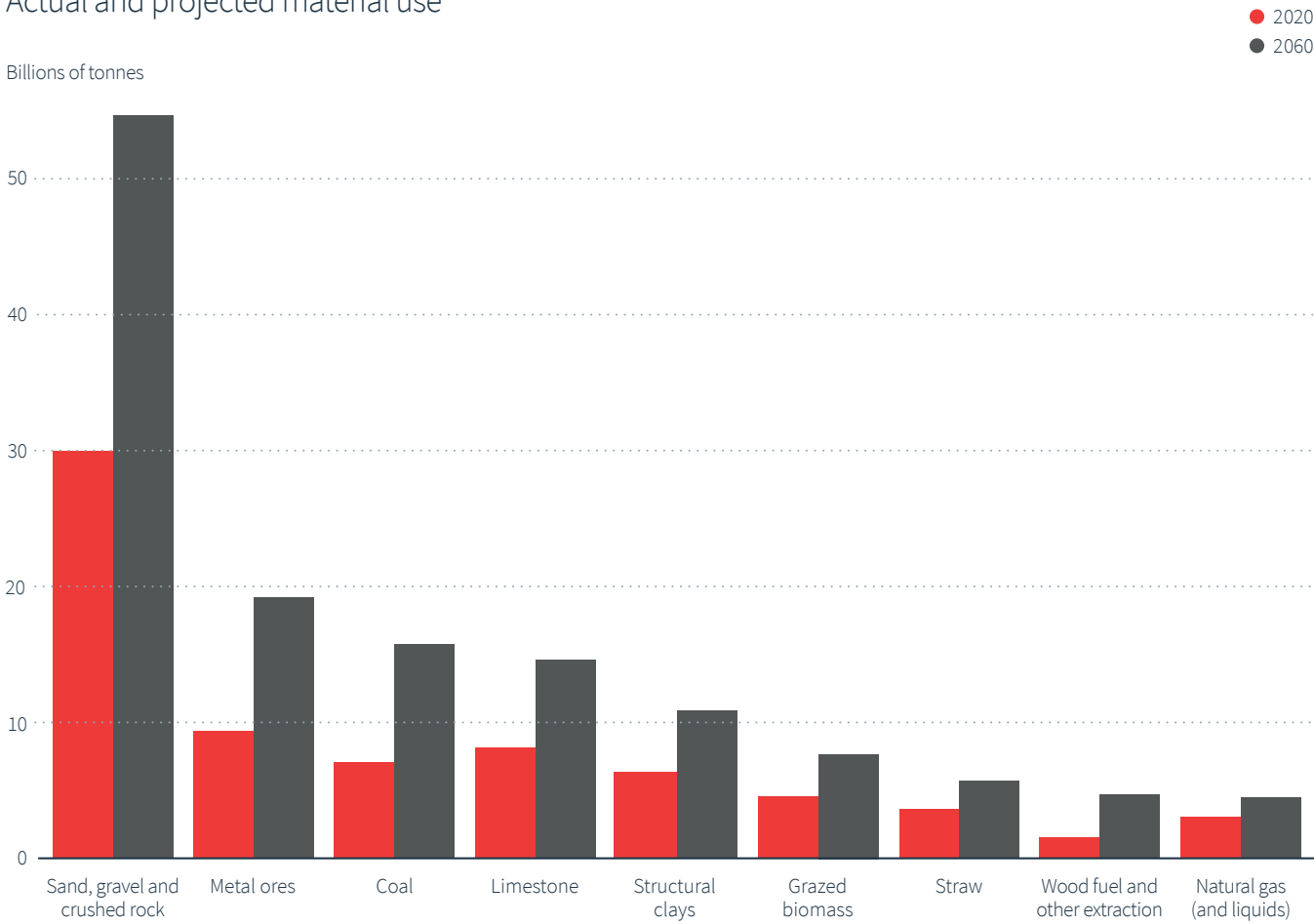
These contrasting regulatory approaches are reflected in the relative market performance of US tech companies (as represented in the Nasdaq-100 Index) and the Hang Seng Tech Index (which includes Chinese tech giants such as Alibaba, Baidu and Tencent).

Shifting sands

Global use of sand soars

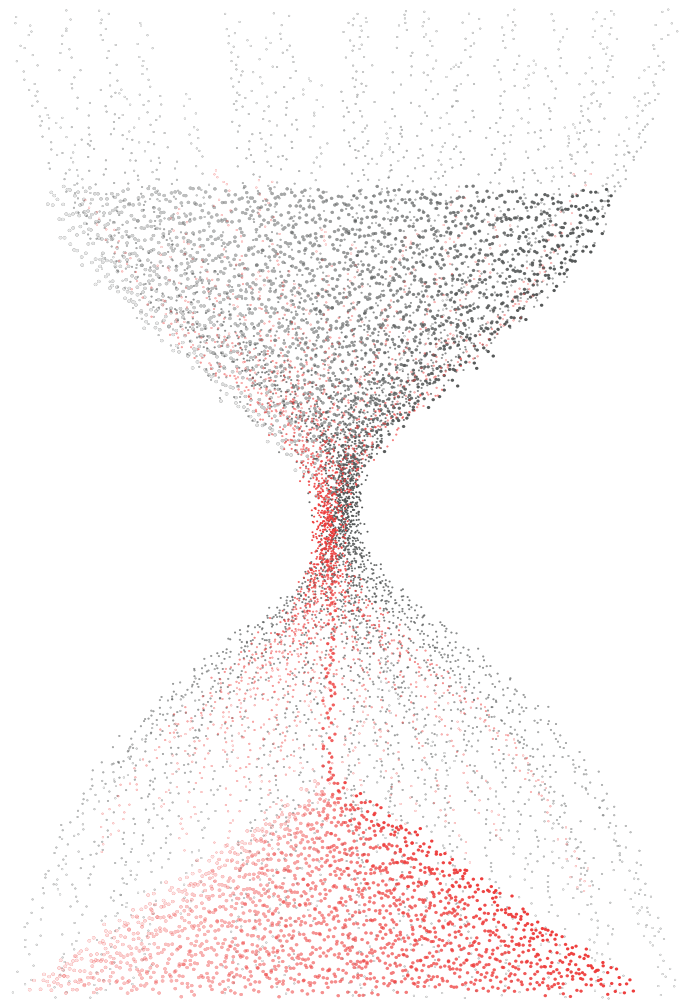
It may surprise many that sand, gravel and crushed rock are the most-used natural materials globally. Indeed, the *Financial Times* reported the construction industry’s use “outstrips total consumption for all fossil fuels and metals” and is expected to double over the next four decades. This increase in demand will create a sustainability headache as the mining of sand depletes rivers and coastlines. Concrete and cement are a big driver of this trend, as sand is a key ingredient in both. Land reclamation is not helping either.

Actual and projected material use



With several of the world’s biggest cities on the coast, one option to expand is by extending into the sea. Singapore, by far the biggest culprit, has increased its land mass by around 25 per cent since 1965. As with any finite resource, trade could become fractured, with sand-rich nations – such as China – restricting exports. And although sand is relatively cheap at present, recycling cement-and concrete-based materials would help reduce overall demand.

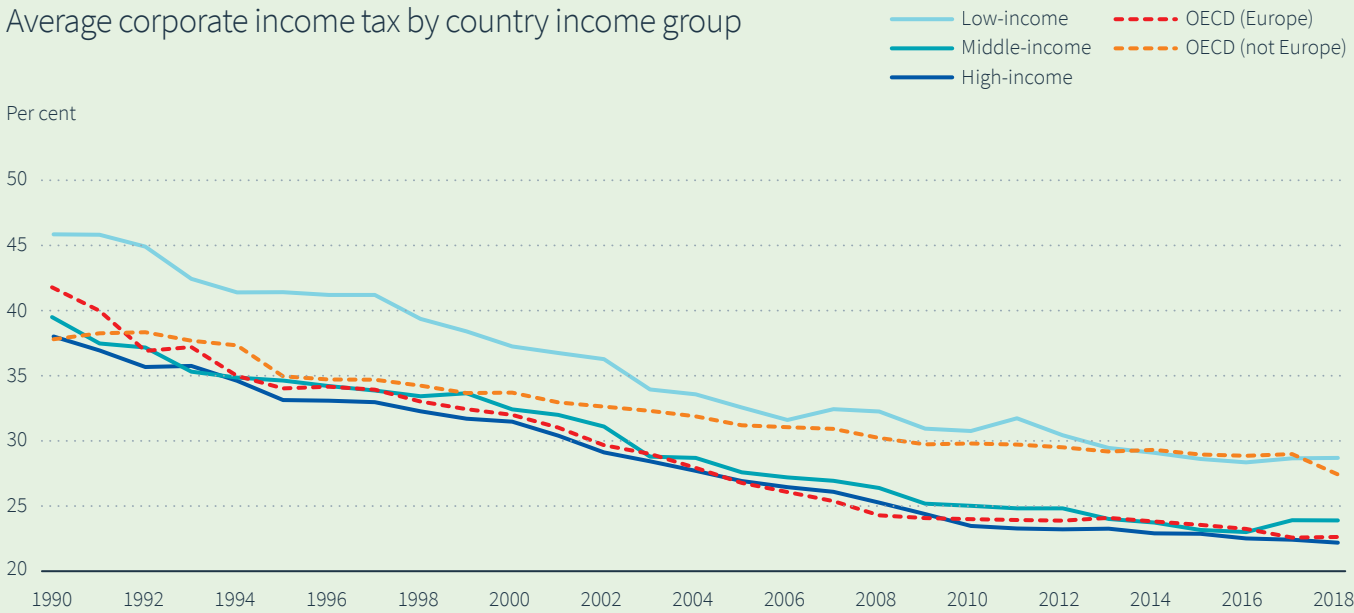
The illustration below presents the data in abstract form, conveying the urgency of the challenge. Time is running out to put our use of sand and other natural resources onto a more sustainable footing.



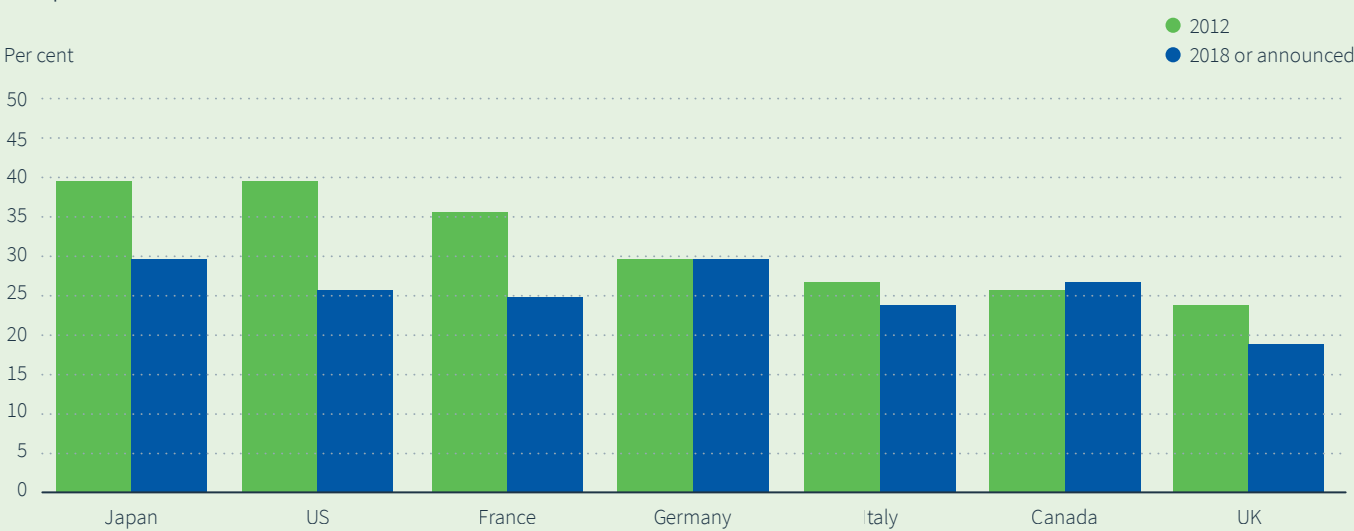
The levy breaks

A new deal on multinational corporation tax

Average corporate income tax by country income group

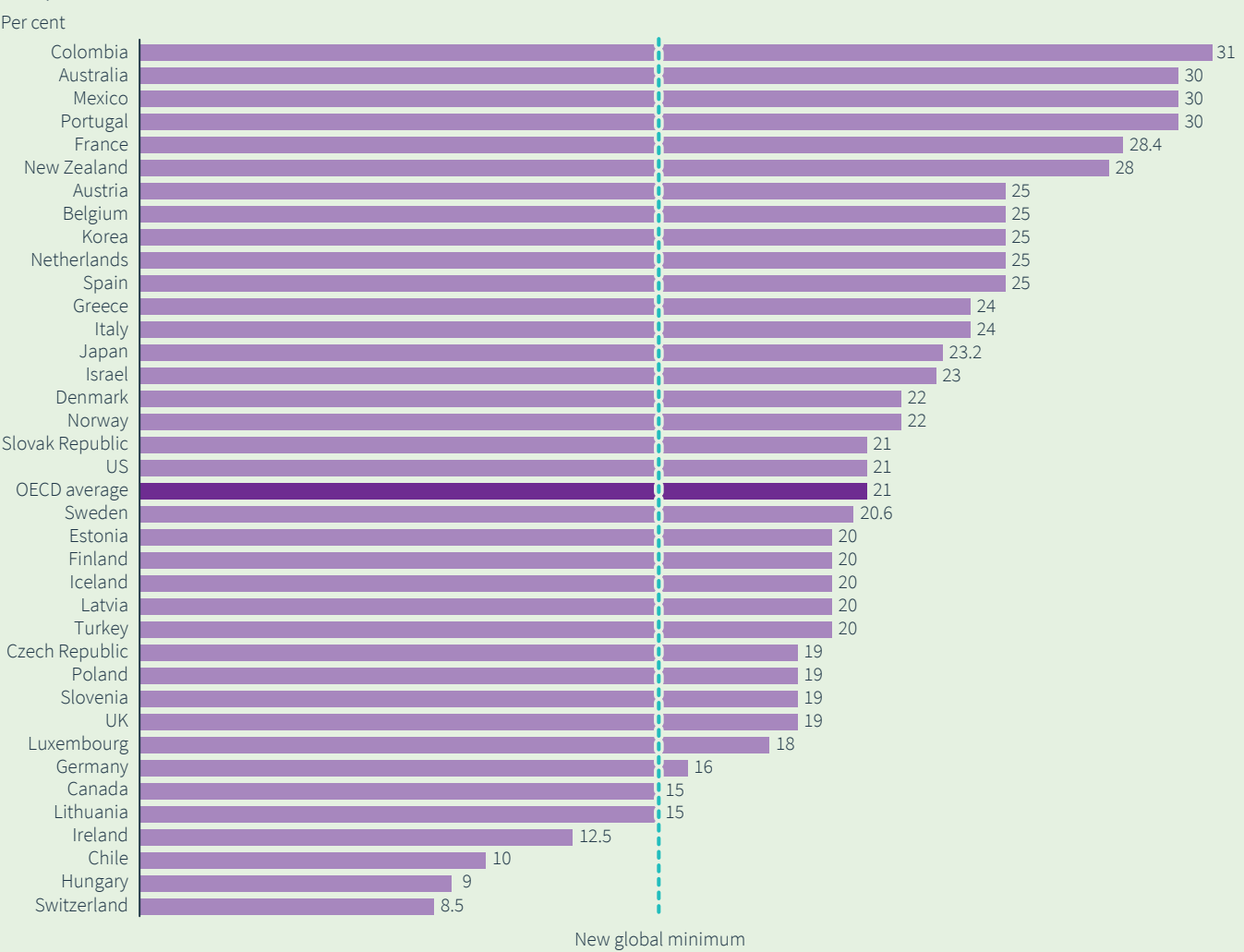


Corporate tax in G7 countries



Large multinationals have faced mounting criticism in recent years for their efforts to “optimise” the amount of corporation tax they pay – the most popular method involves shifting their profits, and therefore taxable revenues, to low-tax countries. That might not be an option for much longer, however, after the G7 reached an accord in June 2021 that aims to create a global minimum corporate tax rate of 15 per cent.

Corporate tax in OECD countries, 2021



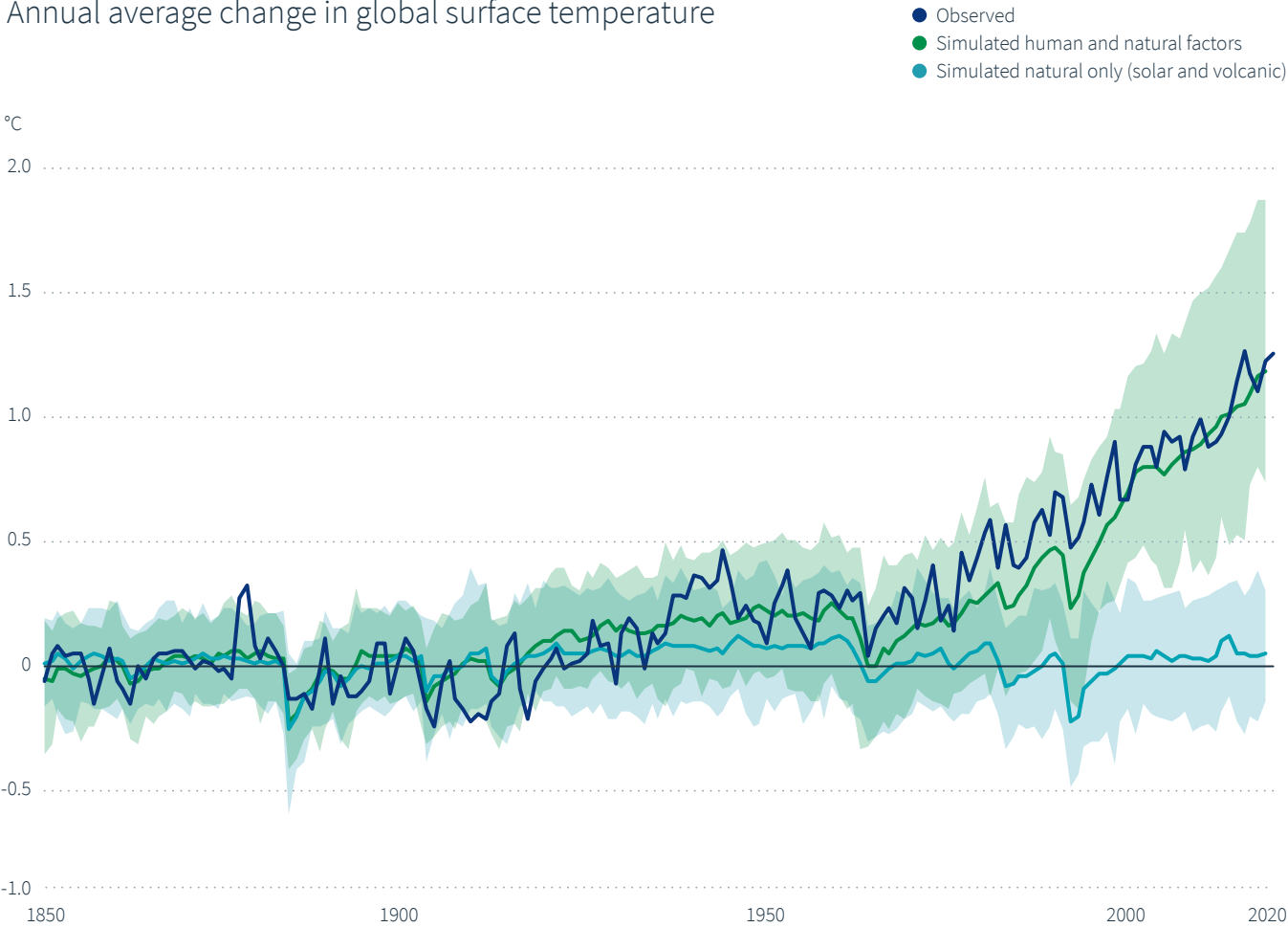
The heat is on

Humans have shaped the warmest period for more than 100,000 years

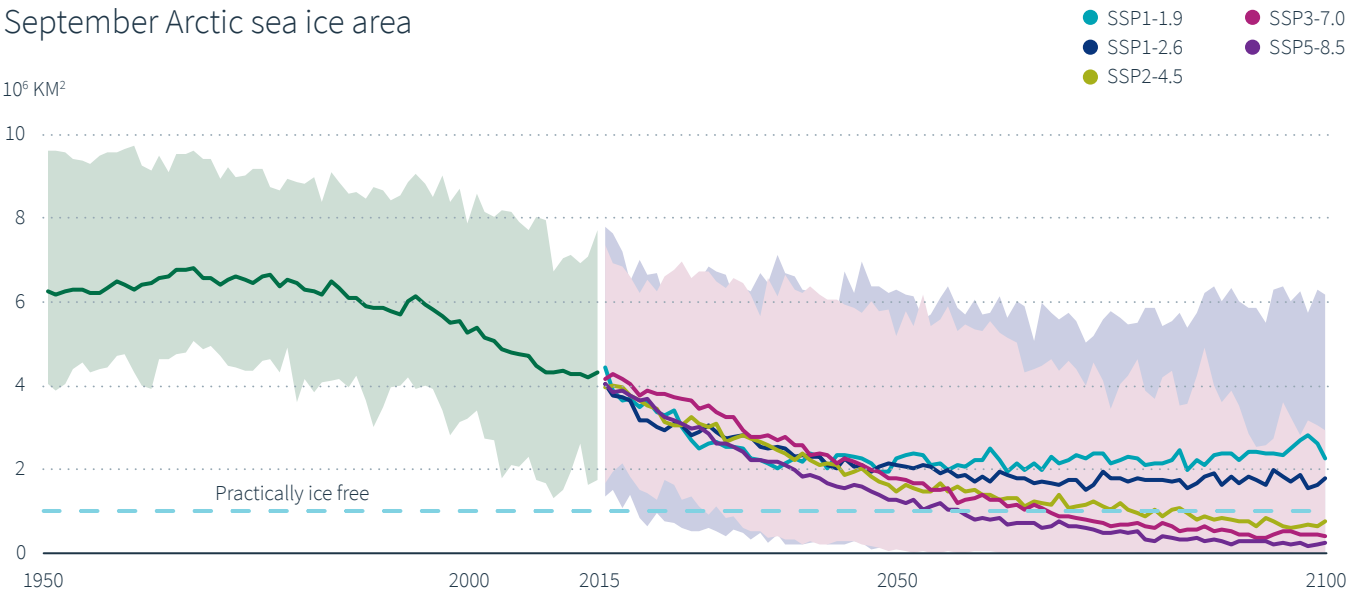
It's time to wake up to the impact that billions of humans walking the planet and burning fuel are having.

The 234 scientists on the Intergovernmental Panel on Climate Change (IPCC), who find evidence for warming, suggest human activities have affected all the major components of the climate system and anticipate catastrophic changes in the natural world if emissions continue to rise (see Appendix for a full explanation of the SSP scenarios).

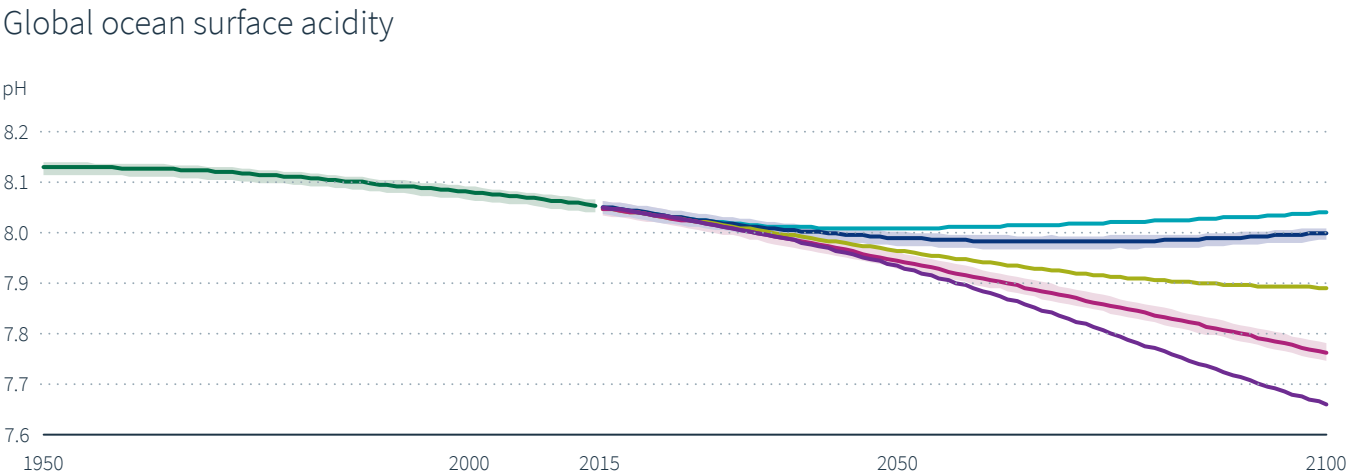
Annual average change in global surface temperature



September Arctic sea ice area



Global ocean surface acidity



Living beyond (and below) our means

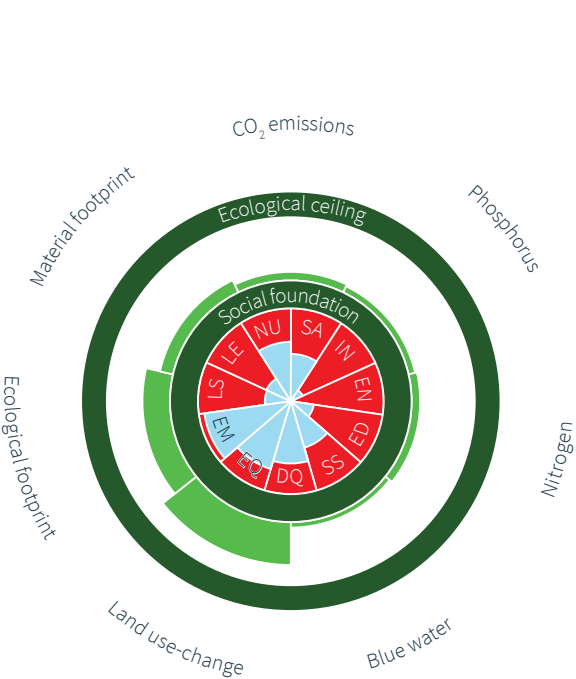
Rich countries bear the most responsibility for climate change

These charts were devised by a team of academics at the University of Leeds, based on the “safe and just space” framework developed by Johan Rockström of the Stockholm Resilience Centre and popularised by the economist Kate Raworth, author of *Doughnut Economics*. They show the connections between socioeconomic development and environmental degradation.

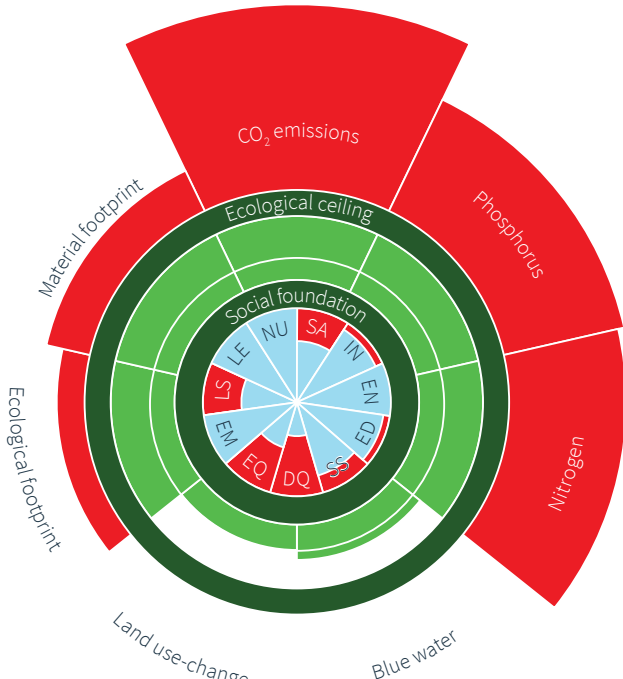
The blue areas in the middle of the circles show progress towards social development objectives; green wedges indicate sustainable resource use; and red wedges on the outside of the circles show the extent to which countries have shot through their ecological ceilings. Rich countries such as the US – along with some fast-growing emerging economies – have achieved development through carbon-intensive resource use, while low-income countries like Malawi have kept within their ecological bounds while falling behind on social metrics.

Assessing environmental sustainability and social performance at a country level

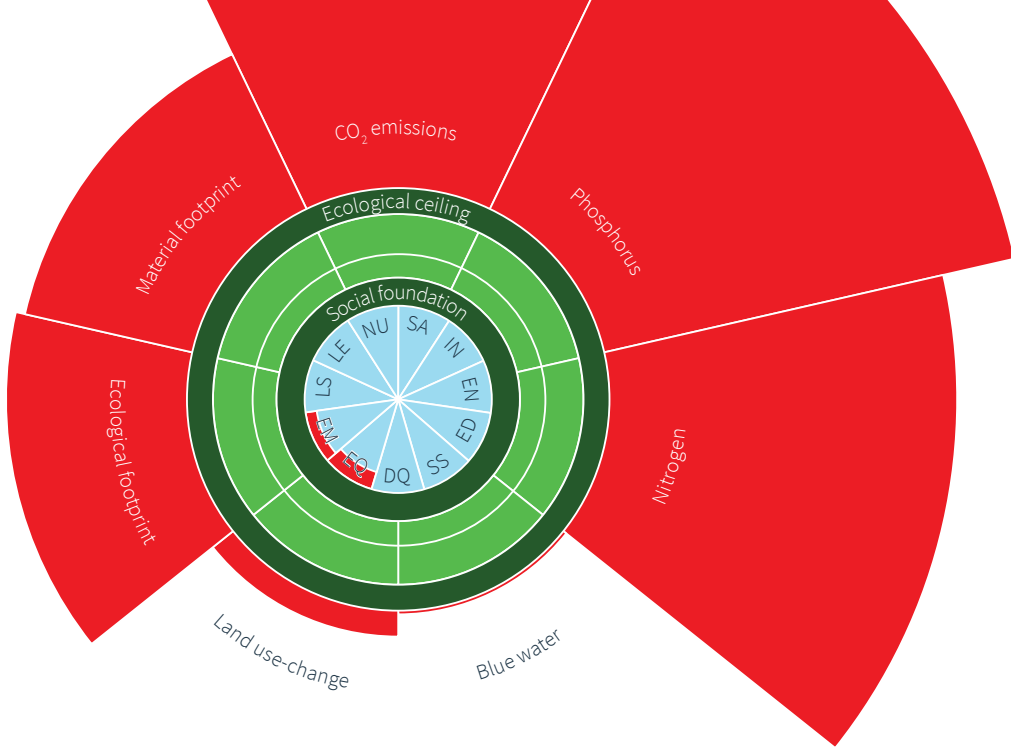
Malawi



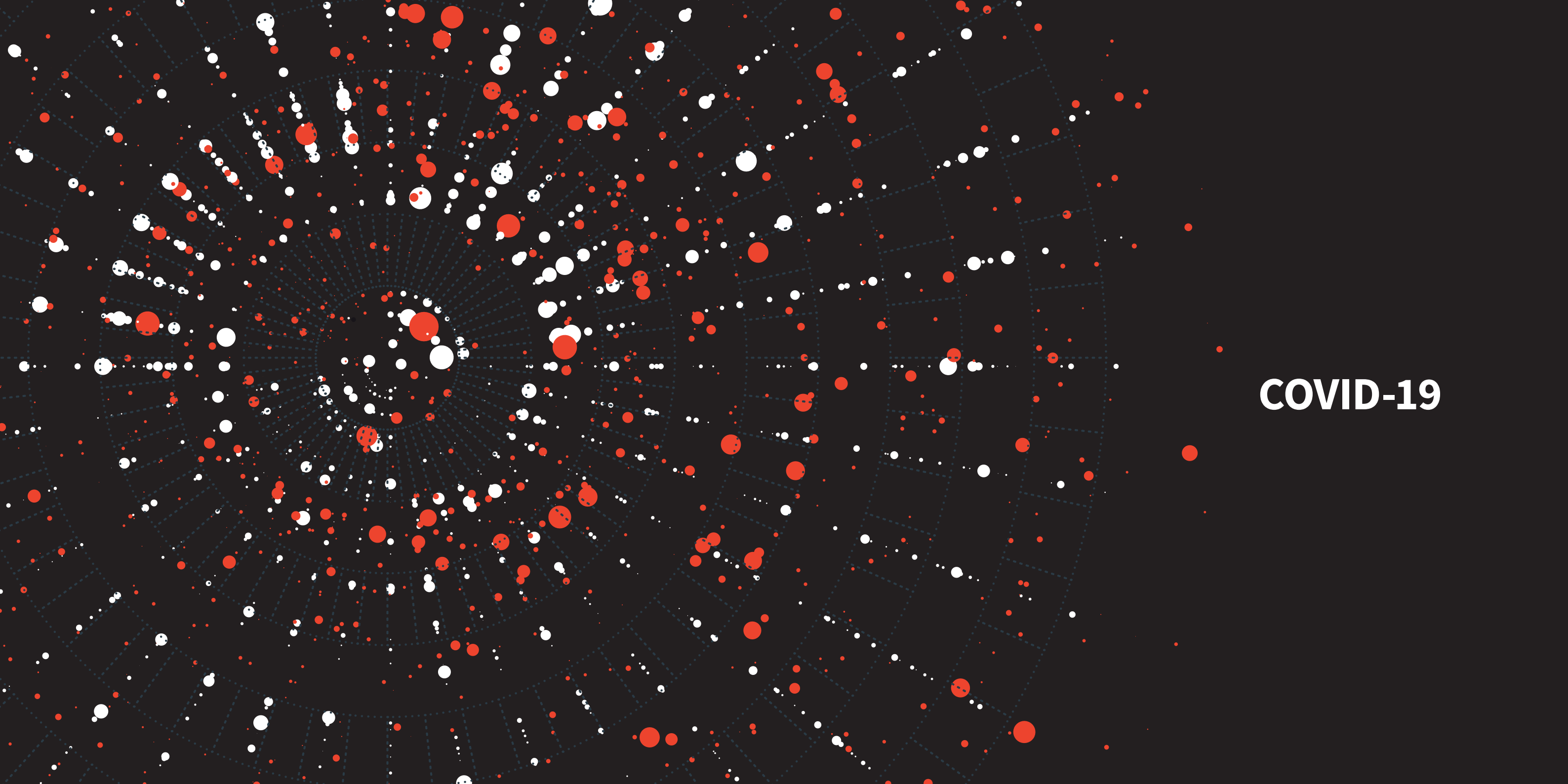
China



US



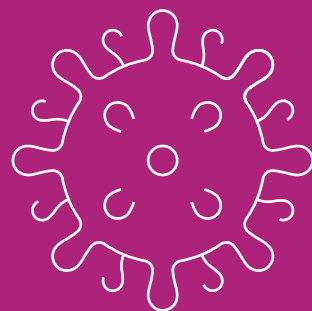
- LS – Life satisfaction
- LE – Healthy life expectancy
- NU – Nutrition
- SA – Sanitation
- IN – Income
- EN – Access to energy
- ED – Education
- SS – Social support
- DQ – Democratic quality
- EQ – Equality
- EM – Employment



COVID-19

Sssshh!

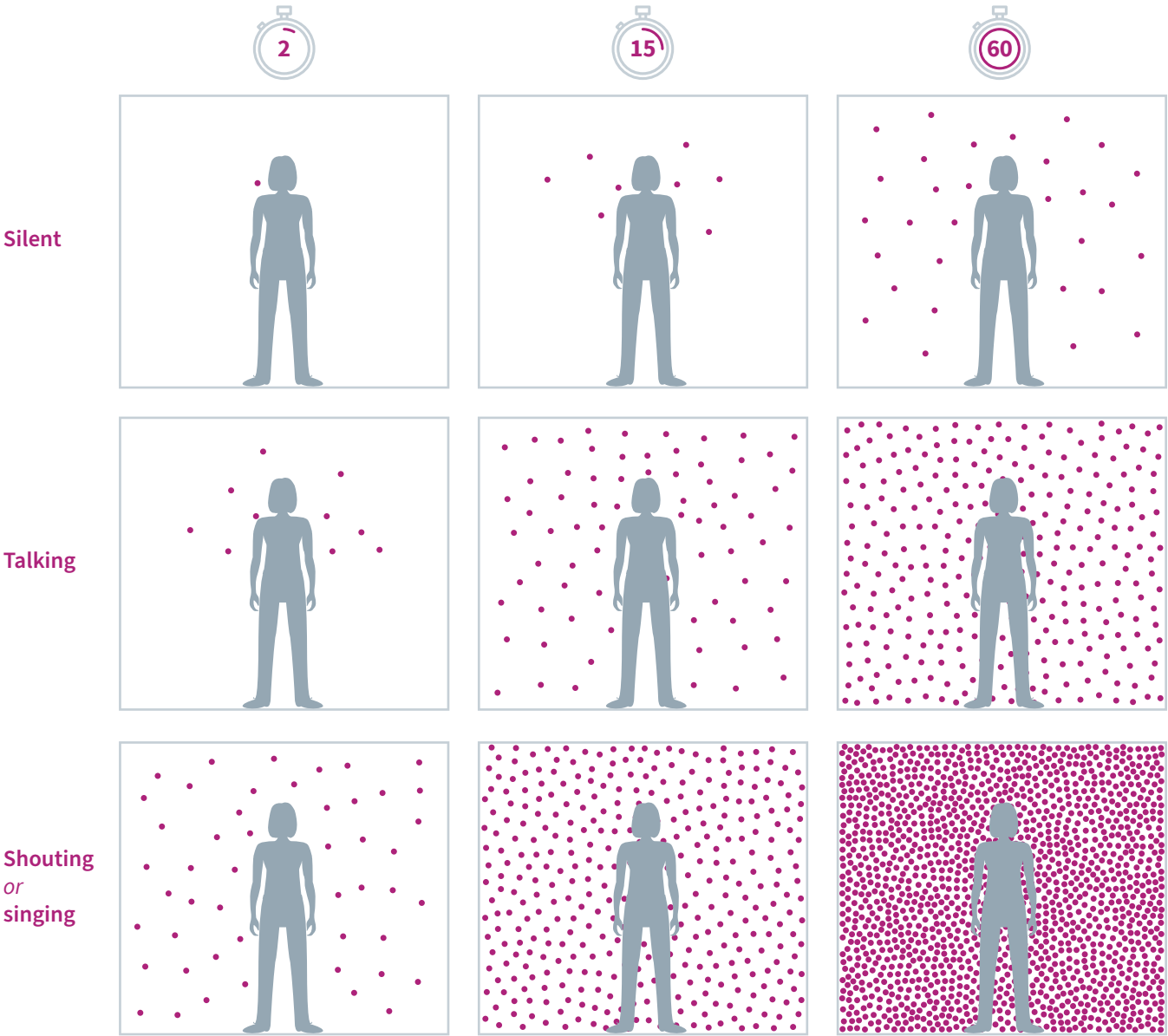
How COVID-19 spreads



At the beginning of the pandemic, it was believed the main risk of contagion occurred through touching infected surfaces, or via coughing or sneezing.

However, science now suggests airborne particle transmission is responsible for most cases – even talking can spread the virus. This graphic from Spanish newspaper *El País* shows we emit ten times the number of virus-laden particles when we talk in poorly ventilated indoor spaces than when we remain silent, and 50 times more when we shout or sing.

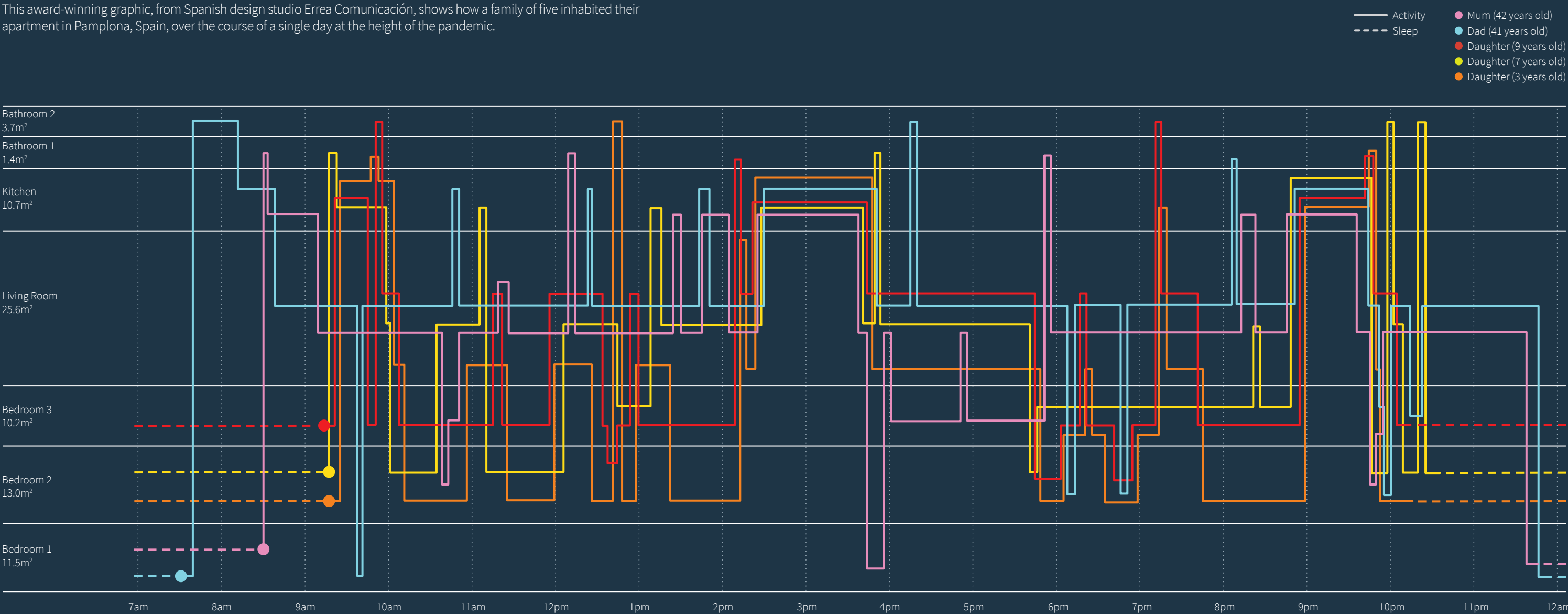
In the worst-case scenario – shouting or singing in a closed room for an hour – a person infected with COVID-19 would release 1,500 infectious particles.



A journal of the plague

How one family spent lockdown

This award-winning graphic, from Spanish design studio Errea Comunicación, shows how a family of five inhabited their apartment in Pamplona, Spain, over the course of a single day at the height of the pandemic.



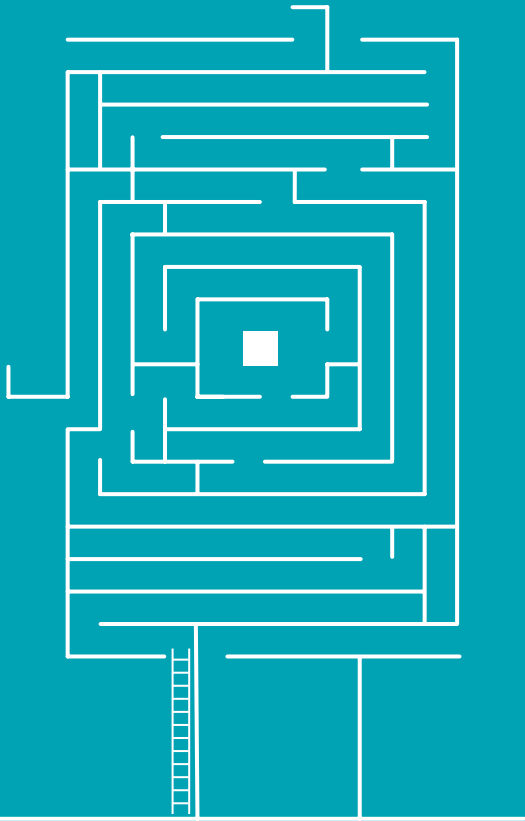
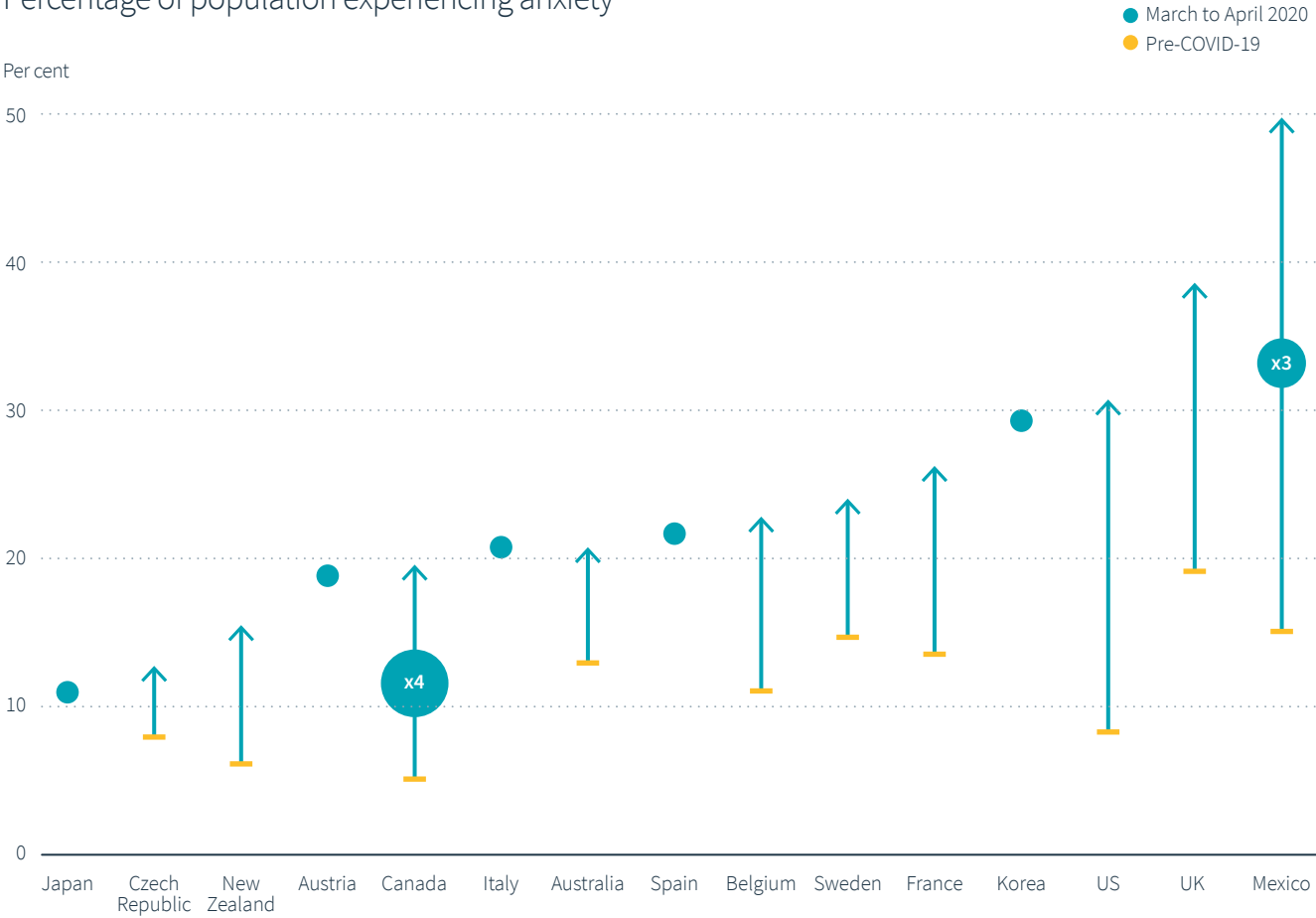
You are not alone

Anxiety levels spike post-COVID

Considering the devastating loss of life, the impact of lockdowns and the ensuing recessions, perhaps it is no surprise that the pandemic led to a significant worsening of mental health across some populations.

Indeed, the pandemic heightened the precise factors that tend to be associated with poor mental health – financial insecurity, unemployment and fear. Meanwhile, positive factors – like social connection, access to physical exercise and health services, and daily routine – fell dramatically.

Percentage of population experiencing anxiety



“Is there no way out of the mind?”
– Sylvia Plath, ‘Apprehensions’

Federico Babina’s illustration, ‘Archisolation’, is an artistic depiction of what the pandemic felt like to those on the frontlines of the health response and others trapped within four walls at home – a labyrinth with no way out.

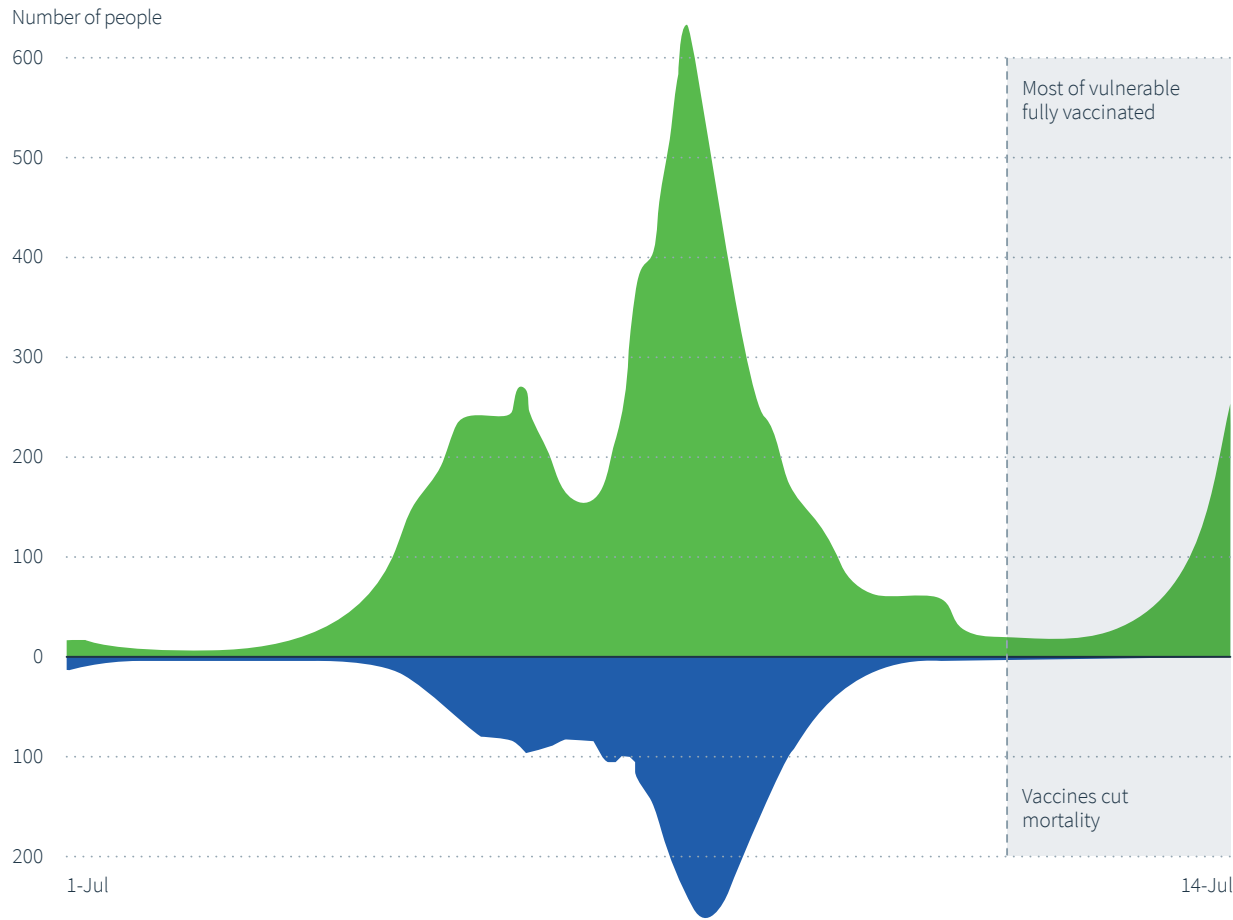
Variants versus vaccines

Well-vaccinated countries are more resilient

The spread of the so-called Delta variant of the coronavirus prompted fears of a fresh escalation in the pandemic. But vaccines offer a good defence, even against more virulent strains.

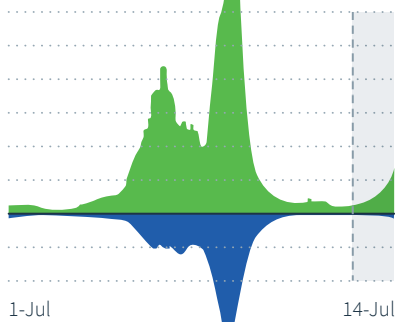
Countries that have vaccinated a large proportion of their populations have managed to reduce the link between a rise in cases and increased COVID-19 deaths, whereas countries where few have been vaccinated are much more vulnerable. Until more people in the global south can access the vaccine, the pandemic will be far from over.

UK: 52.6 per cent of population fully vaccinated

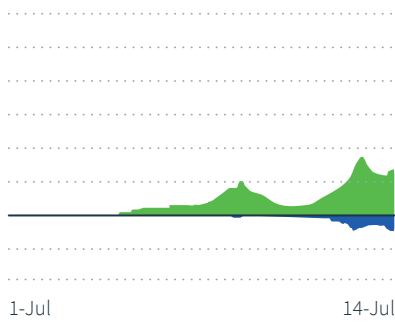


● Weekly cases per 100k people
 ● Weekly deaths per 100k people

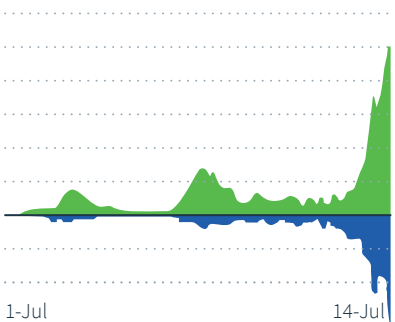
Portugal: 43.5



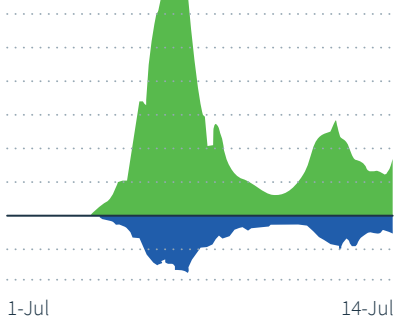
Malaysia: 12.5



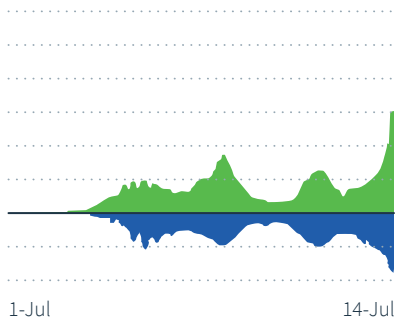
Namibia: 1.2



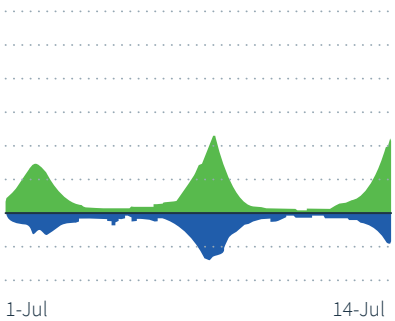
Georgia: 3.1



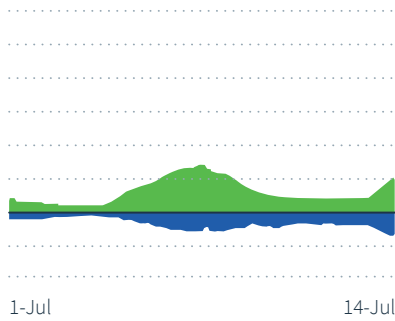
Tunisia: 5.8



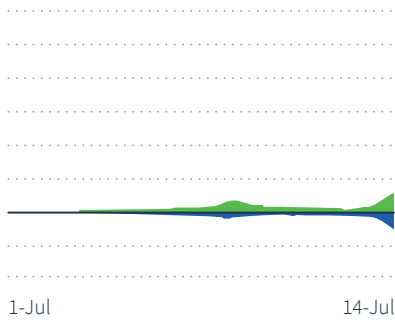
South Africa: 2.5



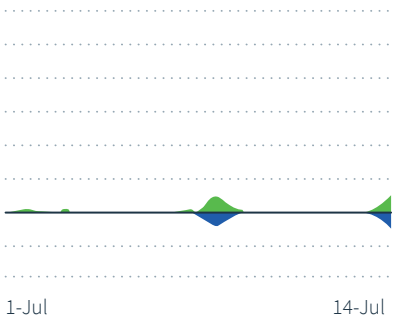
Russia: 13.6



Indonesia: 5.8

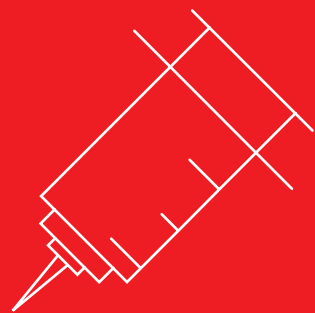


Zimbabwe: 4.2



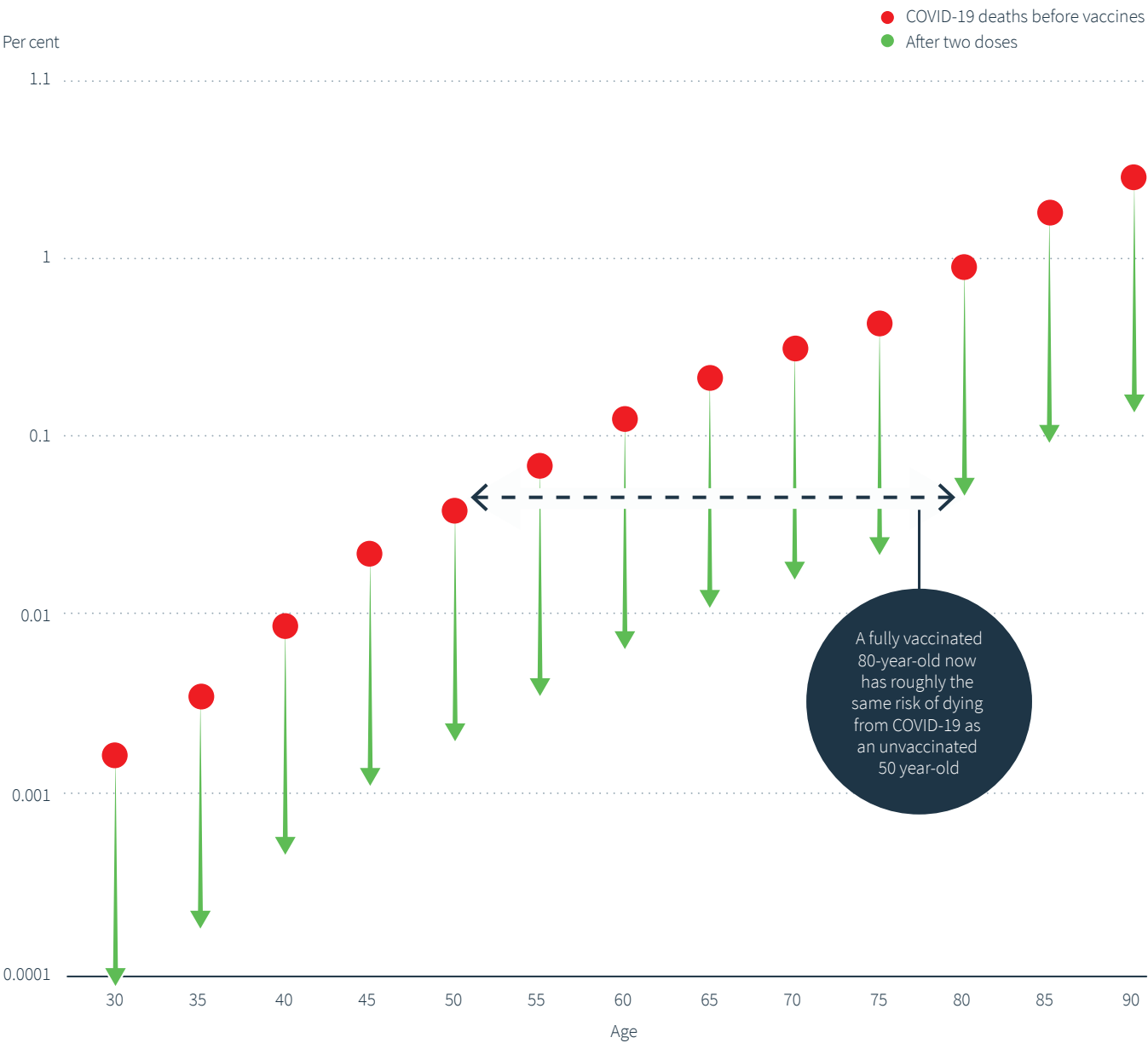
How protected am I?

Vaccines have made COVID-19 far less lethal



This chart, based on a *Financial Times* analysis of global infection fatality rates, shows vaccines dramatically reduce the mortality risk associated with COVID-19. However, older people remain at greater risk. Booster jabs to protect older and immunocompromised people could offer further protection through the winter months.

Risk of catching and dying from COVID-19 by age group

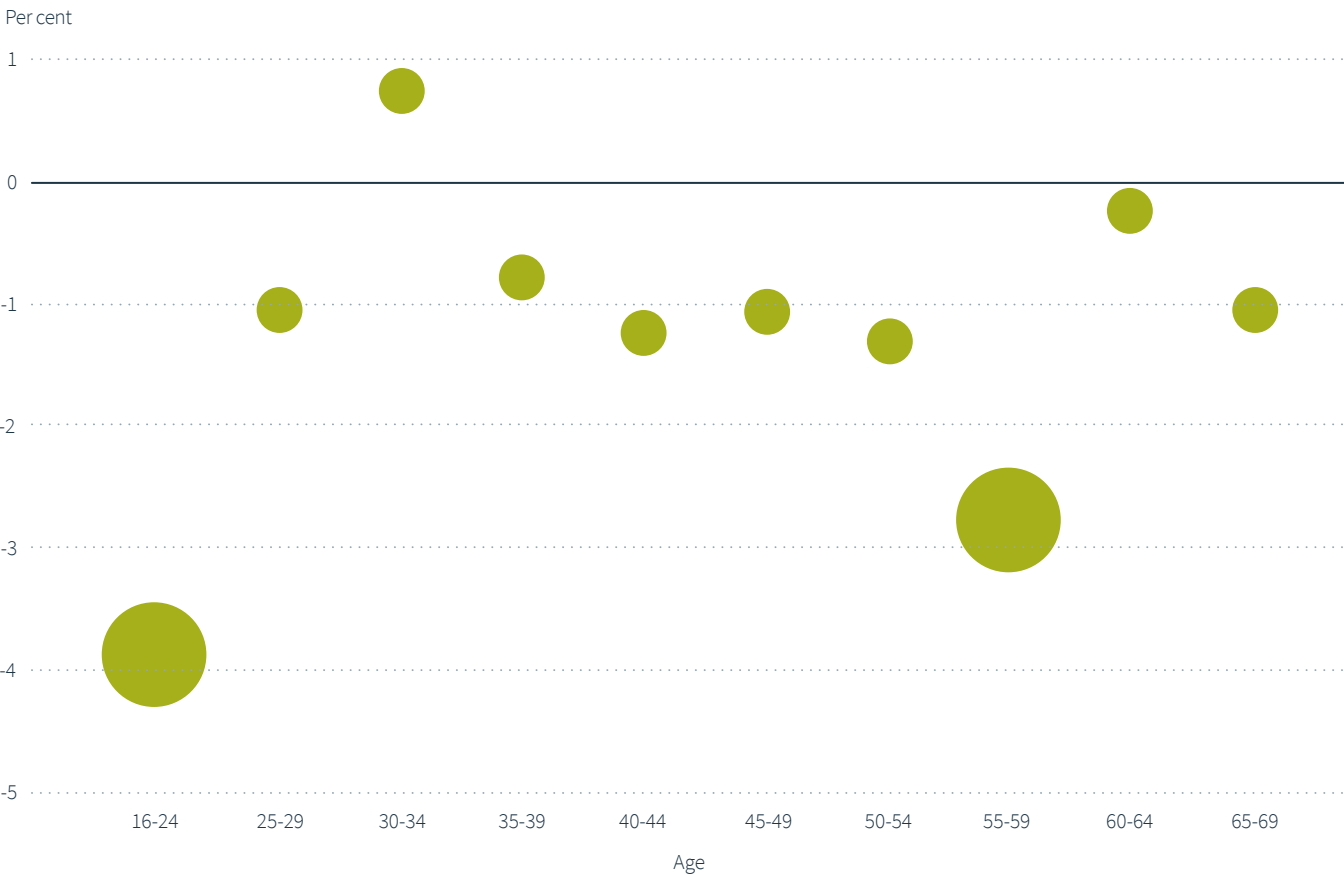


COVID-19 worsens inequality

Low earners and the young hit disproportionately

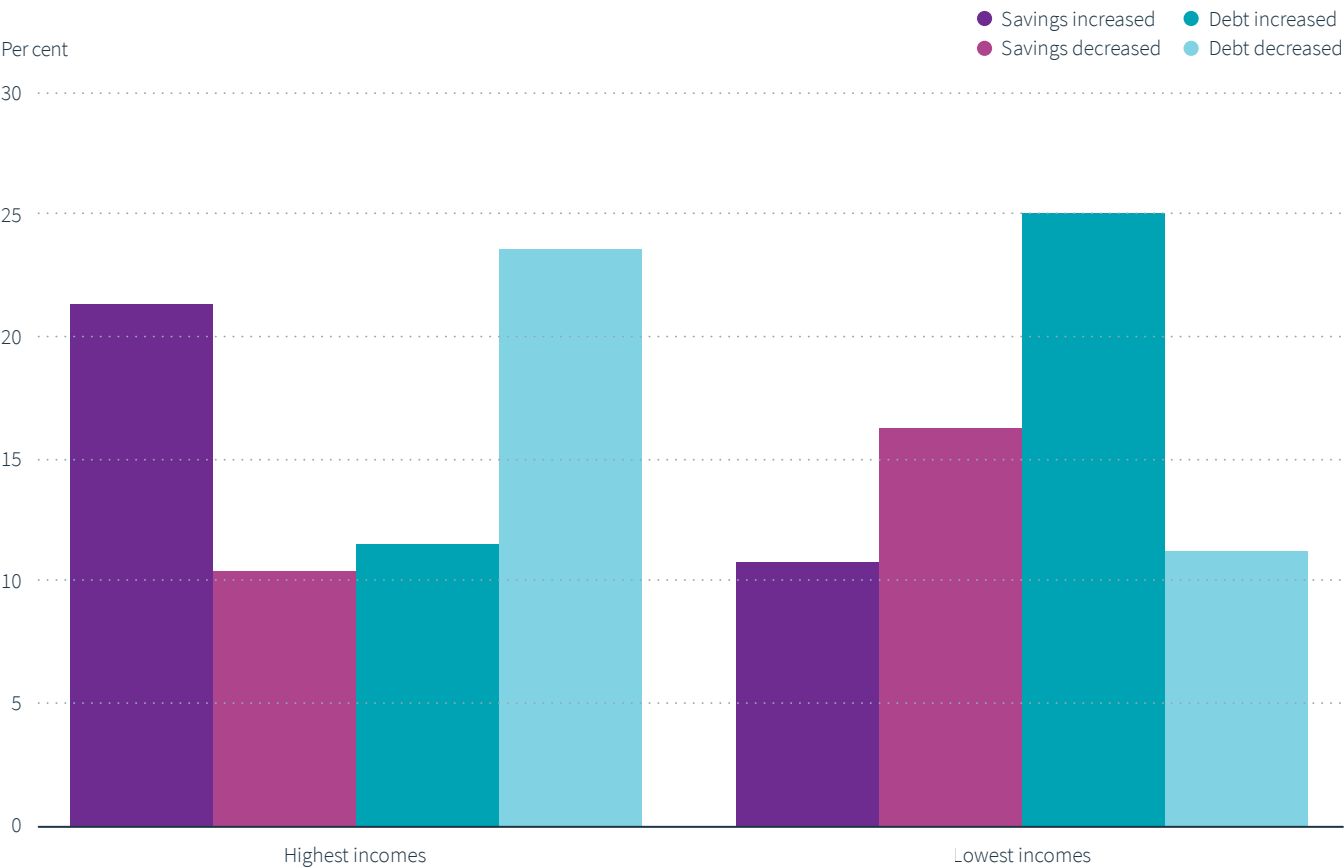
COVID-19 created a huge labour-market shock focused on low earners, the young and the self-employed. The youngest (16 to 24) and lowest paid lost the most work due to COVID-19 through a combination of lost jobs, furloughs, and reduced working hours.

Change in the proportion of each age group employed, Q4 2019–Q4 2020



As a result, while many of those in the highest-income brackets kept their jobs and were able to increase savings and pay back debt, a large share of those in the lowest-income groups saw their income drop. They were forced to either dip into their savings or take on more debt.

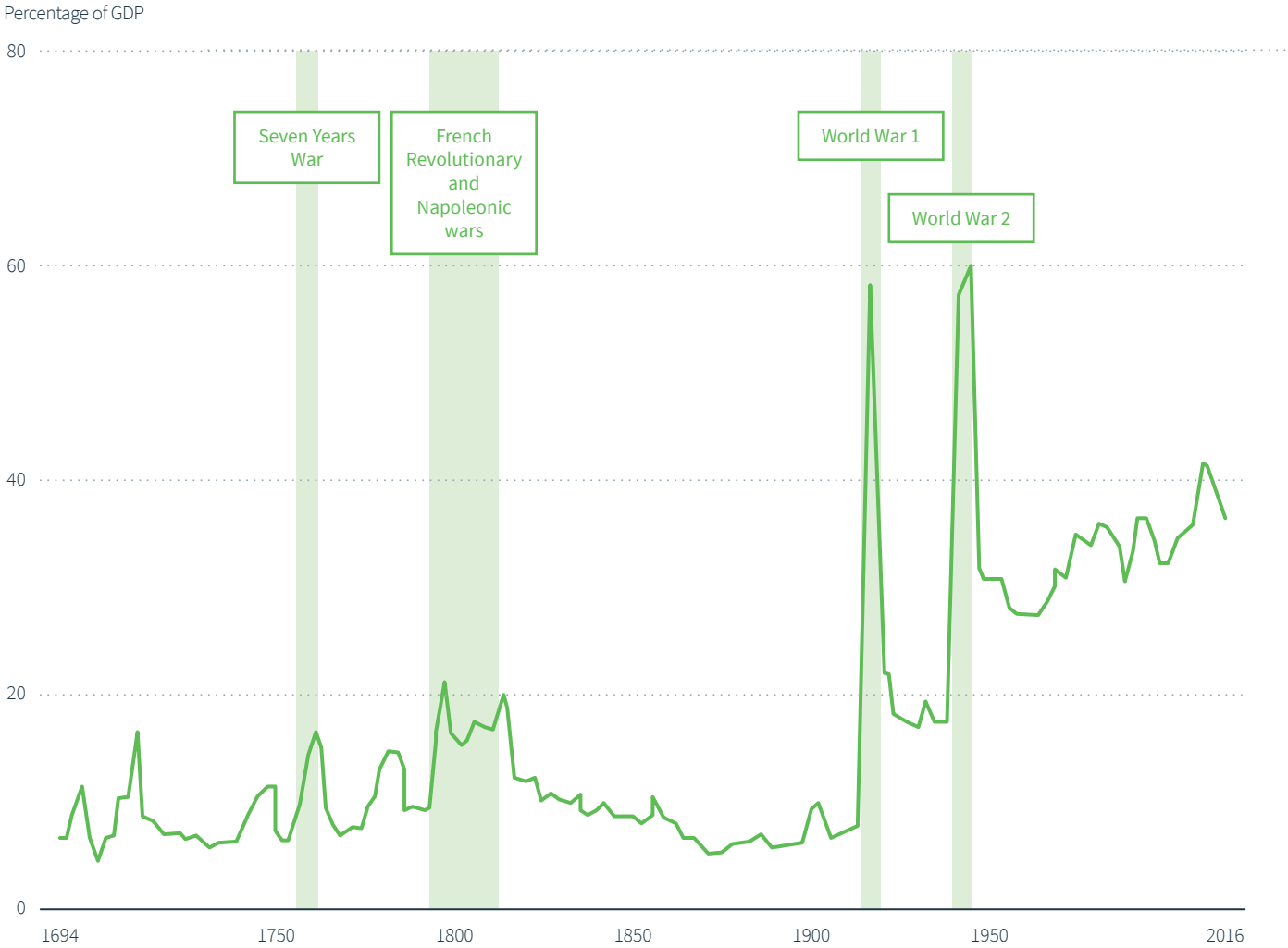
UK households reporting a change in their savings and debt, February 2020–January 2021



Pathogens, pandemics and permanent taxes

Government spending rises over time

Central government expenditure in Britain



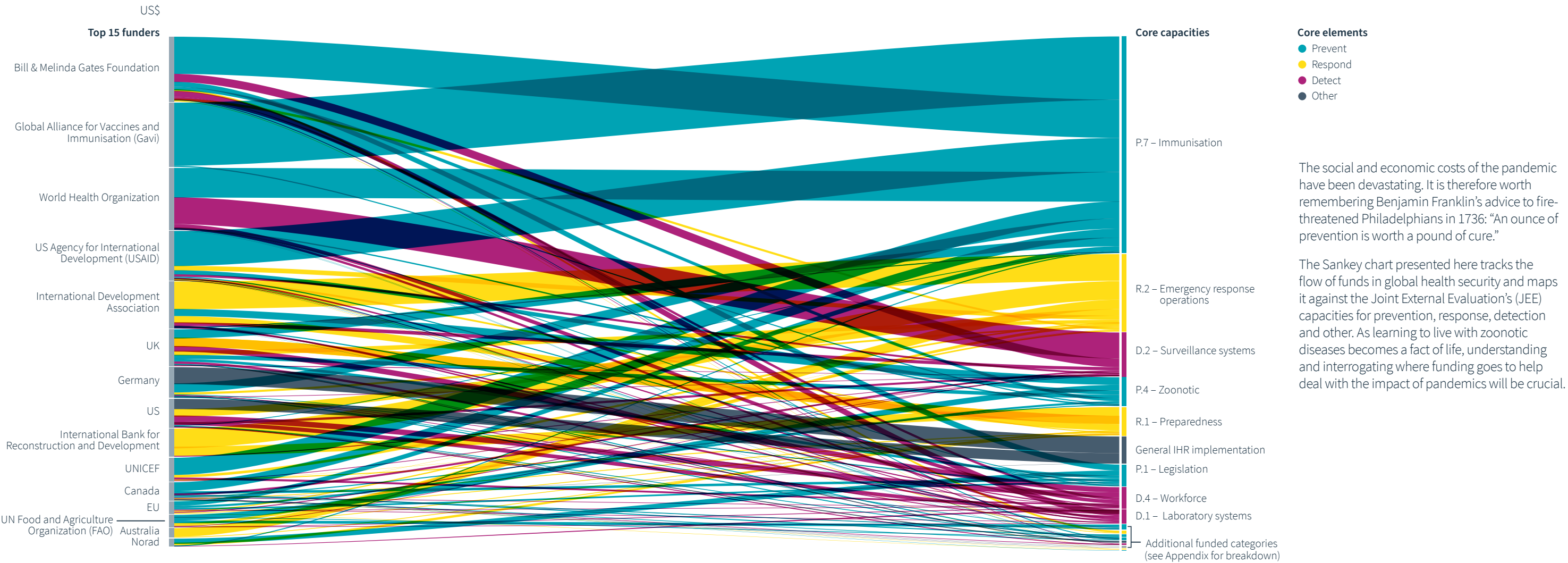
Physics teaches us that what goes up must come down. And yet public debt seems exempt from this law. The funding required to pay for the World Wars in the 20th century resulted in a permanent national debt increase.

Some of this reflects the low starting base, as well as the increased role of government. With COVID-19 causing a major disruption to global and domestic economies, and tax rises on the political horizon, it is natural to wonder where the debt-to-GDP ratio and the ensuing tax rate will plateau.

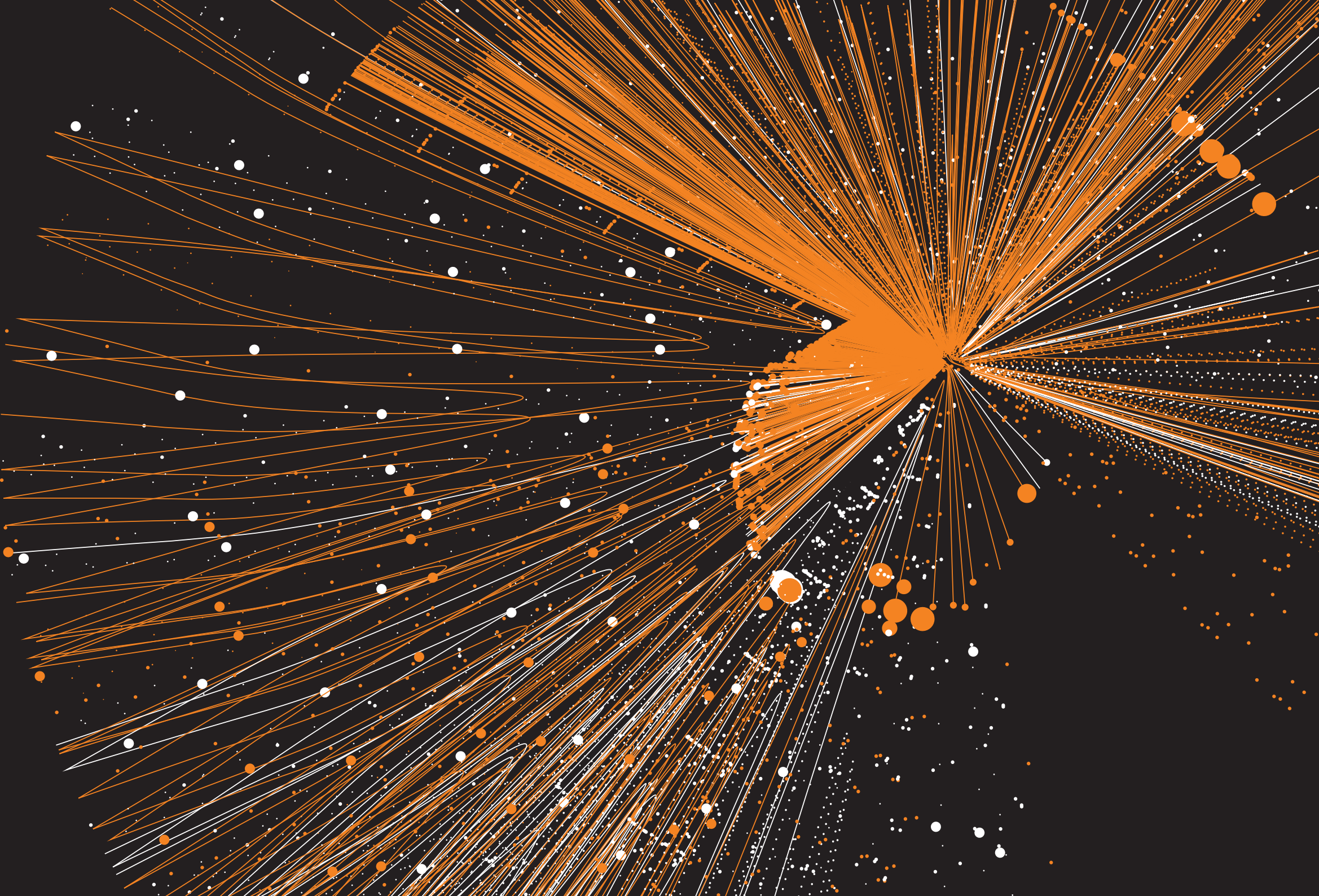
Pandemic preparedness

How pandemic resilience efforts are funded

Flow of funds in global health security, 2014–2021



**Data and
technology**



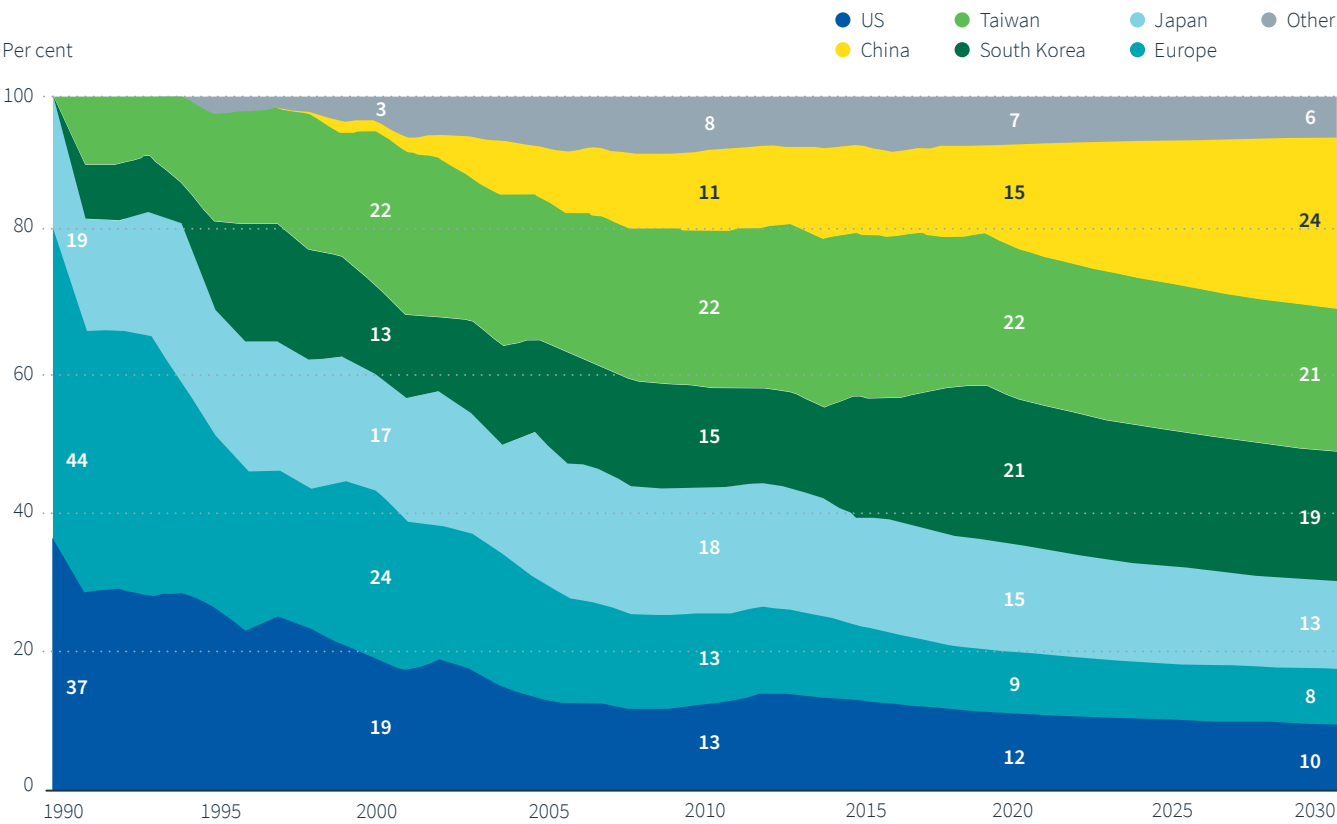
When the chips are down

Semiconductor industry faces increasing concentration risk

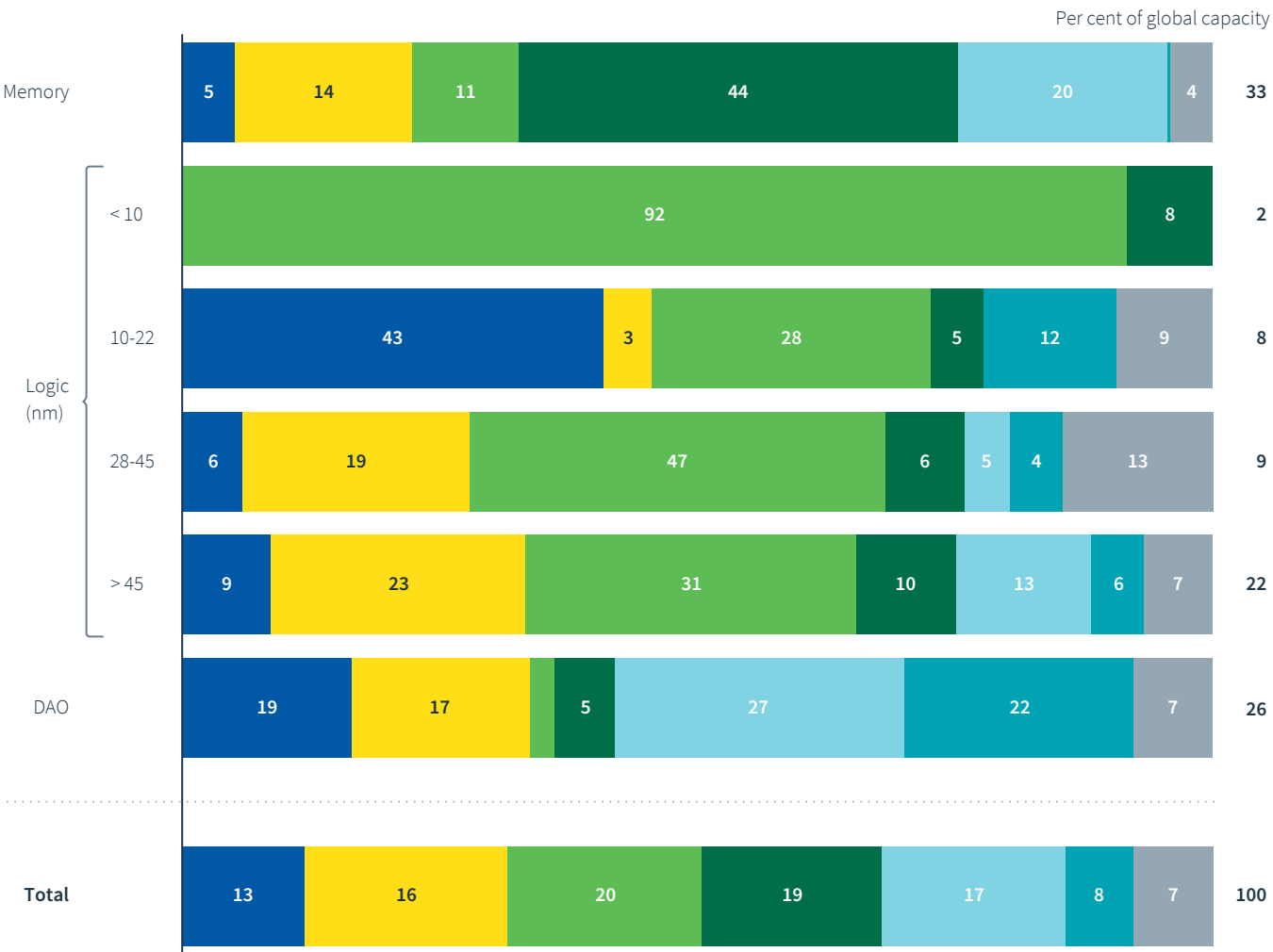
The world is becoming ever more connected, and semiconductor chips are in demand for everything from wi-fi-connected fridges to driverless cars. However, the industry has become highly concentrated, partly due to the gargantuan investment required to build chipmaking facilities from scratch.

The tiny, high-end chips needed to run data centres and artificial intelligence servers are made almost exclusively in Taiwan and South Korea. This could be a big problem. The early stages of the pandemic showed how geographical concentration of manufacturing can bring supply-chain snarl-ups – and that’s before we factor in geopolitical risk: Taiwan and South Korea are both located in what political analysts would describe as “hostile regions”.

Global manufacturing capacity by location



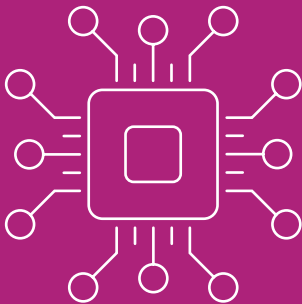
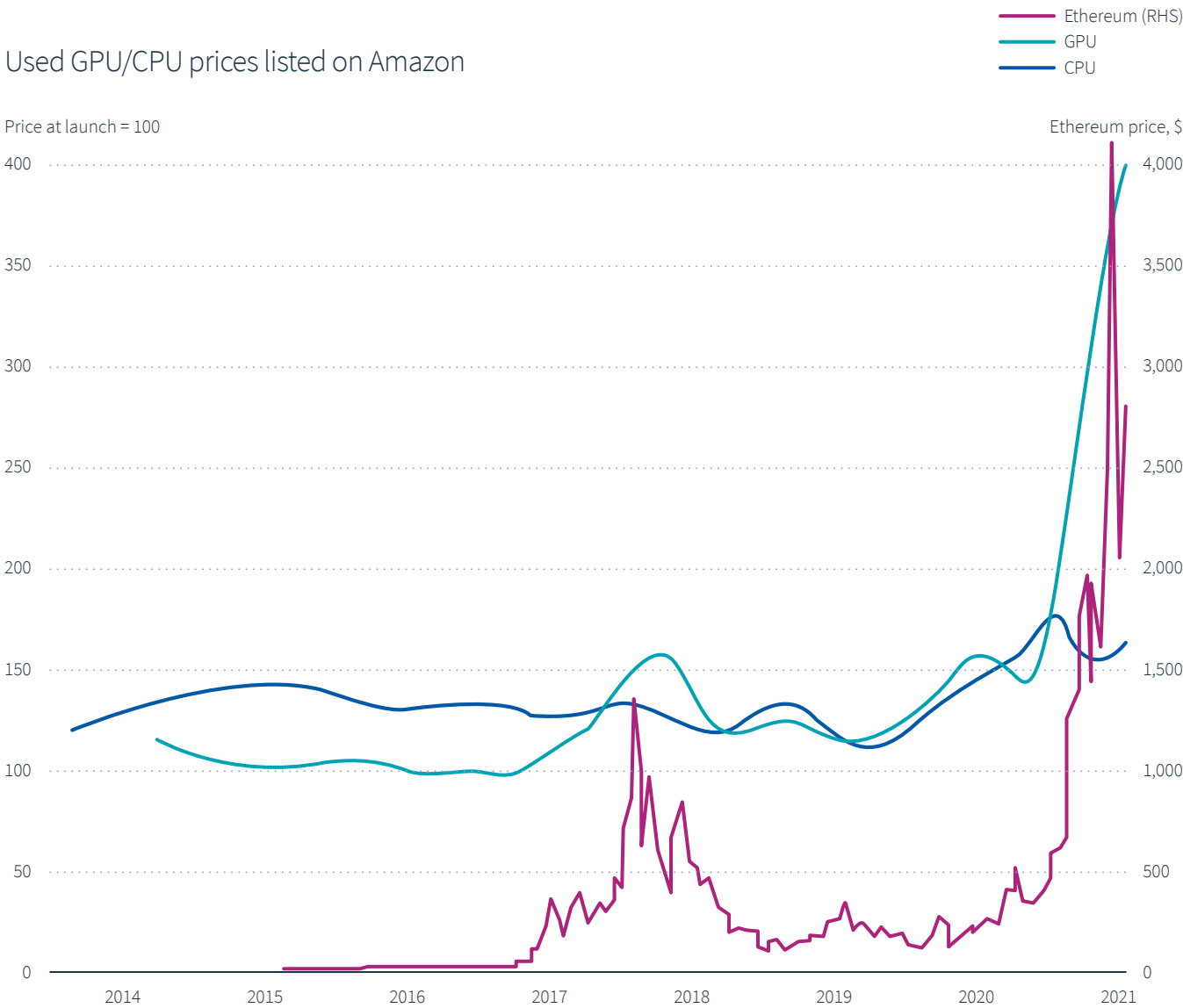
Global wafer fabrication capacity by location, 2019



Crypto stokes the chip shortage

GPUs are in demand – and not just from gamers

Used GPU/CPU prices listed on Amazon



Demand for video games soared during the pandemic, as gamers sought to meet friends remotely and escape into virtual landscapes. But this wasn't the only factor that drove up the cost of graphics processing units (GPUs) over the past year.

Crunching data from Keepa, a website that tracks listings on Amazon's marketplace, *The Economist* made an interesting discovery. The spike in GPU prices closely correlated with the rise of Ethereum, one of the world's most popular cryptocurrencies – as well as rendering 3D-graphics, specialised chips such as GPUs are the best tool for mining the currency. Emphasising the connection, central processing units, which are useful for playing video games but not cracking cryptocurrencies, have remained stable in price.

With the crypto-craze showing few signs of slowing down, gamers might have cause to grumble for some time yet.

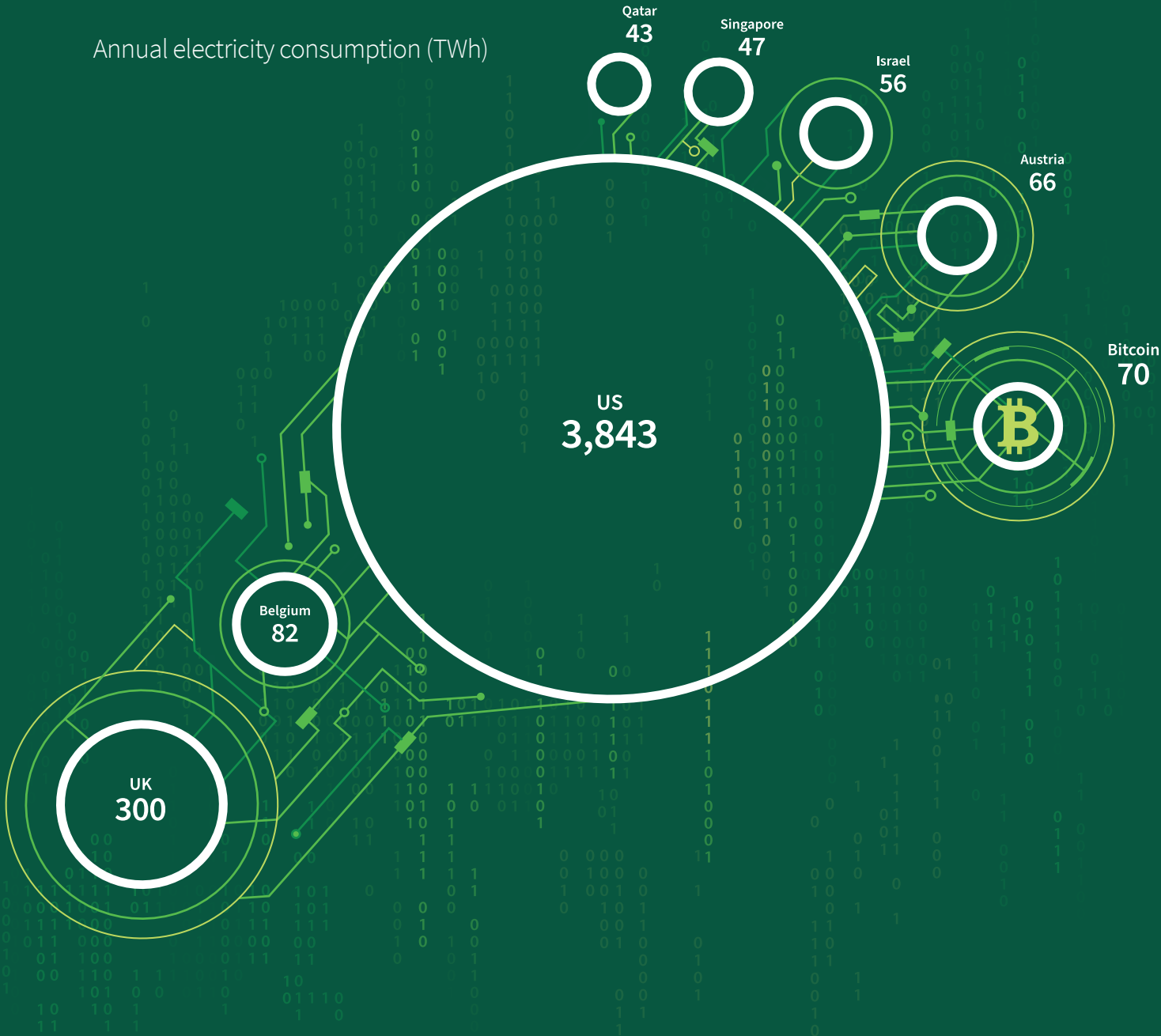
Bitcoin's carbon footprint

Cryptocurrency consumes more energy than many countries

Mining for Bitcoins requires brute computer power to undertake random numerical searches; it is a laborious and enormously energy-intensive process. Awareness of the environmental cost is growing, and not before time – Bitcoin's energy consumption now outstrips that of many countries.

Electric car manufacturer Tesla recently announced it will stop accepting payments in Bitcoin, due to concerns about the associated carbon emissions. Meanwhile, Inner Mongolia is among the provinces in China to have banned industrial-scale Bitcoin mining facilities, with officials complaining the associated electricity usage will prevent them from meeting the country's emissions-reduction targets.

Annual electricity consumption (TWh)



Data boom

COVID-19 accelerates internet traffic surge

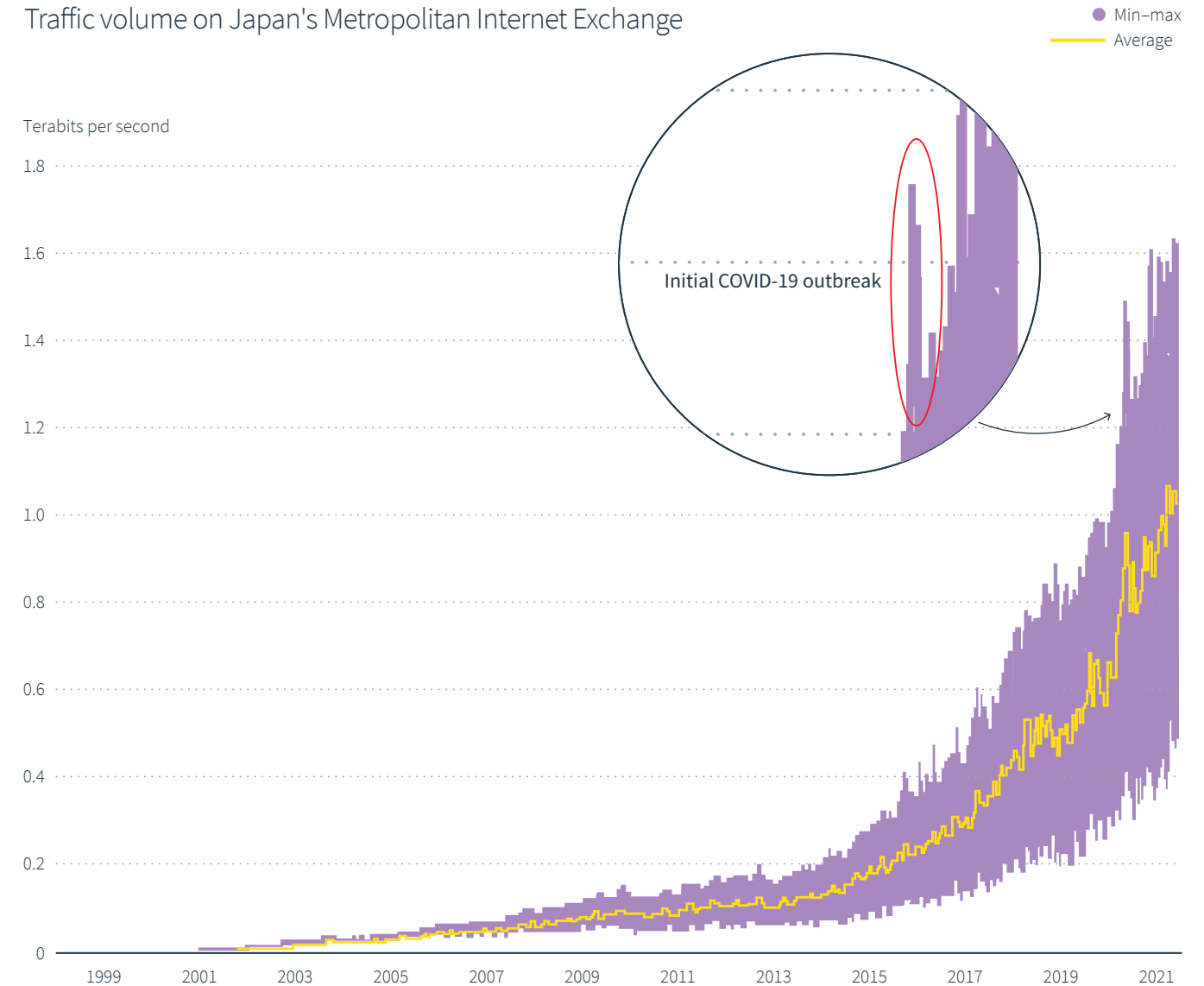


It has been said many times that COVID-19 has simply accelerated existing trends rather than created new ones. This is certainly true of data usage: the amount we use and consume is growing exponentially.

Take Japan. The chart clearly shows a pandemic-driven spike as large swathes of the population started working from home. Zoom out, however, and you can see the rise in data usage was already well underway. The interplay with remote working is not straightforward though. As a leader in technology, electronics and robotics, you might expect Japan to be a leader in flexible working – particularly given the infrastructure challenges its cities' population densities throw up. Indeed, 15 years ago Japan invested in superfast broadband and the country's mobile data usage outpaced the US by a factor of ten.

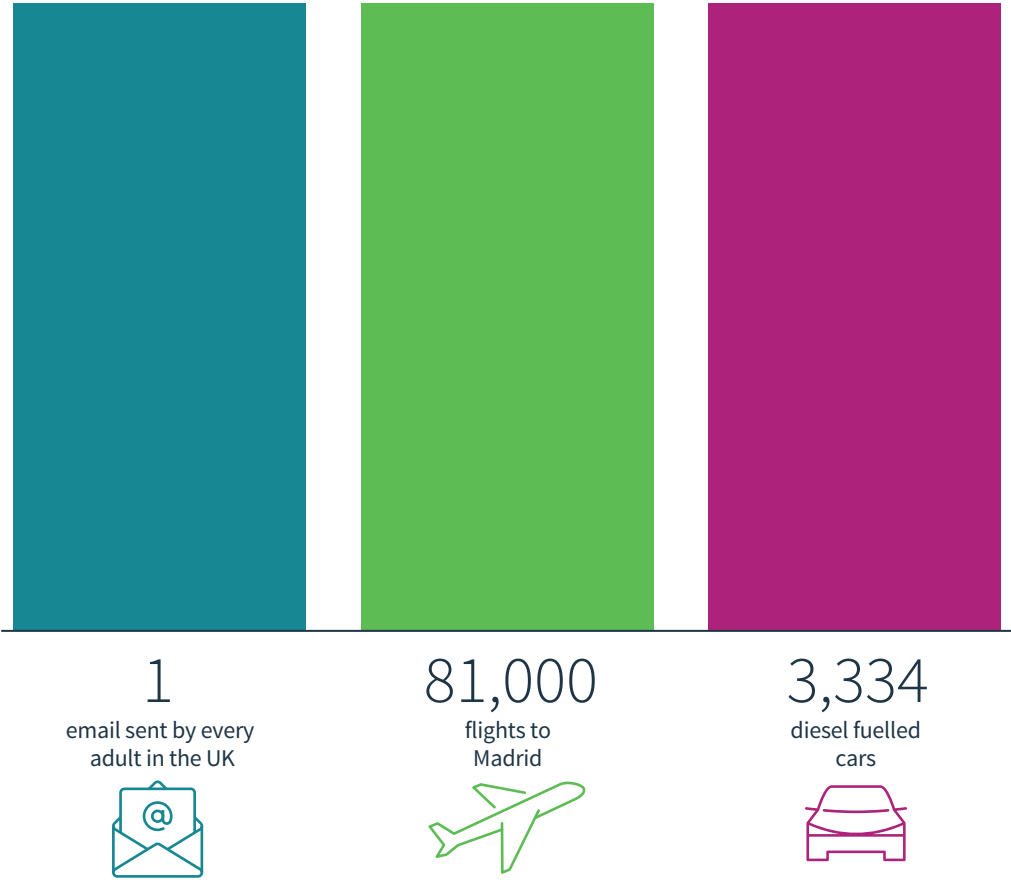
However, a deep-rooted cultural barrier exists. The need for office facetime and an underinvestment in software has stymied any wholesale embrace of hybrid working habits. Maybe the pandemic will finally change that.

Traffic volume on Japan's Metropolitan Internet Exchange



Do you need to send that email?

The environmental cost of data



The digital world can seem intangible, ephemeral. But every online activity – from sending an email to streaming a Netflix series or Spotify track – uses a small amount of energy. And multiplied on a global scale, these add up.

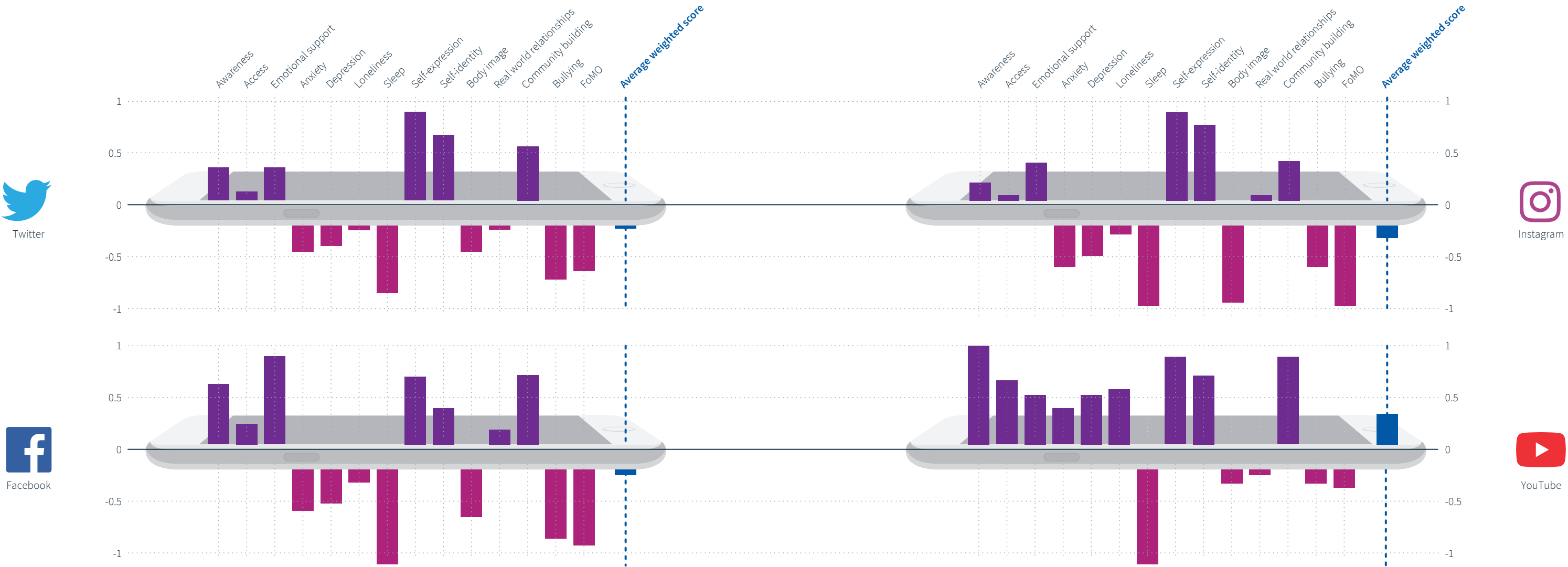
According to energy company OVO, if every adult in the UK sent one fewer email, 16,433 tonnes of carbon would be saved each year. That’s equivalent to the annual emissions of 3,334 diesel cars or 81,000 flights from London to Madrid. One more reason not to hit “Reply All”.

Don't feed the troll

Social media and mental health

In 2011, social media firms were hailed for providing valuable tools to activists battling oppression during the Arab Spring protests. Ten years on, these companies have become more associated with the negative impact of their platforms – especially when it comes to the mental health of younger users facing bullying and abuse.

This graphic shows how major social media platforms ranked in a UK-wide survey conducted by the Royal Society for Public Health. A group of 14-24-year-olds were asked to rate the extent to which social media made certain health-related factors better or worse, from -2 (a lot worse) to +2 (a lot better). Only YouTube received a positive overall score.



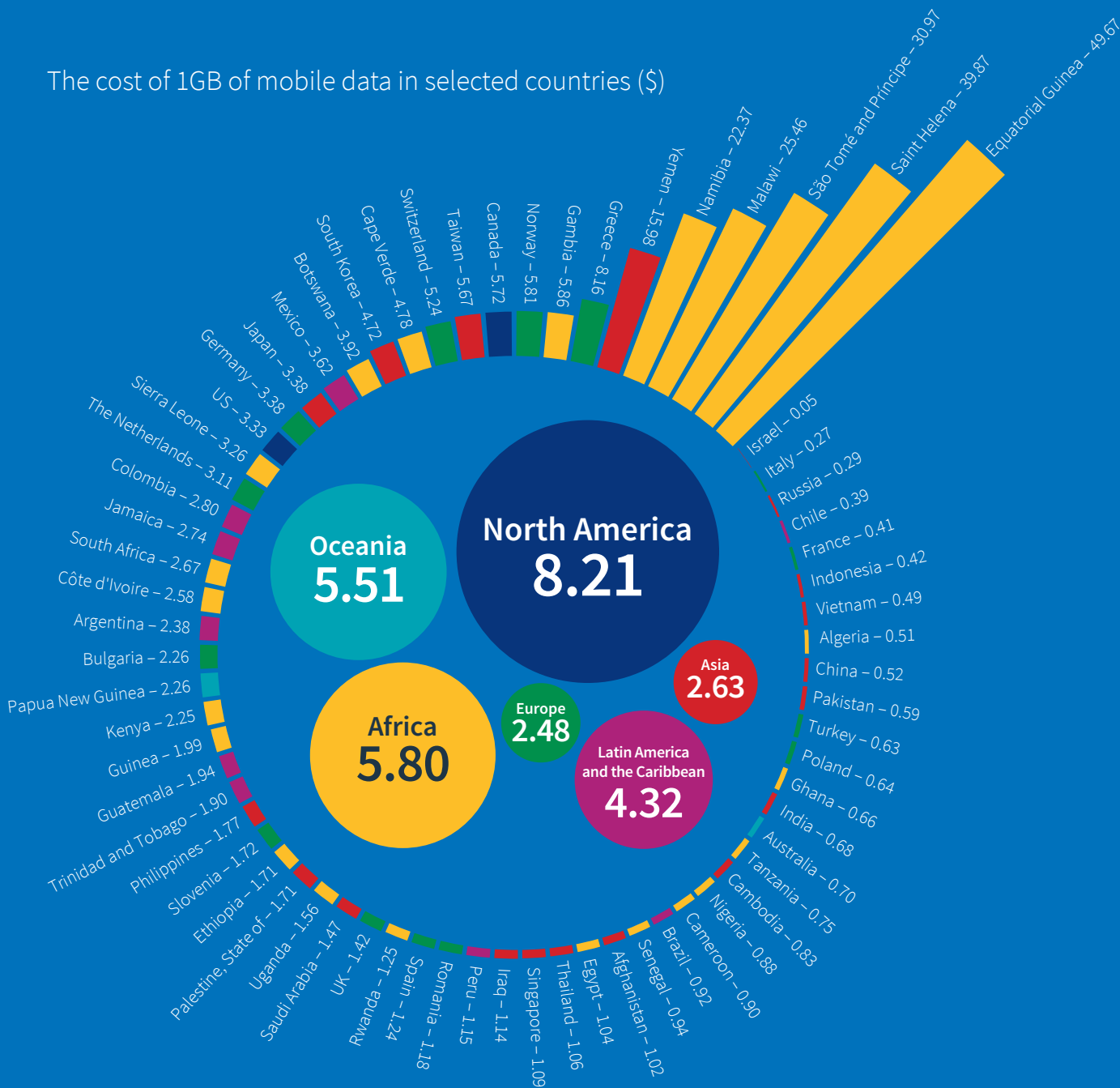
Connection costs

The price of mobile data

The cost of a mobile internet connection varies massively across the world, and for many different reasons. In his book *The Great Reversal*, the academic Thomas Philippon argued a lack of competition is why North American mobile phone plans are so expensive compared with Europe, where the telecoms industry is subject to tougher anti-monopoly rules.

In developing economies, such as those in sub-Saharan Africa, high prices have more to do with a lack of infrastructure, which restricts the amount of data the system can handle and forces up the cost for individual mobile data plans. High prices for internet access in the global south are a major barrier to socioeconomic development and only worsen inequalities of income and opportunity.

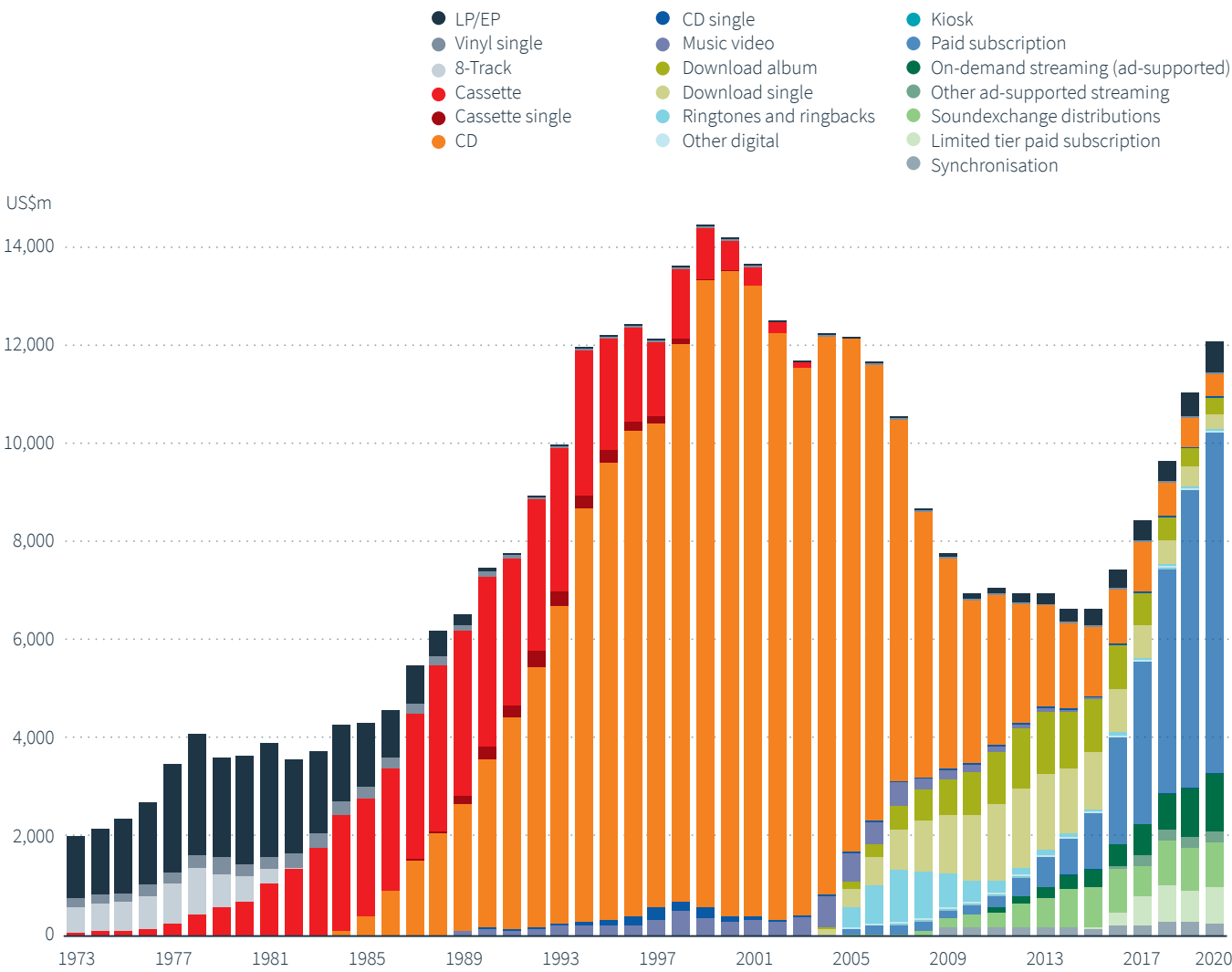
The cost of 1GB of mobile data in selected countries (\$)



Streaming killed the radio star...

...but saves the music business

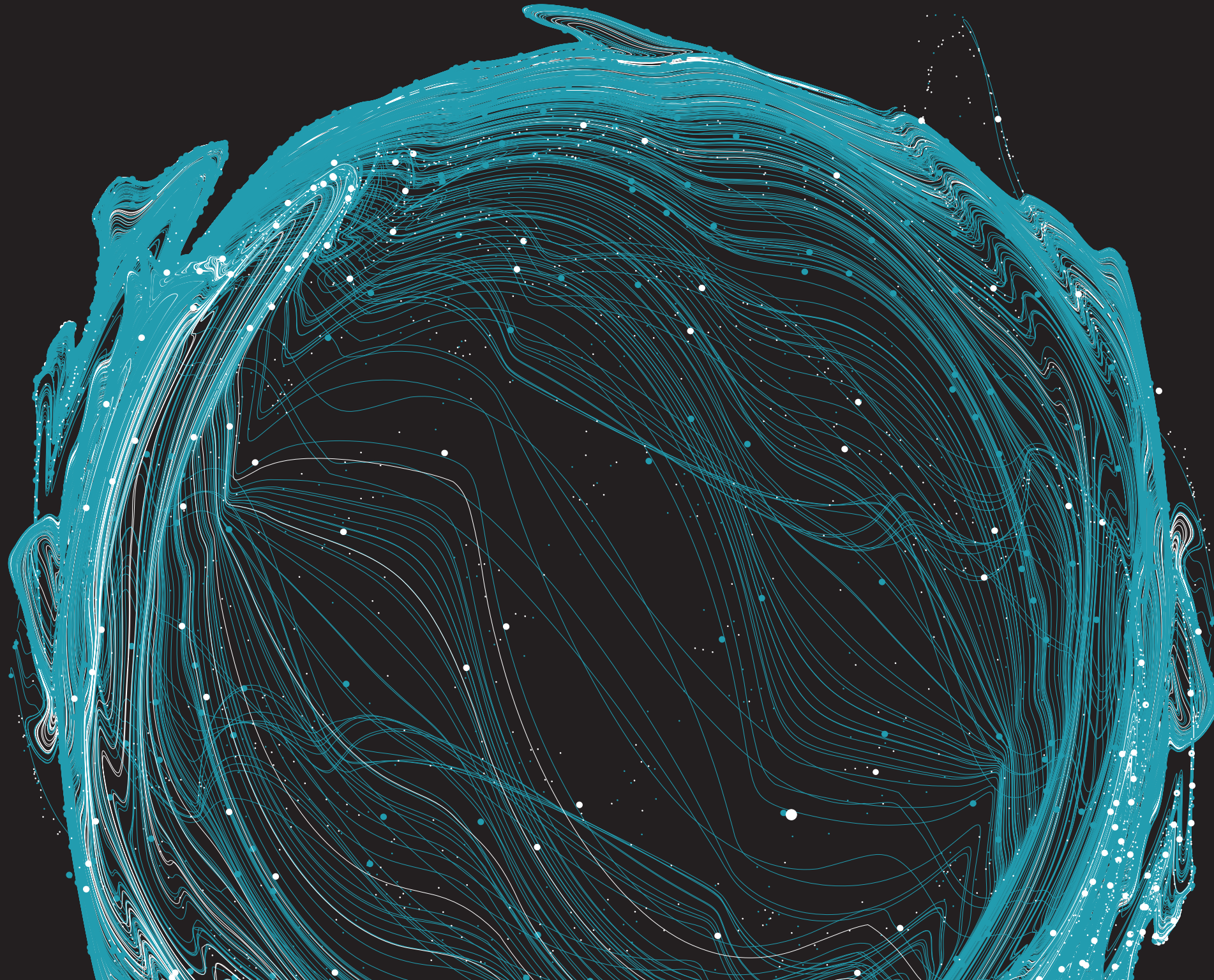
Five decades of US recorded music revenues by format



The music industry is filled with tales of talented artists who struggled to make financial ends meet while sharp-suited record company executives – AKA ‘The Man’ – grew rich at their expense. That was until the turn of the millennium, when the industry began what seemed a terminal decline as CD sales slumped and online downloads (often via illegal file-sharing platforms) decimated the business models of major record labels.

The subsequent surge of streaming through platforms such as Spotify and Apple Music has proved a salvation for ‘The Man’, who still pockets the lion’s share of streaming revenues as ‘recording rightsholders’. By luck rather than design, record labels have also benefited from the recent vinyl comeback, as listeners have reengaged with physical music formats.

The one thing streaming has not addressed is the unequal distribution of revenues between platforms, record labels and artists (not to mention many other interested parties seeking a cut). Artists rich and poor have united in calling for the streaming revenue model to be overhauled, with the *#BrokenRecord* campaign prompting a damning report on the economics of streaming by the UK government’s Digital, Culture, Music and Sport Committee. But will ‘The Man’ sticking it to ‘The Man’ lead to meaningful reform of the business?



Sustainability

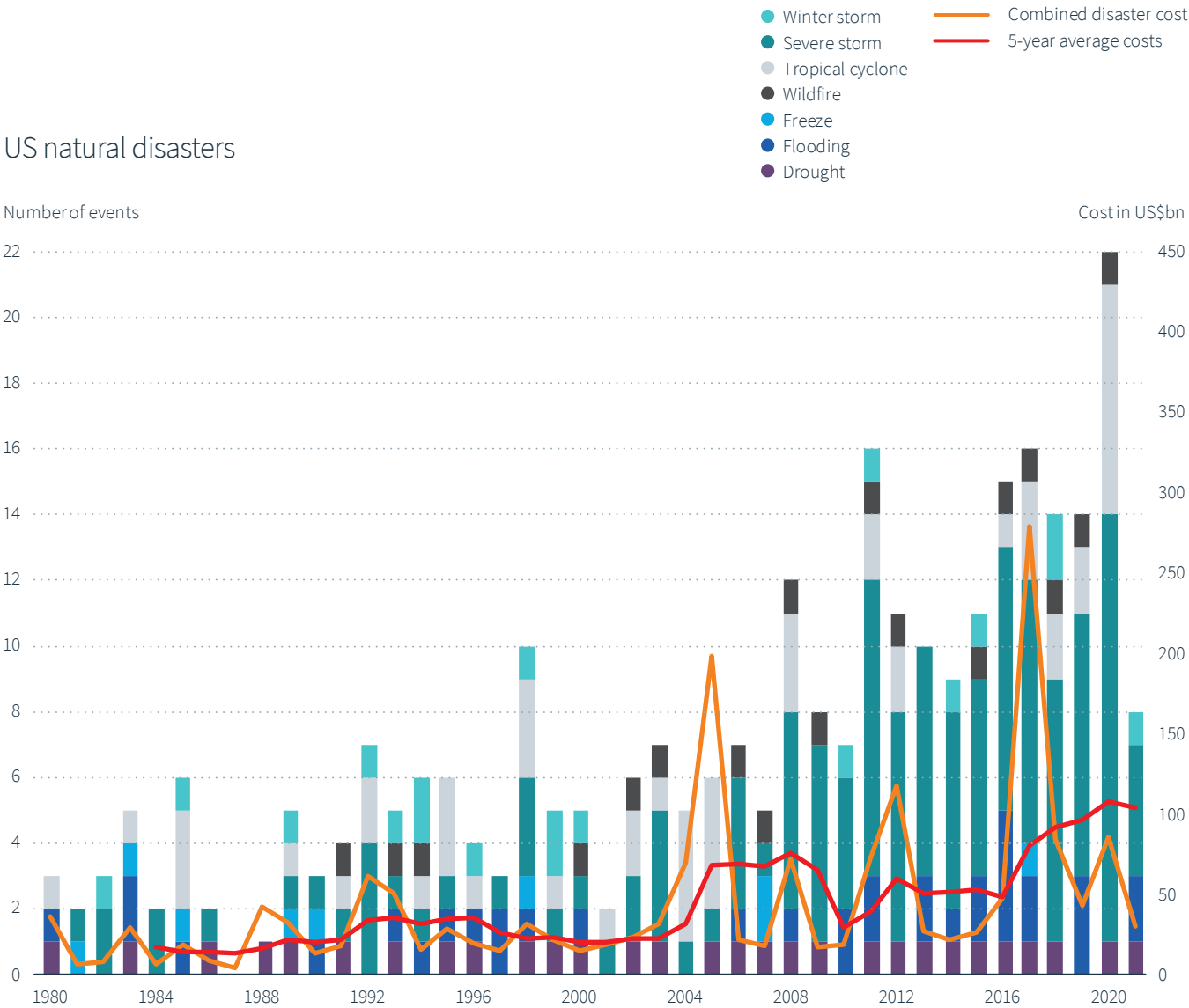
Danger zone

Natural disasters on the rise



At \$172.5 billion, Hurricane Katrina in 2005 remains the most expensive natural disaster in US history. The number of natural disasters in the US has increased over time, with climate change one of the key contributing factors. Extreme weather events leading to billion-dollar disasters are becoming more frequent: 2020 set a new annual record of 22 natural disaster events in the US, shattering the previous record of 16 in 2011 and 2017.

US natural disasters



Turning off the tap

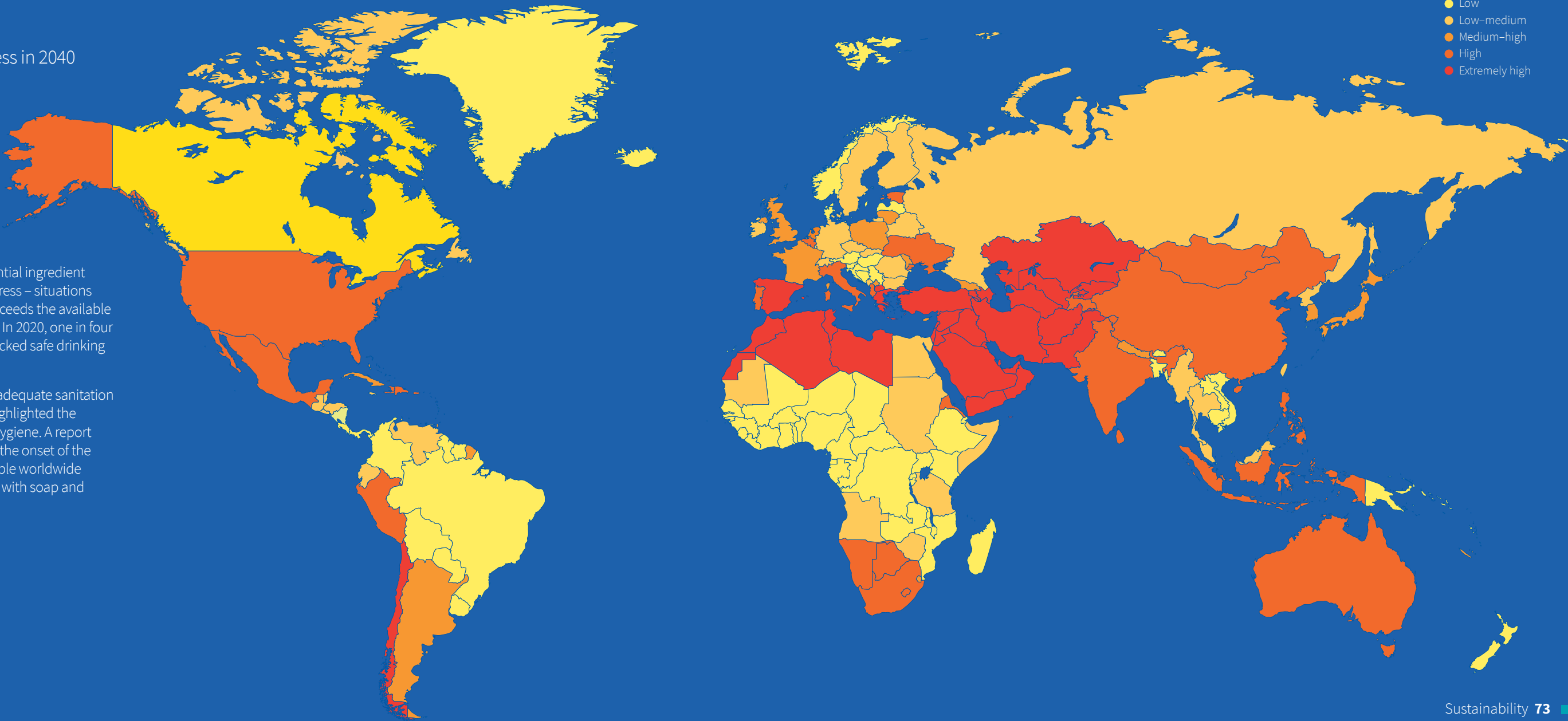
Mapping the global water crisis

Forecasted water stress in 2040

Clean freshwater is an essential ingredient for human life, and water stress – situations where demand for water exceeds the available amount – is a serious issue. In 2020, one in four people around the world lacked safe drinking water in their homes.

Water stress also caused inadequate sanitation at a time when COVID-19 highlighted the importance of good hand hygiene. A report from UNICEF shows that at the onset of the pandemic, three in ten people worldwide could not wash their hands with soap and water in their homes.

- Overall water risk
- Low
 - Low-medium
 - Medium-high
 - High
 - Extremely high

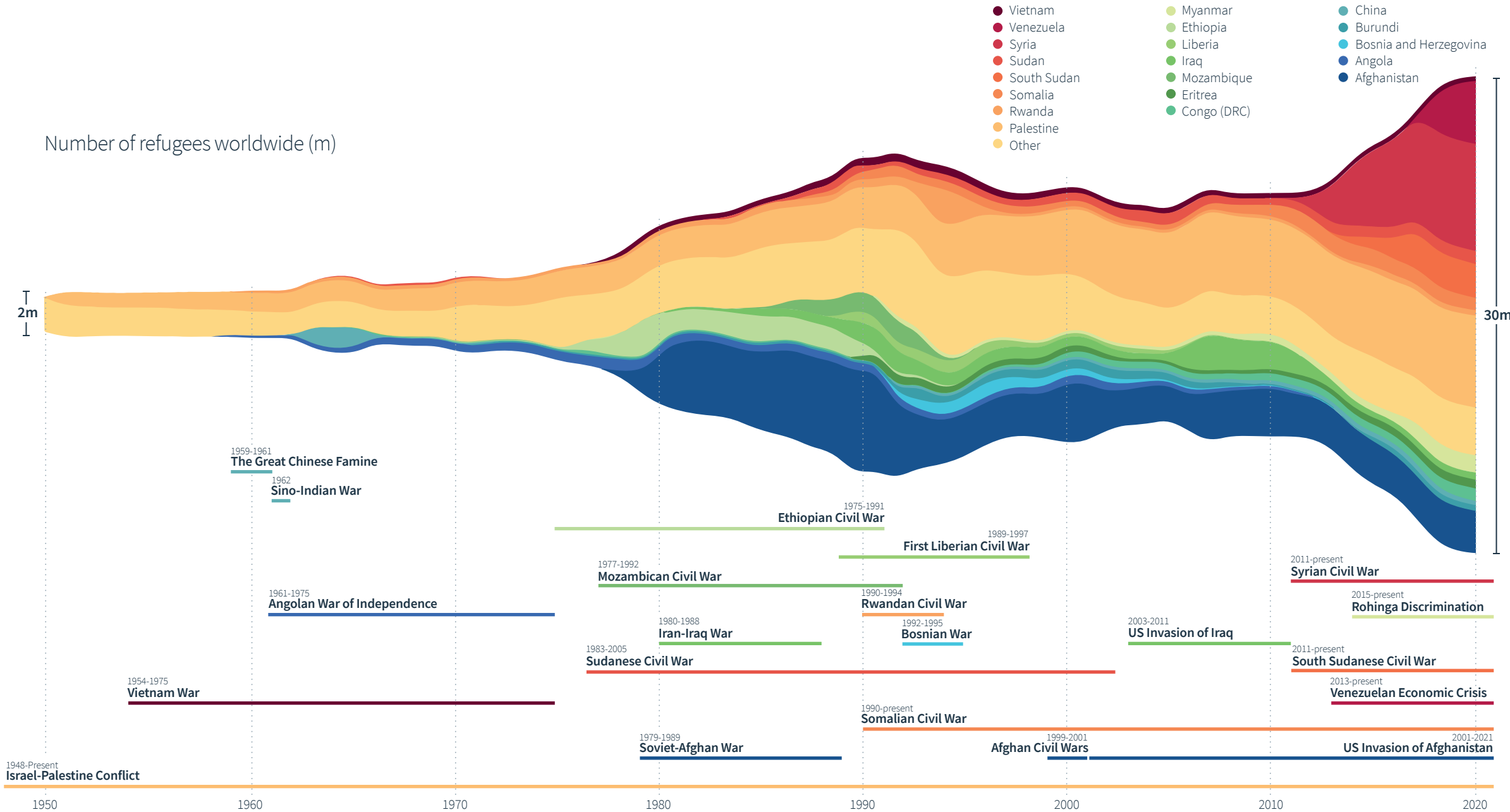


On the move

70 years of refugee journeys

This graphic shows events that have forced cross-border migration and displacement of people since 1951, when the United Nations established the Refugee Convention. According to the UN High Commissioner for Refugees, there were around 30 million refugees worldwide at the end of 2020.

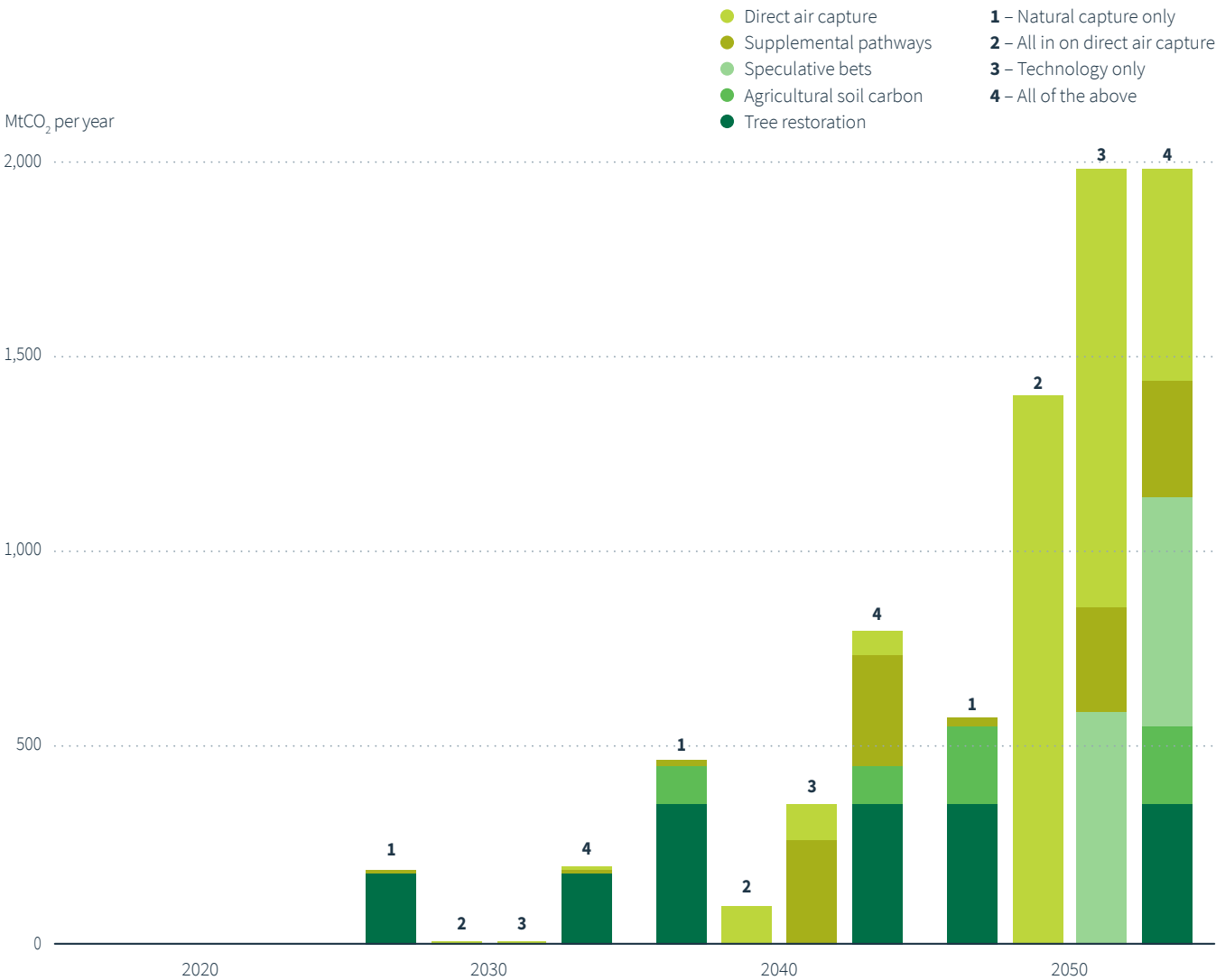
There are worrying signs the refugee crisis may get worse. The exit of US troops from Afghanistan in 2021, which allowed the Taliban regime to re-establish control, is likely to spark new waves of migration out of the country. In some regions, the effects of climate change are already combining with political instability to force people from their homes. The World Bank estimates there will be over 140 million climate migrants in Latin America, sub-Saharan Africa and Southeast Asia by 2050.



It's in the trees

How to capture carbon

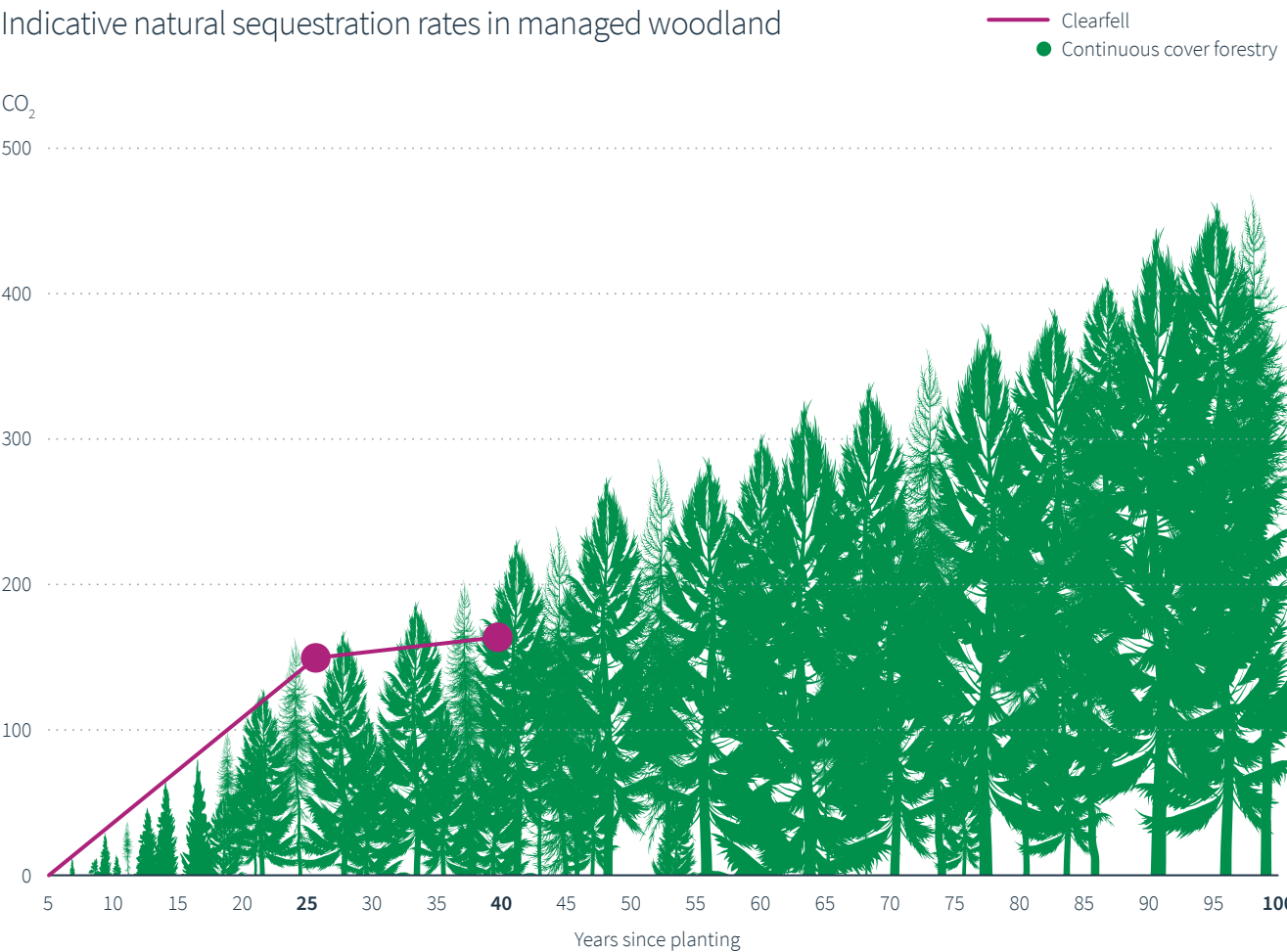
Natural and technical sequestration pathways in the US



Managed woodland can reduce carbon dioxide in the atmosphere, produce in-demand forest products and (in the best regulated schemes) generate certified carbon credits as well. But there are risks, like fire, which cannot be ignored. And how many investors are prepared to take a 40 or 100-year view?

The chart on the left, based on policy scenarios explored by the World Resources Institute, shows how carbon capture through trees could be supplemented using different methods, including enhanced crops and new technologies for direct air capture.

Indicative natural sequestration rates in managed woodland

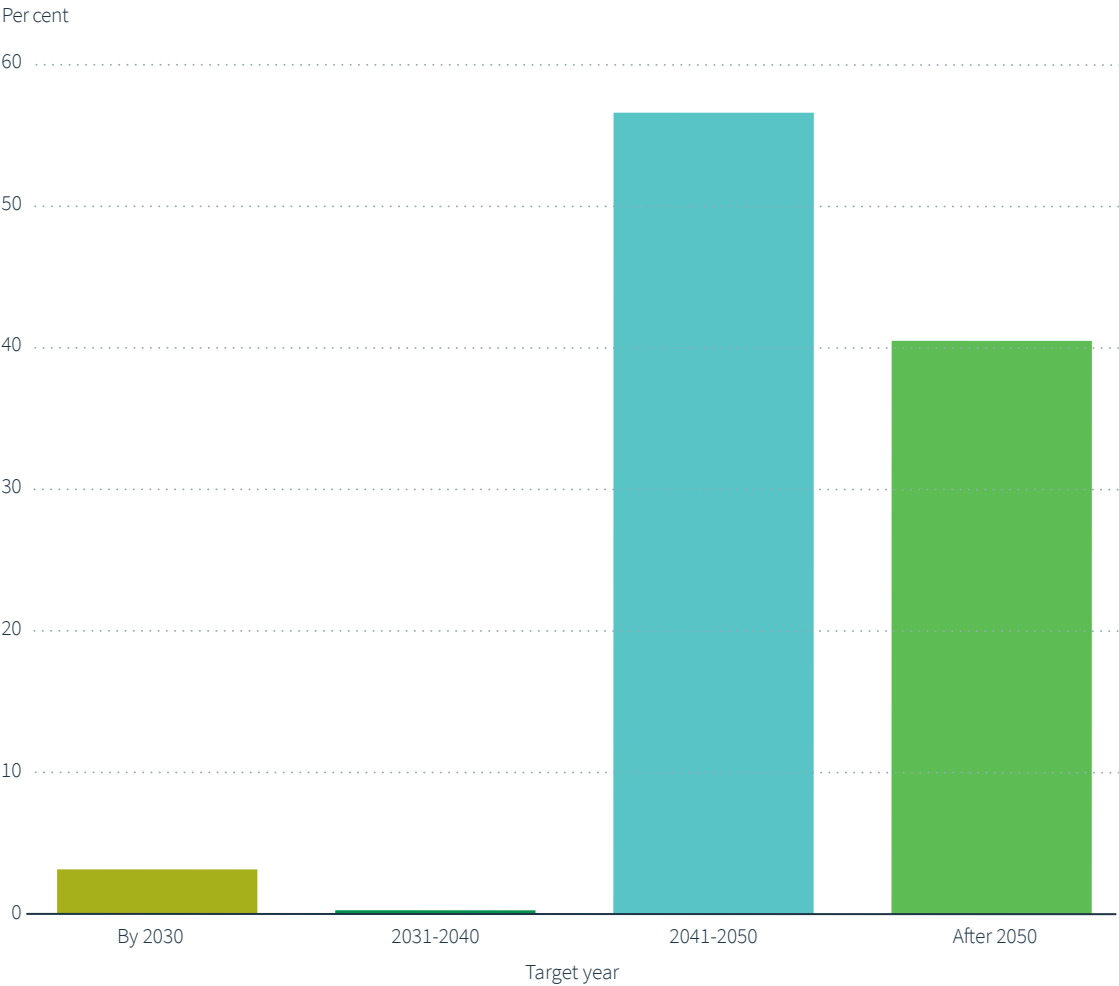


Less than (net) zero

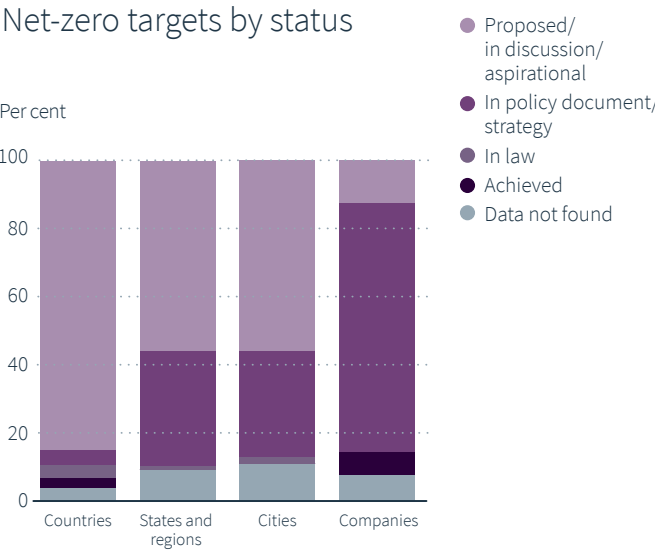
Will we reach elusive climate targets?

In 2015, governments around the world pledged to take action to halt global warming, but it has taken time to get the largest greenhouse gas (GHG) emitters like China on board. Today, pledges to meet net zero (where GHGs produced and removed from the atmosphere are aligned) have been made by nations making up over two-thirds of the global economy. But how will such a complex goal be delivered, and how soon?

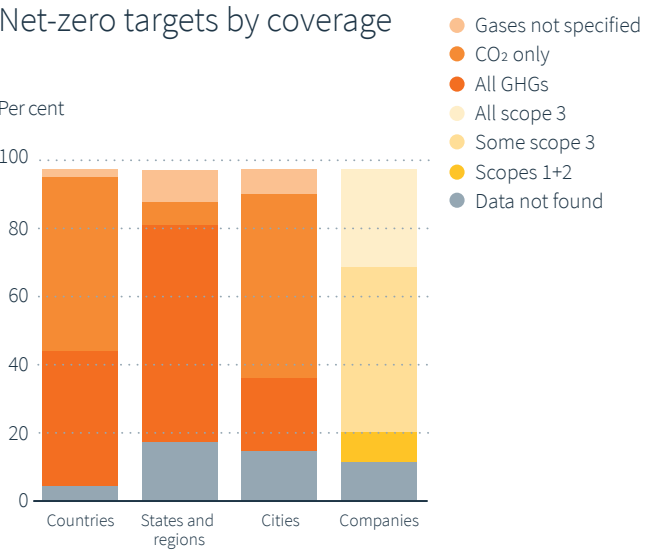
Countries with established targets currently emit 28,890 GtCO₂e



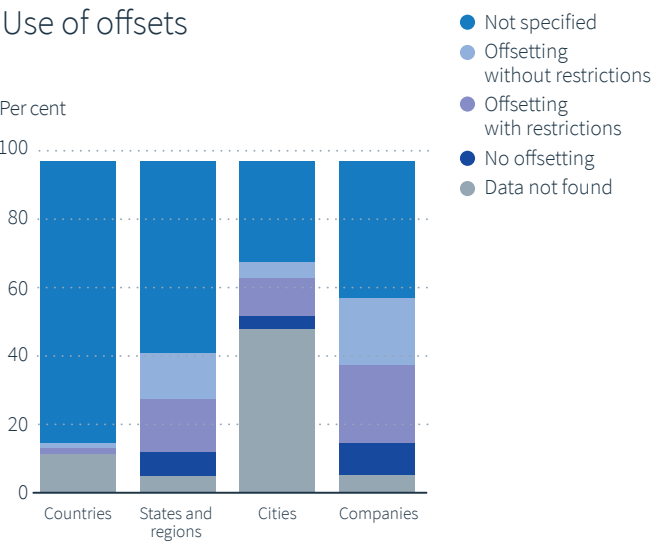
Net-zero targets by status



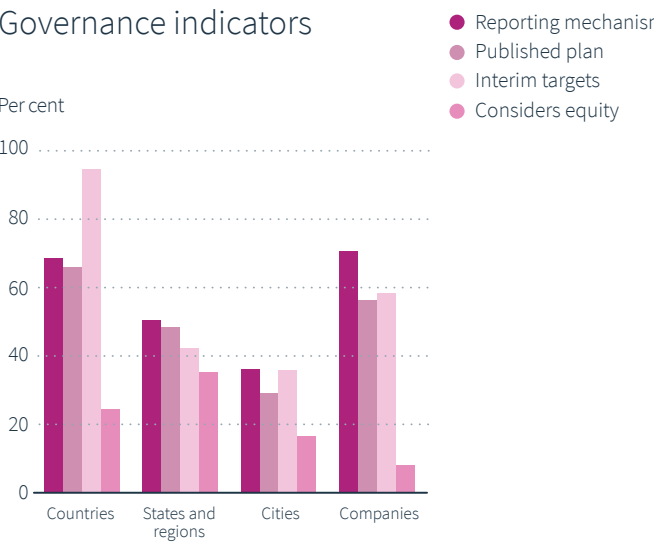
Net-zero targets by coverage



Use of offsets



Governance indicators

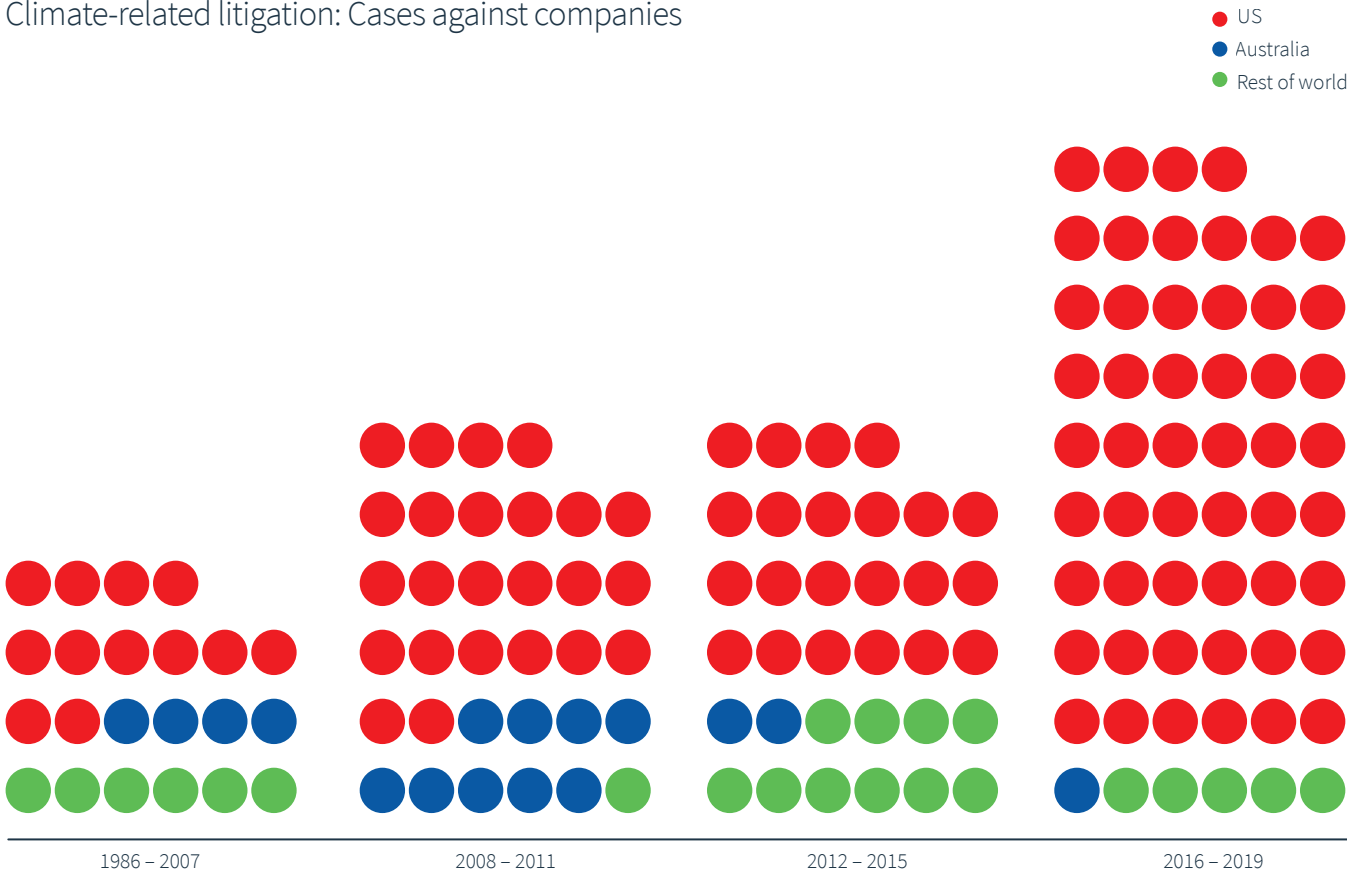


Law and climate (dis)order

Legal action is growing on the climate frontline

Cases against significant carbon-emitting companies have been growing. A landmark ruling in the Netherlands against Shell, ordering it to move faster with emissions reductions, is part of a trend.

Climate-related litigation: Cases against companies

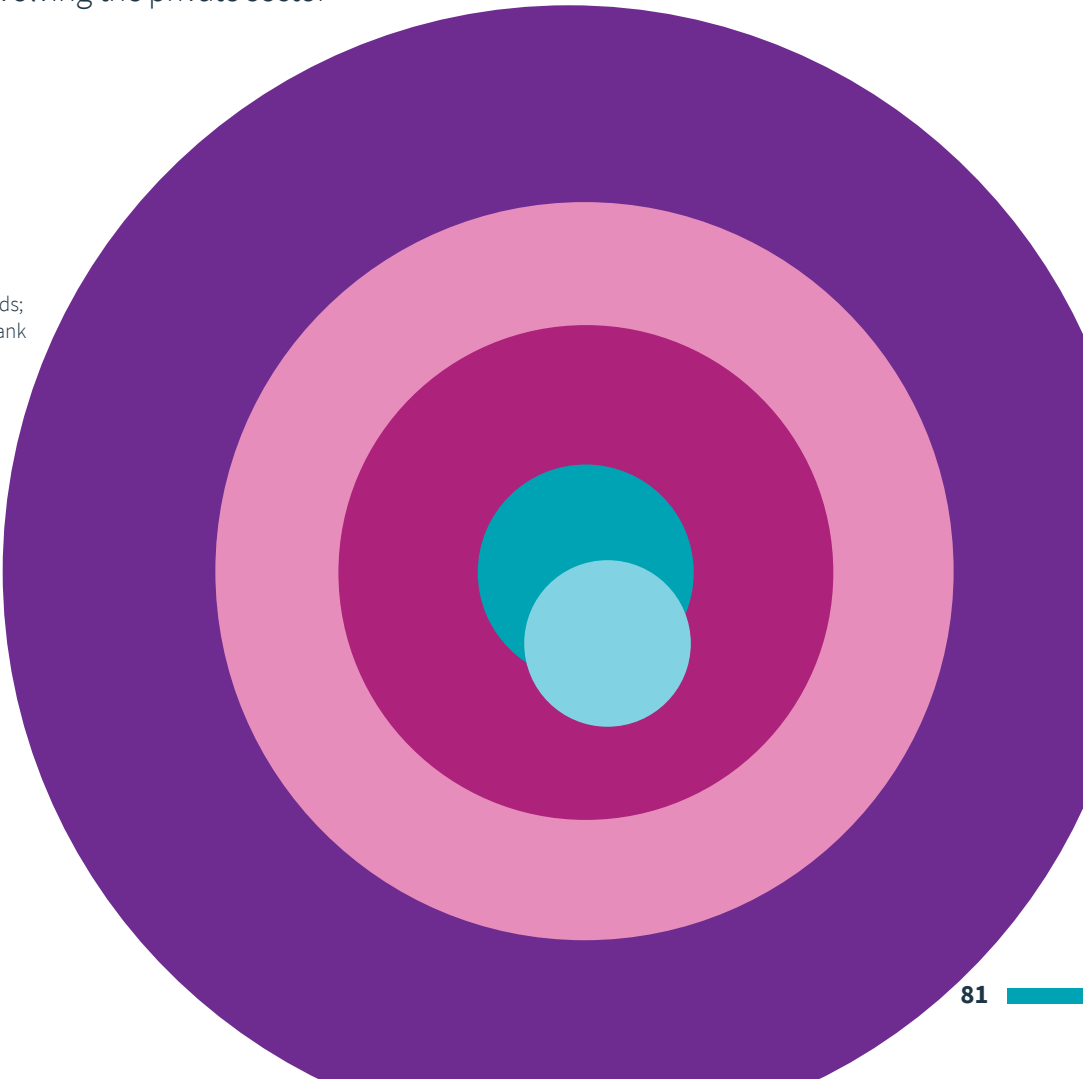


There are at least 33 cases worldwide being taken against carbon majors – the energy and cement companies identified by Richard Heede as responsible for 63 per cent of carbon dioxide and methane emitted from 1751-2010.

There are also a growing number of financial markets cases, focusing on financial risks, fiduciary duty and corporate due diligence – affecting banks, pension funds and asset managers. Other litigation seeks to have corporate human rights responsibilities recognised or to challenge carbon-intensive projects.

Direct and indirect cases involving the private sector

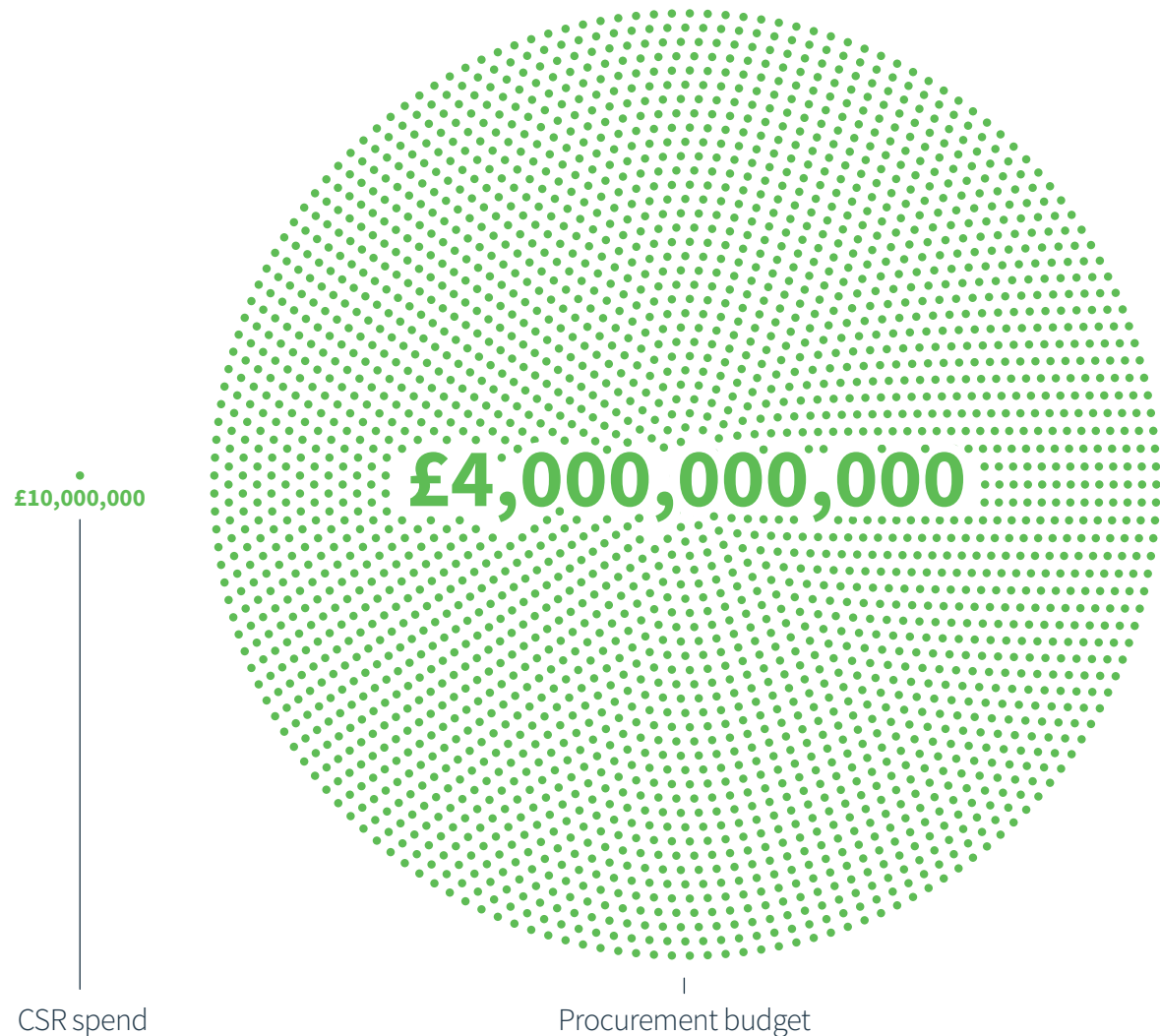
- Cases against government bodies that could impact corporate actors, e.g. Urgenda Foundation versus Netherlands; Client Earth versus Belgian National Bank
- Financial markets cases, e.g. McVeigh versus REST
- Cases against high-emitting corporations, e.g. Smith versus Fonterra
- Cases against carbon majors, e.g. Milieudefensie versus Shell
- Cases involving high-emitting projects, e.g. Client Earth versus Polska Grupa Energetyczna



The ripple effect

CSR spending and procurement budgets

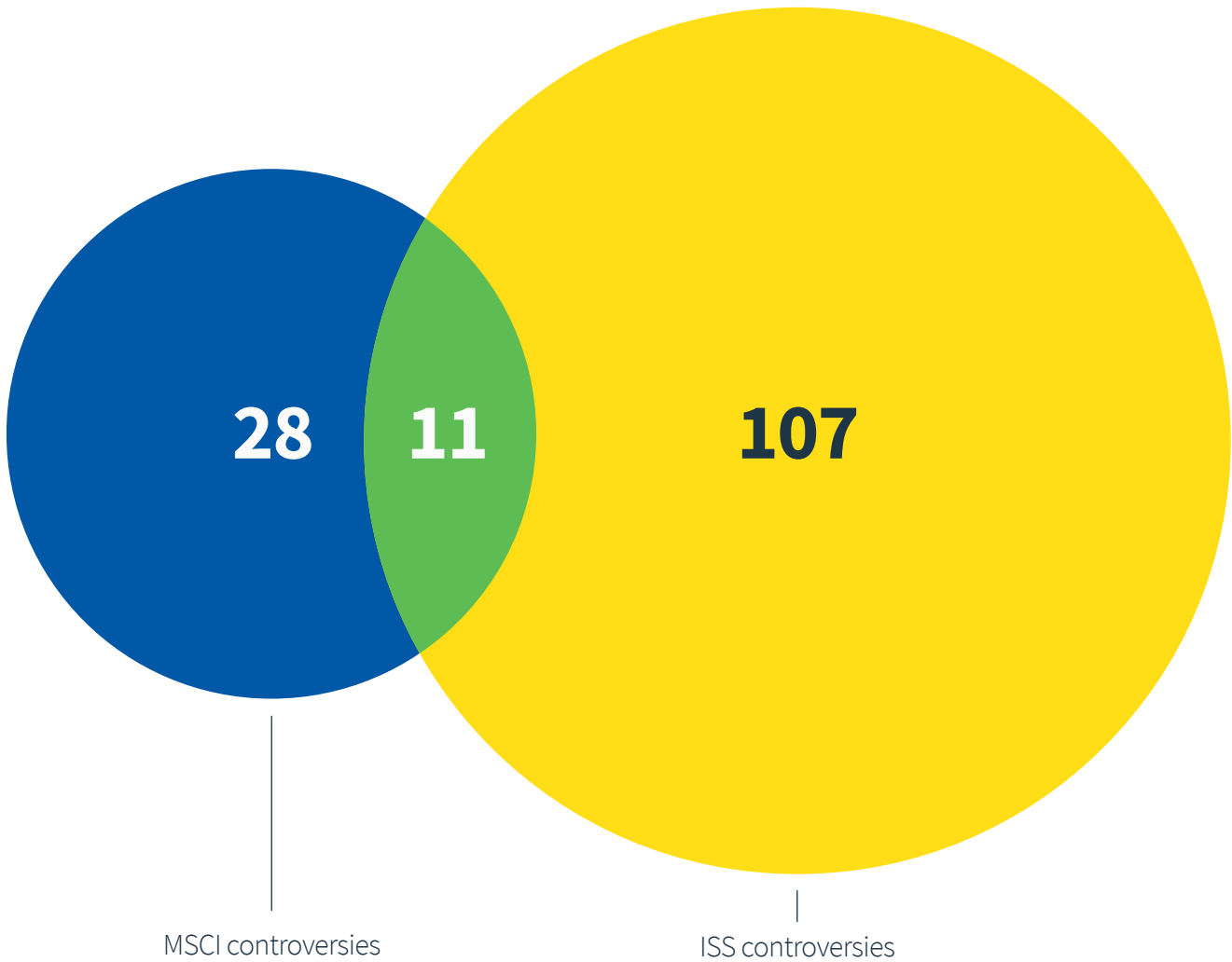
The average FTSE 100 company spends a whopping 400 times more on its procurement budget than it does on corporate social responsibility (CSR) initiatives. Viewed through one lens this is depressing, but it also highlights the latent power within supply chains to tackle environmental and social issues. Each firm can play a part in forcing change among the suppliers it is connected to in the value chain.



Don't trust the numbers

Why controversy scores can be misleading

While many investors use controversy scores as a filter to screen out risky companies, these have serious limitations. Our analysis shows leading controversy scoring systems offered by MSCI and ISS have little in common – only 11 companies show up on both datasets. This suggests investors should start cross-checking the scores and only use them as a starting point for further due diligence.



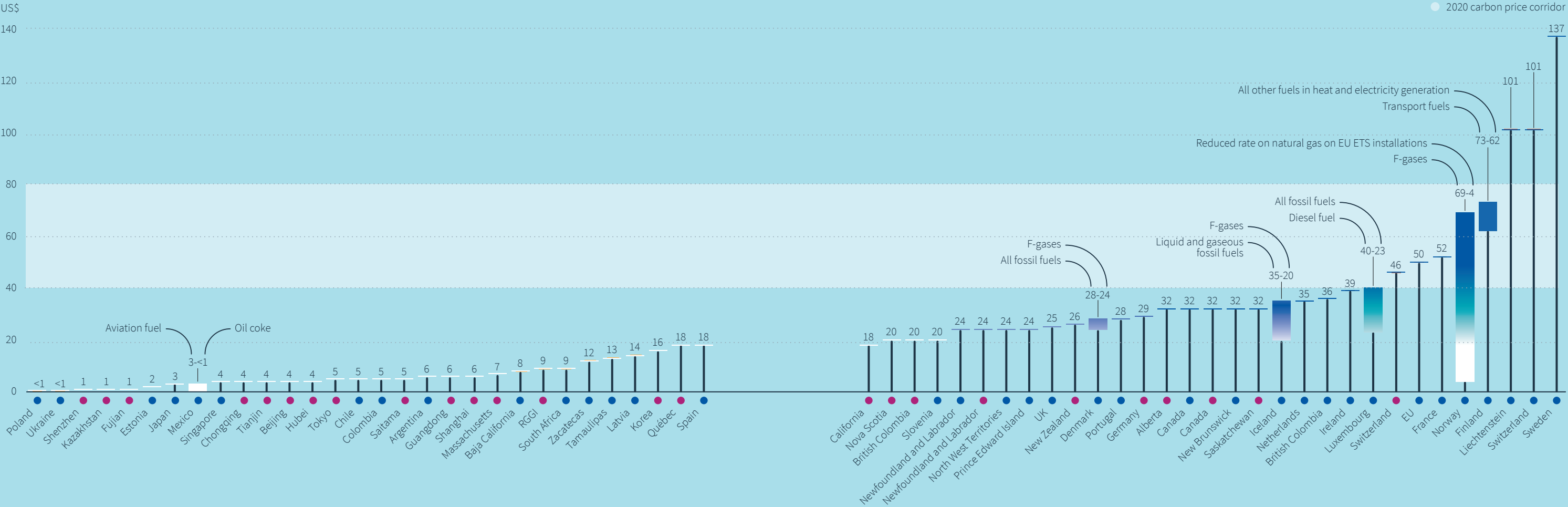
Carbon pricing is on the rise...

...but remains woefully inadequate

Carbon pricing schemes have been growing in number and ambition. According to the World Bank, as of 2021 there are 64 initiatives, either emissions trading schemes or carbon taxes, in operation. In 2021, 21.5 per cent of global greenhouse gas emissions are covered by carbon pricing instruments. The chart below shows a breakdown of these schemes; the white area indicates the World Bank's recommended carbon price corridor.

The fact remains that the world fails to price nearly 80 per cent of emissions, and the levy on the minority of emissions that are taxed is woefully inadequate. Worldwide CO₂ emissions totalled around 34 billion tonnes in 2020, while carbon revenues are estimated to be \$53 billion. That implies an average carbon tax rate of just \$1.60 per tonne, a tiny fraction of the cost many environmental economists are calling for as a matter of urgency to tackle climate change.

Carbon prices, 2021

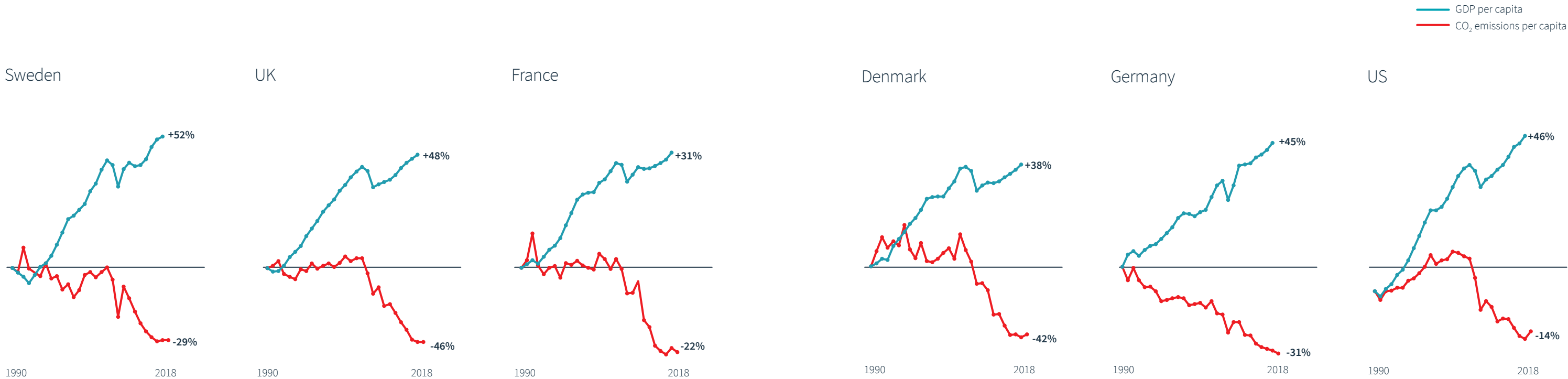


More from less

Major economies are slowly decoupling growth from emissions

A common narrative in developed market media and society is that we use too much stuff. While this is undoubtedly true – who couldn't do without much of their accumulated tat – there are encouraging signs that economic growth and things like energy use and agricultural inputs, as well as metal and other material usage, are decoupling.

Economist and technologist Andrew McAfee, whose book provides this page's heading, argues a more service-led economy, focused on intangible assets (data and the like), should be one with a lighter environmental footprint – so long as we learn to control data-centre carbon emissions, that is. Think about all those gadgets your smartphone has made redundant.



How safe is your energy supply?

One more reason to wean ourselves off fossil fuels

Death rates from energy sources, per terawatt-hour produced

Coal
24.6

Oil
18.4

Nuclear energy
0.07

Wind
0.04

Hydropower
0.02

Solar
0.02

Biomass
4.6

Natural gas
2.8

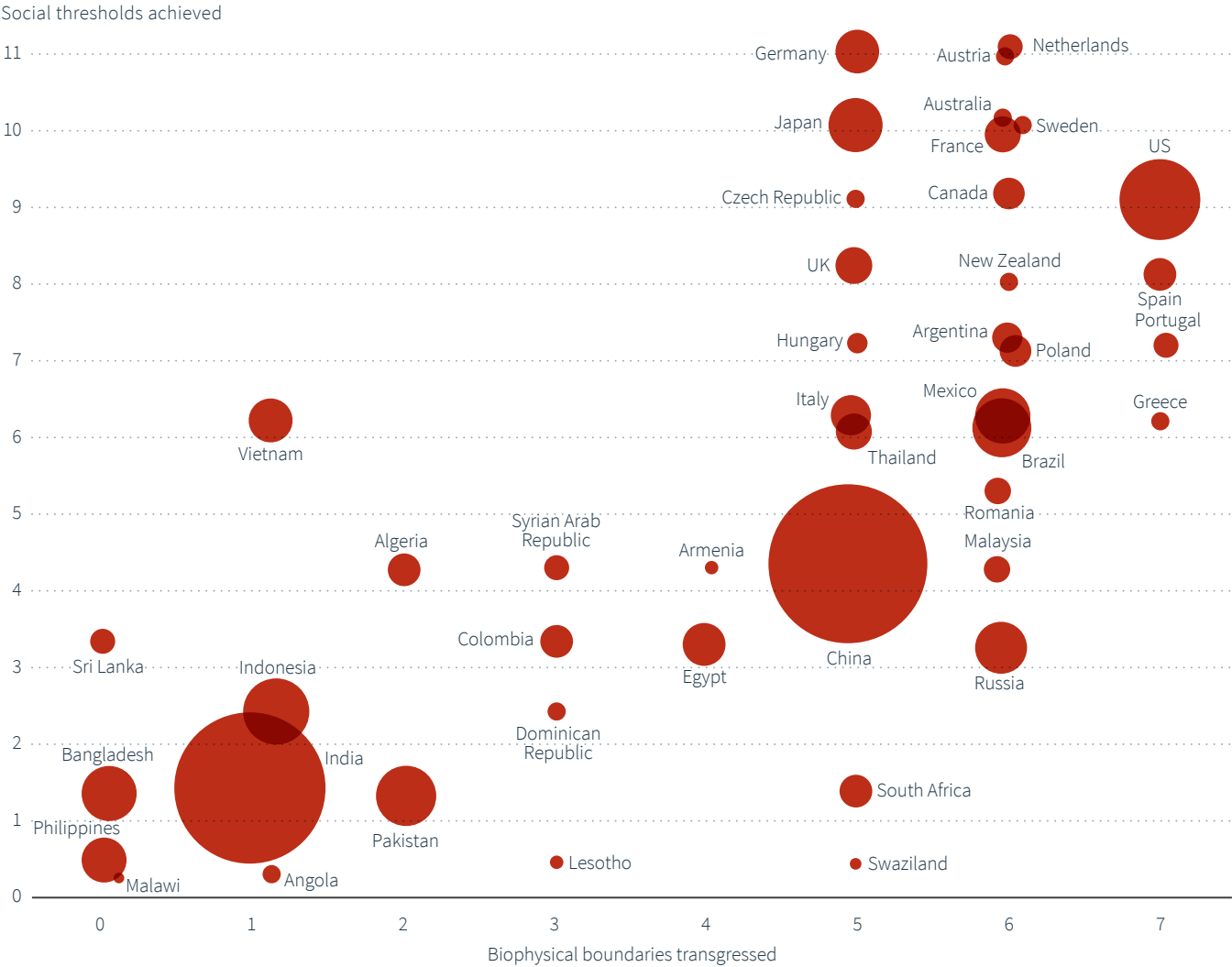
While the threats posed by climate change are the most obvious incentive to transition away from fossil fuels, the health risks associated with them offer another. As the chart reveals, mortality rates caused by accidents and air pollution for coal and oil, measured by the number of deaths per terawatt-hour of energy produced, are significantly higher than for other sources. This is particularly troubling given that coal and oil respectively account for 25 per cent and 31 per cent of global energy.

It may surprise some that nuclear energy – long viewed as a pariah, in large part due to health concerns – has historically been one of the safest sources. While it has struggled to escape a complex history, it is increasingly being viewed as an important alternative to renewables in a low-carbon world, including by the French and UK governments.

Charting a just transition

Can everyone have everything?

Social versus environmental indicators by country

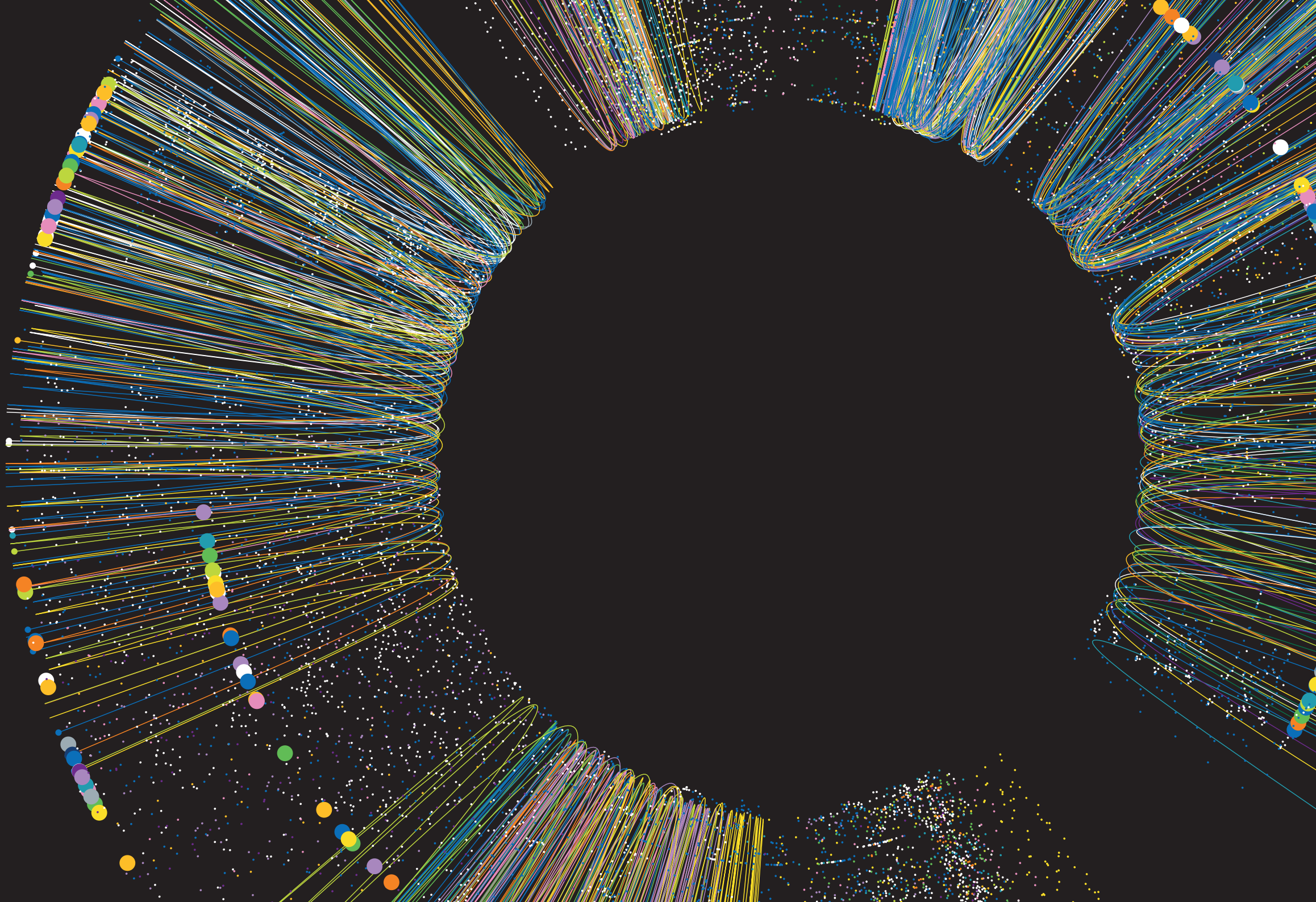


Despite the encouraging signs from ‘More from less’ (see pp88-89), we are still consuming too much. This chart from the University of Leeds shows there are currently no countries in the world meeting the needs of their citizens while staying within the planet’s sustainability limits. It plots performance on seven environmental sustainability indicators and 11 minimum social thresholds needed to achieve a “good life”.

In an ideal world, every country would occupy the top left corner of the graphic, matching high living standards with a small environmental footprint. In reality, poorer countries tend to perform badly on social metrics and better on environmental ones; the reverse holds true for richer countries.

So, how can we raise living standards without burning the planet? This is the goal of a just transition: to ensure low-income countries can move up the Y axis of the chart without moving right along the X axis. Financial support from richer nations will be a key part of the solution.

**Diversity and
inclusion**



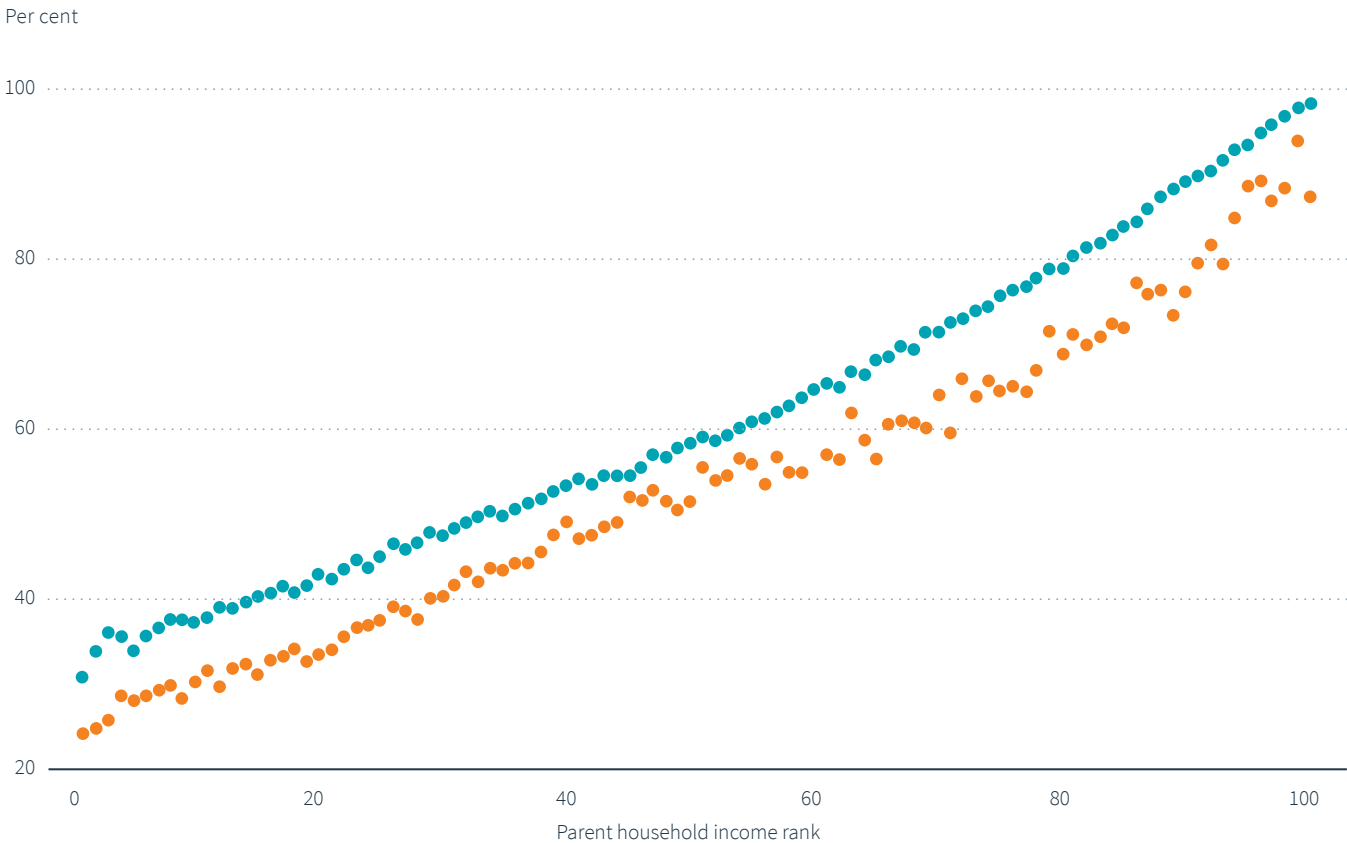
Race, class and opportunity in America

How inequality compounds over generations

The Black Lives Matter movement has shone a light on the persistence of anti-black racism in Western societies. Research from Raj Chetty of Harvard University suggests how deep rooted the problem is.

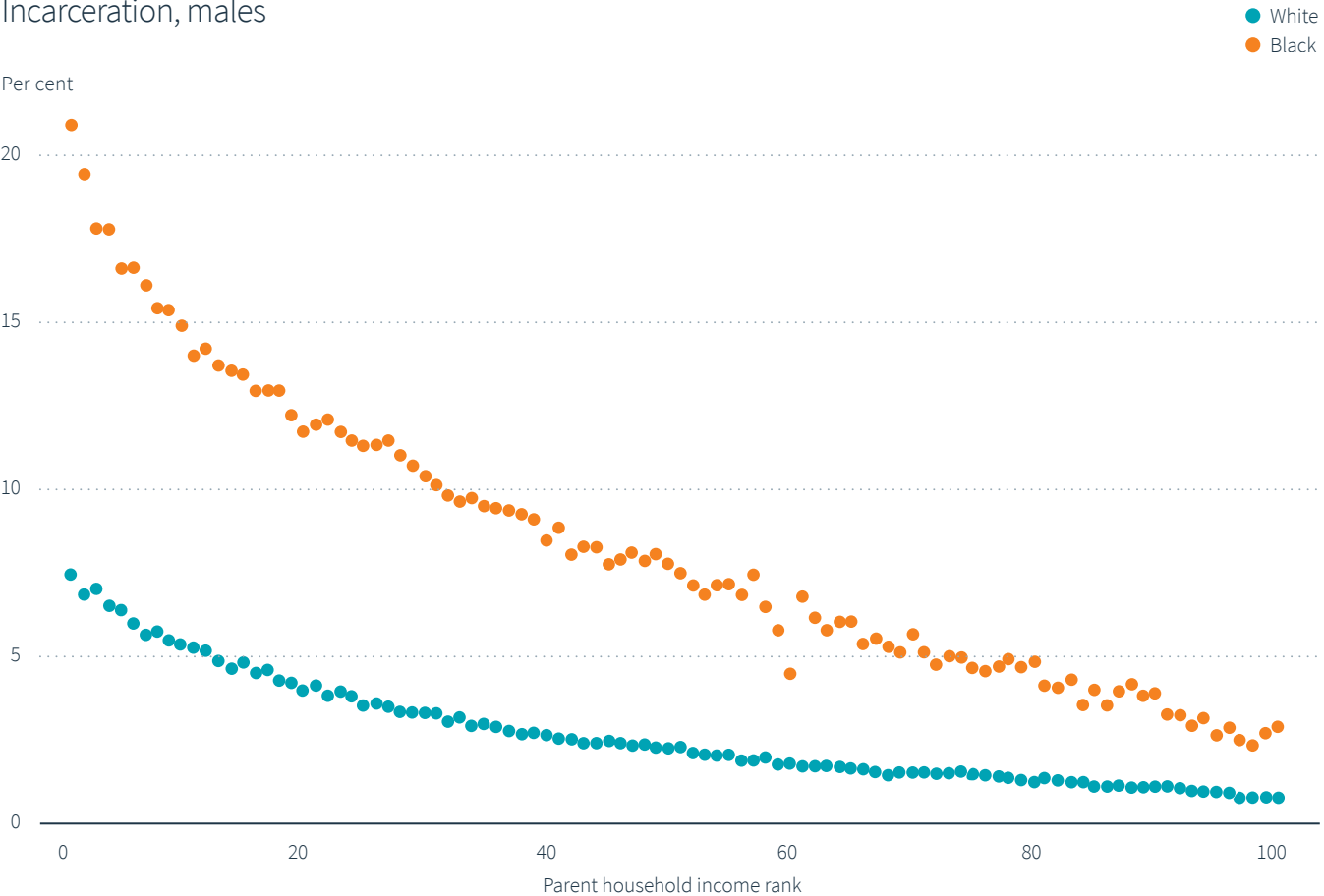
Chetty and his colleagues analysed data on children in the US born between 1978 and 1983. Investigating the sources of racial disparities in income, they looked at factors such as parental wealth, educational achievement and incarceration rates, finding black Americans had much lower rates of upwards social mobility than white Americans. They also uncovered a particularly large disparity between the incomes of white and black men.

College attendance rates, males



These charts show how structural racism affected the life chances of a generation of black male children, with those from poorer backgrounds suffering a particular lack of opportunity. The chart on the left shows the relationship between the children's college attendance rates and their parents' household income; the chart below shows incarceration rates in later life among the same cohort, indicating an institutionally racist system. Reducing the black-white income gap will require “policies whose effects cross neighbourhood and class lines and increase intergenerational mobility”, the authors argue.

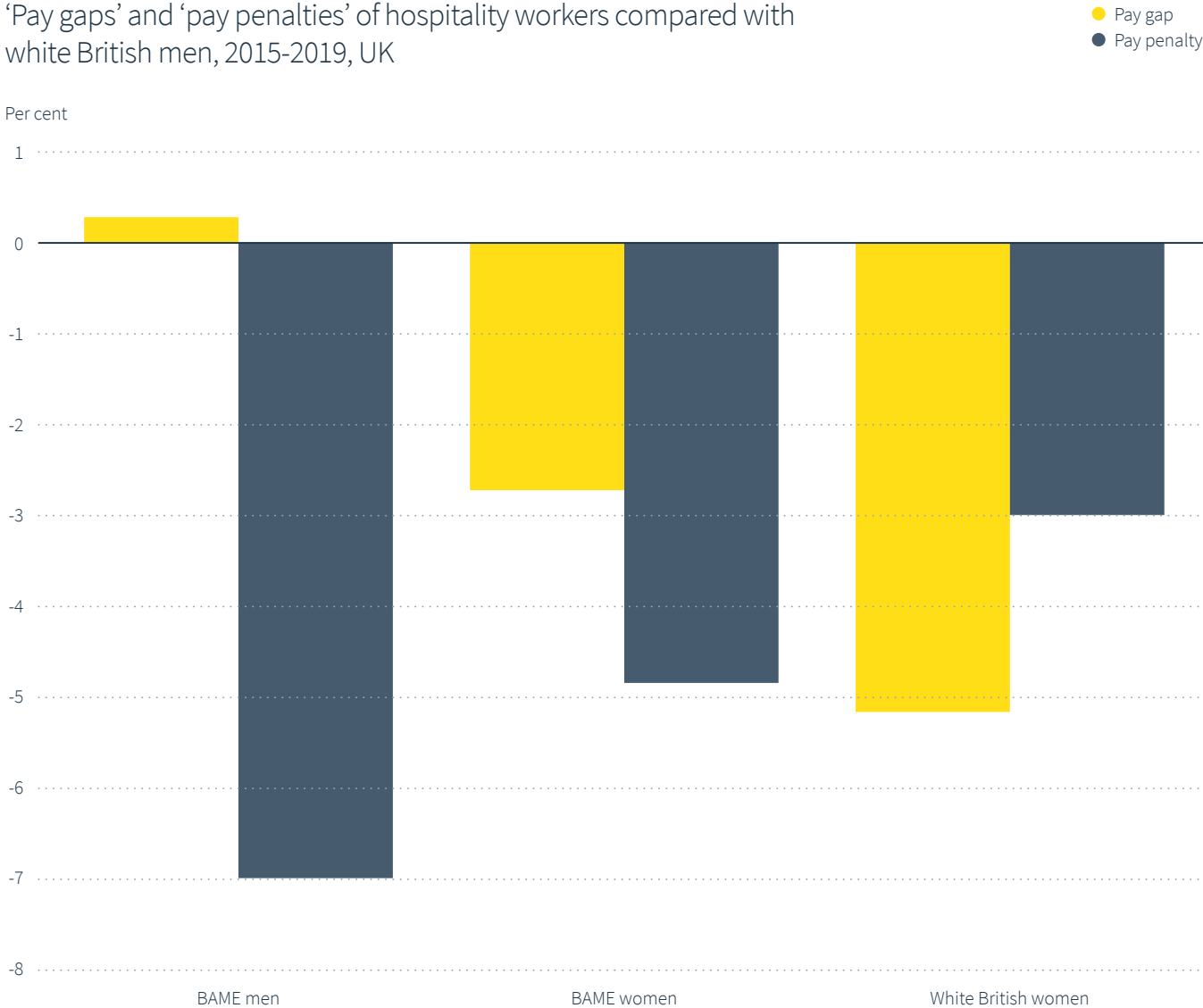
Incarceration, males



An inhospitable environment

Inequality in the hospitality industry

‘Pay gaps’ and ‘pay penalties’ of hospitality workers compared with white British men, 2015-2019, UK



The COVID-19 pandemic hit the hospitality industry hard, as large parts of the sector were shuttered under lockdowns. Research from the Resolution Foundation suggests this will have affected black, Asian and minority ethnic (BAME) hospitality workers disproportionately, as they were already earning less than their white colleagues in the run-up to the crisis.

This chart shows the incomes of white women, BAME women and BAME men relative to white men in UK hospitality between 2015 and 2019, indicating evidence of pay gaps and pay penalties. Pay gaps are the raw pay difference that exists before controlling for compositional factors (individual characteristics such as age, region of residence, level of qualifications and contract type); pay penalties are pay differences that exist even after controlling for compositional factors.

It's all connected

How intersectionality can help in the fight for equality

“If we aren’t intersectional, some of us, the most vulnerable, are going to fall through the cracks.”

– Kimberlé Crenshaw

In 1976, Emma DeGraffenreid teamed up with a group of other black women to sue General Motors for discrimination – they argued the company segregated its workforce by race and gender, with ‘black’ jobs going to black men and ‘white’ jobs going to white women. The court dismissed their claims on the basis General Motors was not discriminating on the grounds of colour (it was hiring black men) or gender (it was hiring black women). In other words, the specific form of discrimination faced by black women was invisible from a legal point of view.

The academic Kimberlé Crenshaw drew on this case in defining the concept of intersectionality, an approach that highlights how different social categories combine in ways that create new forms of disadvantage. The graphic on the right shows some of the human characteristics captured by an intersectional view. We must ensure power is no longer concentrated among the identities in the middle, and distributed more fairly across the circle.

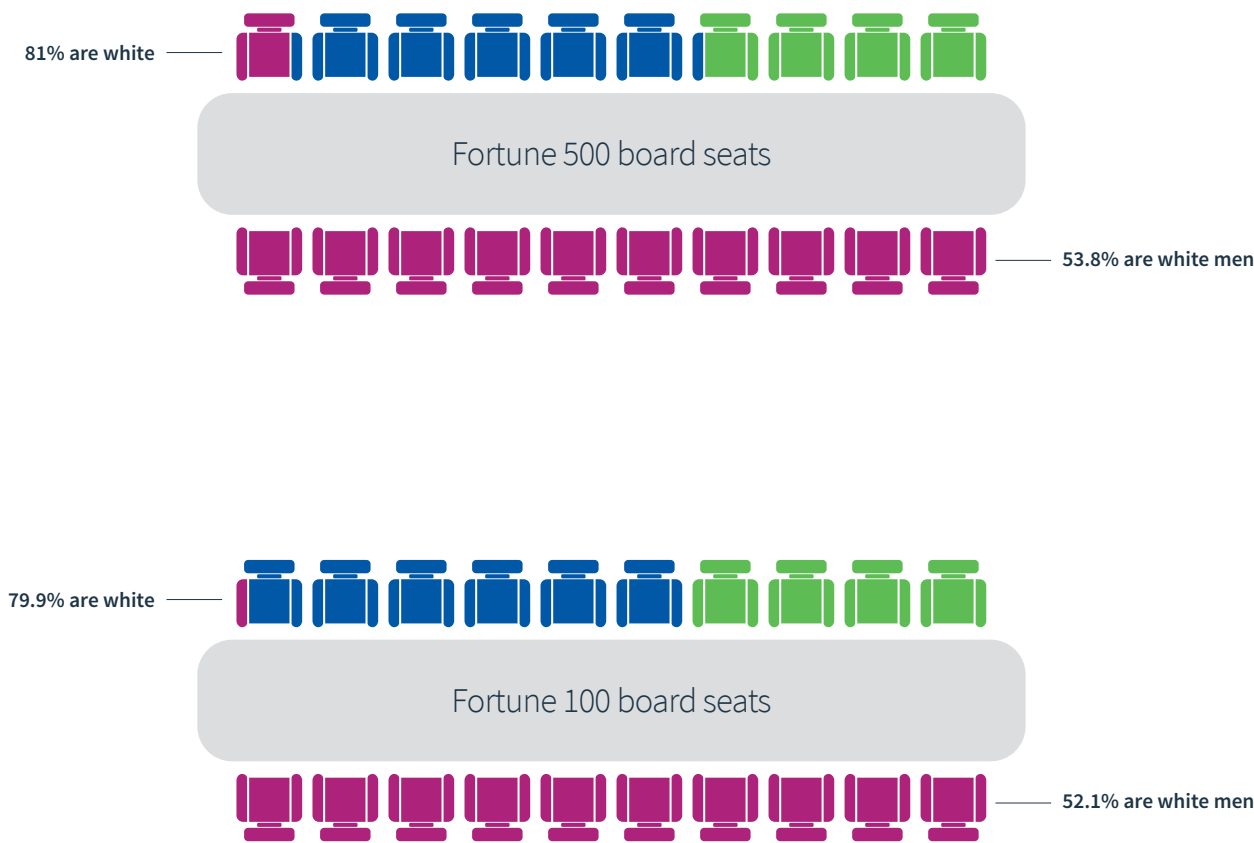


The diversity deficit

The example of US Fortune 100 and Fortune 500 companies

Composition of new directors at Fortune 100 and Fortune 500 companies, 2020

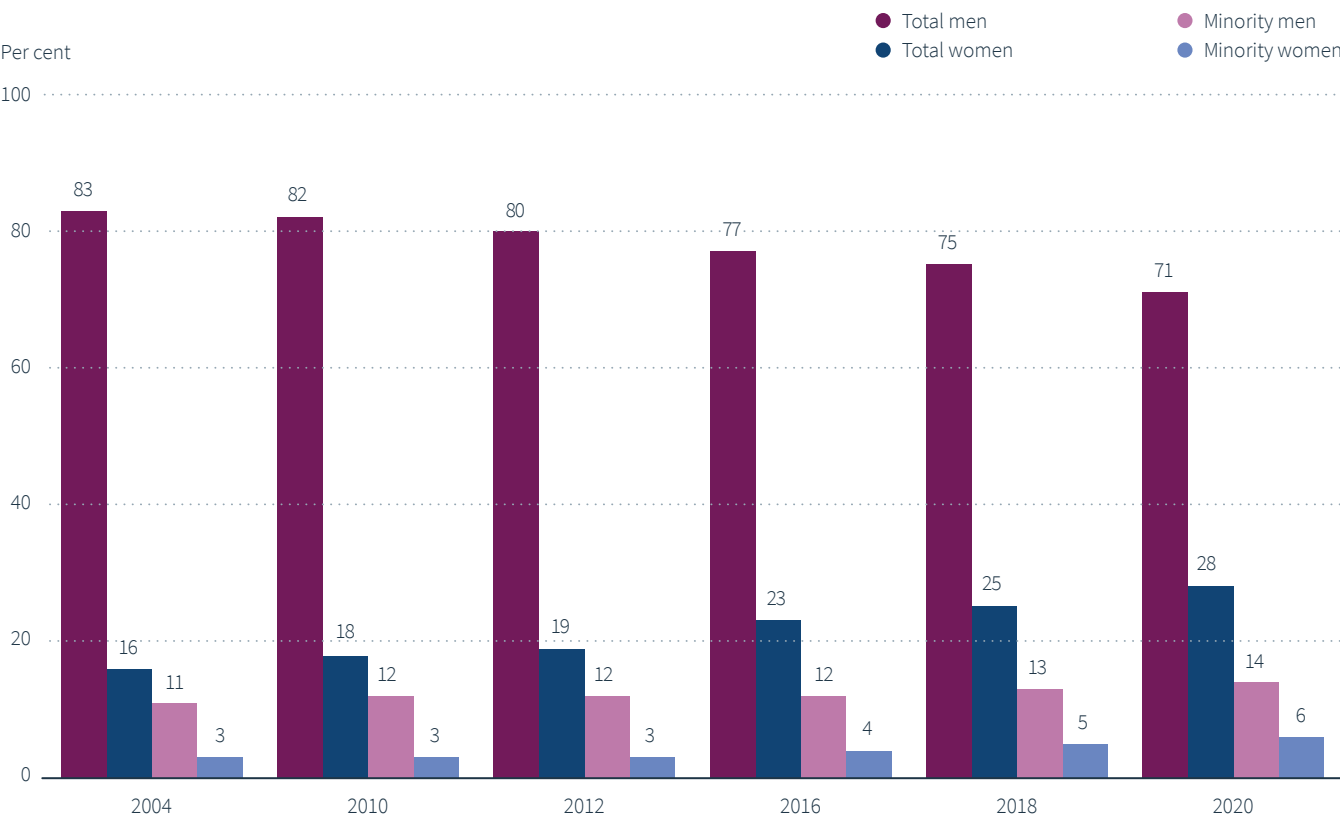
- White men
- White women
- Minorities



While there have been some gains in US board diversity, at the current rate, achieving proportional representation could be decades away. Progress has also largely been due to the increase of white women on boards. In contrast, minority men's representation in the Fortune 500 has been growing at less than 0.5 per cent a year since 2010.

In addition, nearly 36 per cent of diverse board seats are occupied by people on multiple Fortune 500 boards – not accounting for seats they may hold outside the Fortune 500. The opportunities need to be spread more widely among diverse board candidates.

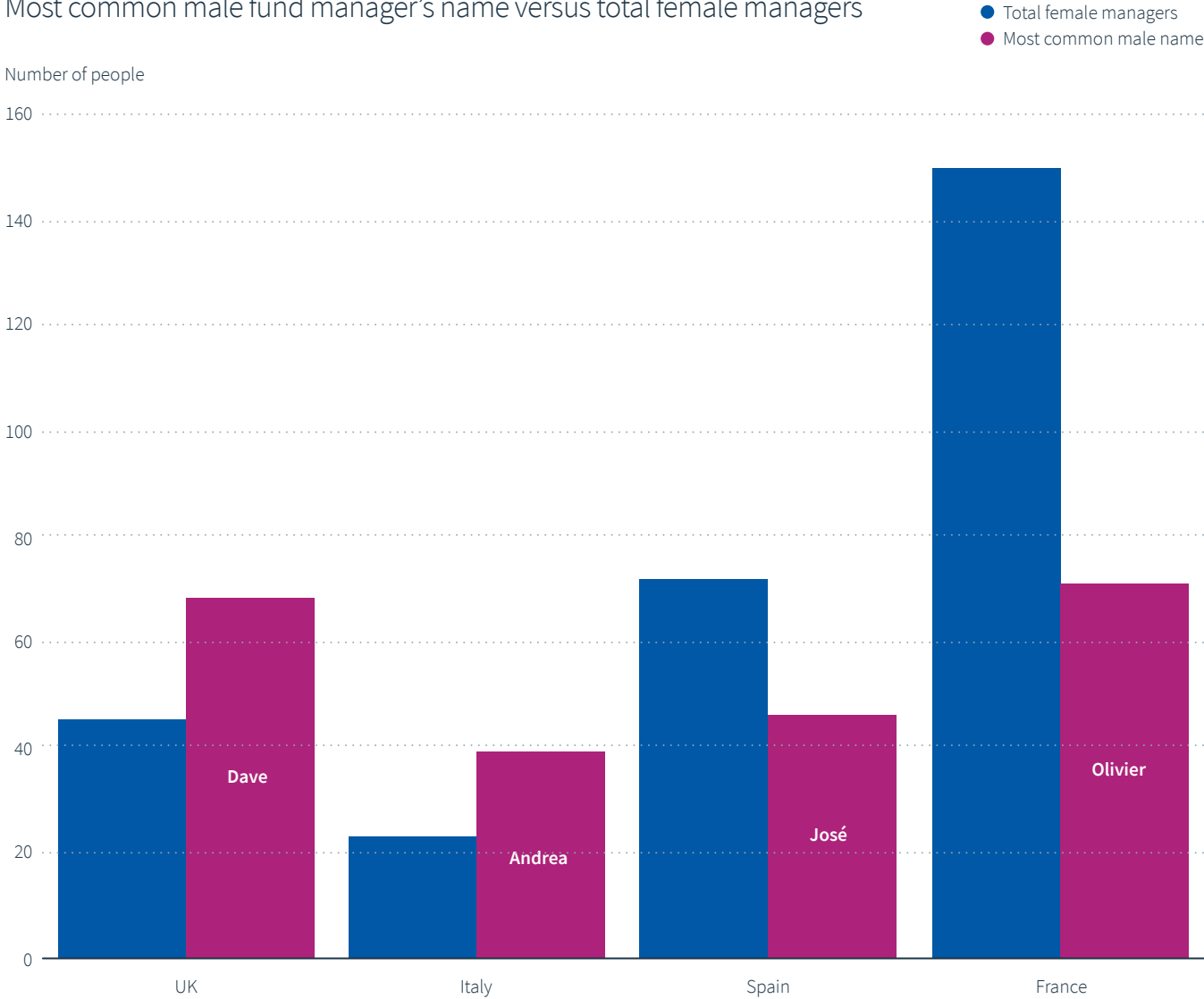
Fortune 100 board seats held



What's in a name?

Men still dominate the investment industry

Most common male fund manager's name versus total female managers

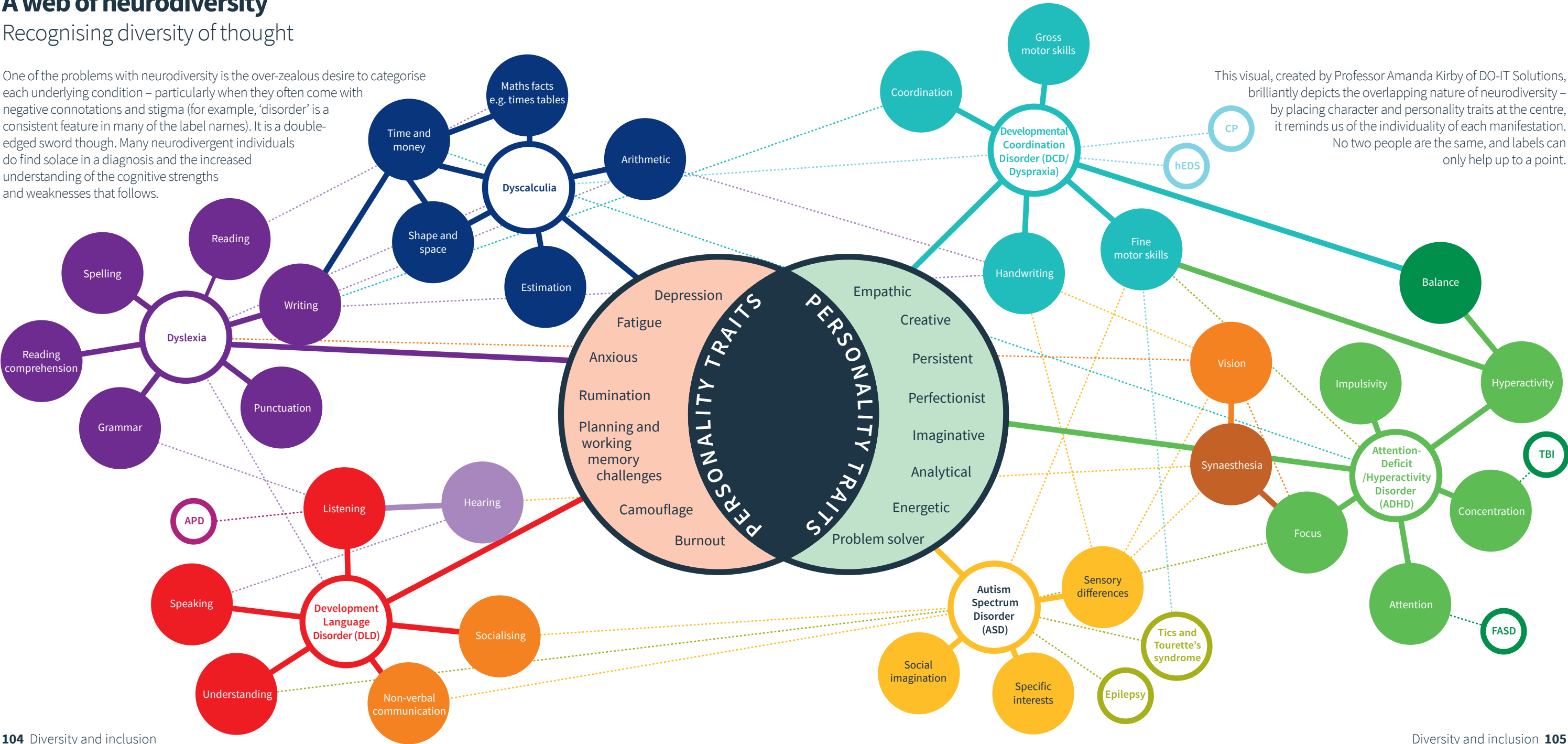


It's quite alarming there are more fund managers called Dave in the UK than there are female fund managers. The same situation applies in Italy – just swap Andrea for Dave. While the situation is slightly better in France and Spain, where there are at least more female managers of funds than those run by the most common male name, the overall picture highlights the considerable room for improvement in the investment industry on gender diversity.

A web of neurodiversity

Recognising diversity of thought

One of the problems with neurodiversity is the over-zealous desire to categorise each underlying condition – particularly when they often come with negative connotations and stigma (for example, ‘disorder’ is a consistent feature in many of the label names). It is a double-edged sword though. Many neurodivergent individuals do find solace in a diagnosis and the increased understanding of the cognitive strengths and weaknesses that follows.



This visual, created by Professor Amanda Kirby of DO-IT Solutions, brilliantly depicts the overlapping nature of neurodiversity – by placing character and personality traits at the centre, it reminds us of the individuality of each manifestation. No two people are the same, and labels can only help up to a point.

It's coming home

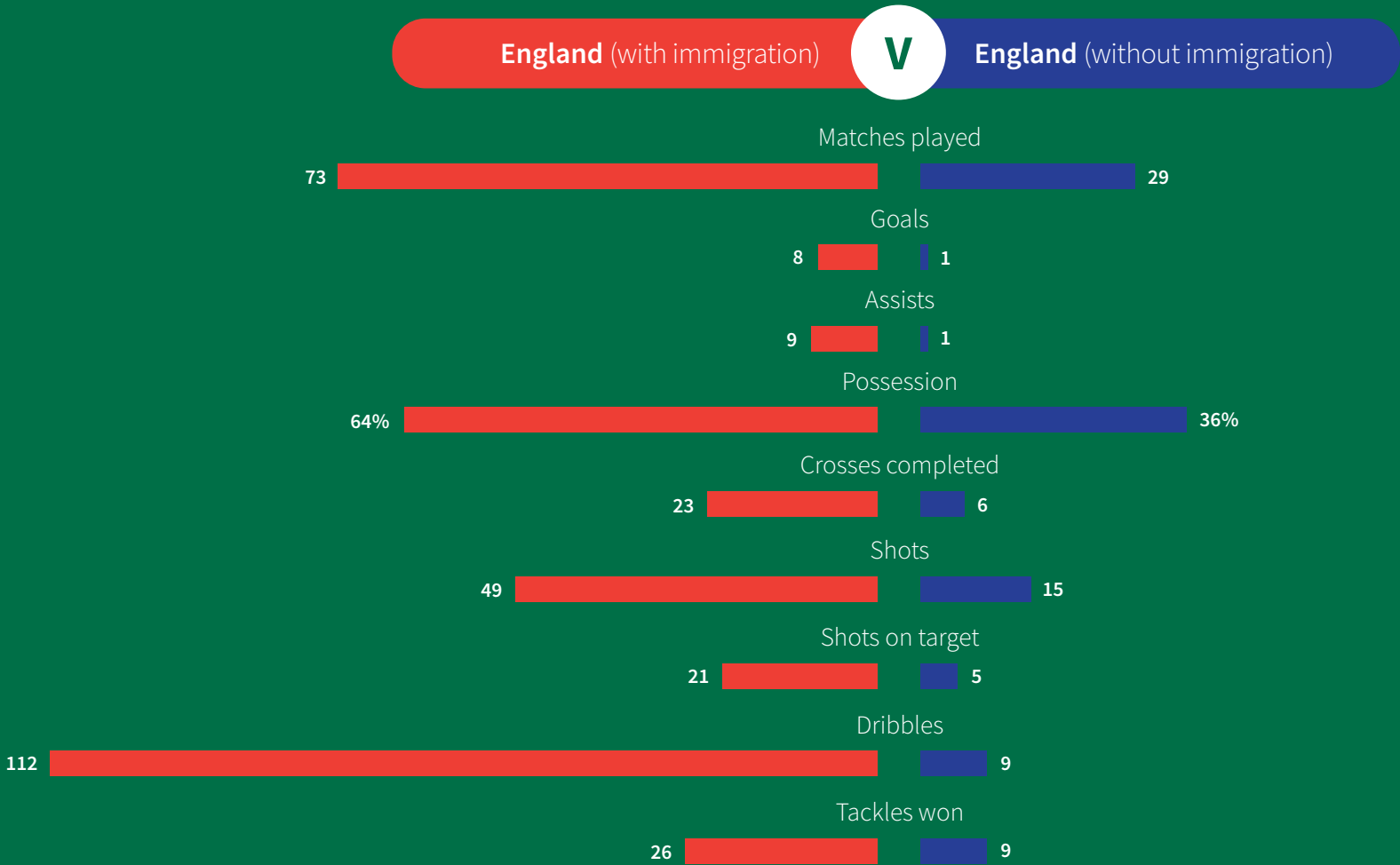
Would England win without immigration?

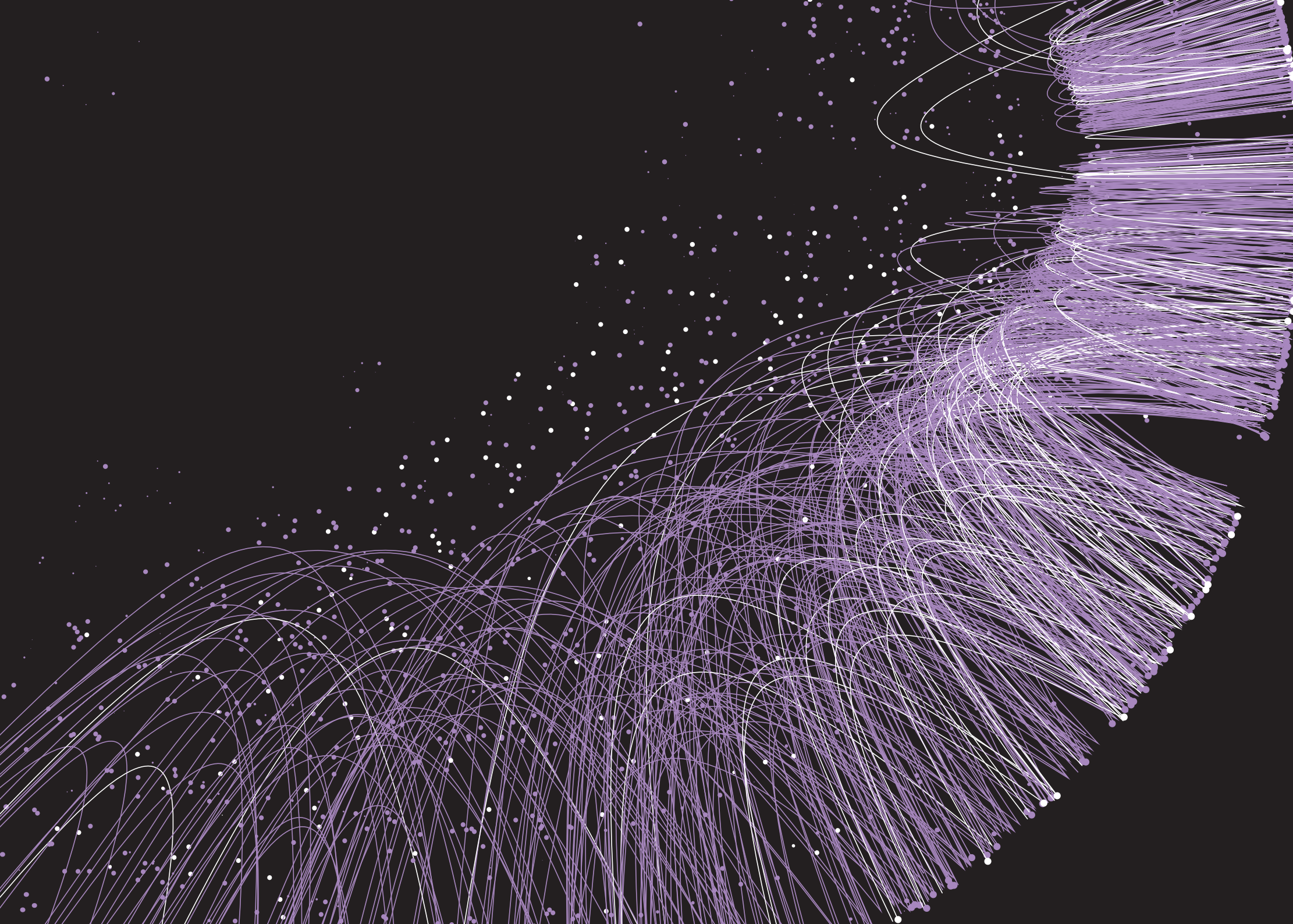


During their progress to the final of the European Championships, the England men's football team did more than just perform on the pitch. They donated match fees to the NHS, spoke eloquently about the need to tackle racial injustice and celebrated the presence of LGBTQ+ fans in the crowds.

The fans who booed as the players took the knee – not to mention the senior politicians who refused to condemn the abuse – might want to reflect on how the team would have fared without immigration. Harry Kane's father moved to London from Ireland. Raheem Sterling was born in Jamaica. Bukayo Saka has Nigerian parents.

In this chart, we have crunched the data to show the contribution of England players from migrant backgrounds to the team's performance during the tournament. It's a decisive victory for an open, inclusive England.





Markets and economies

Trading places

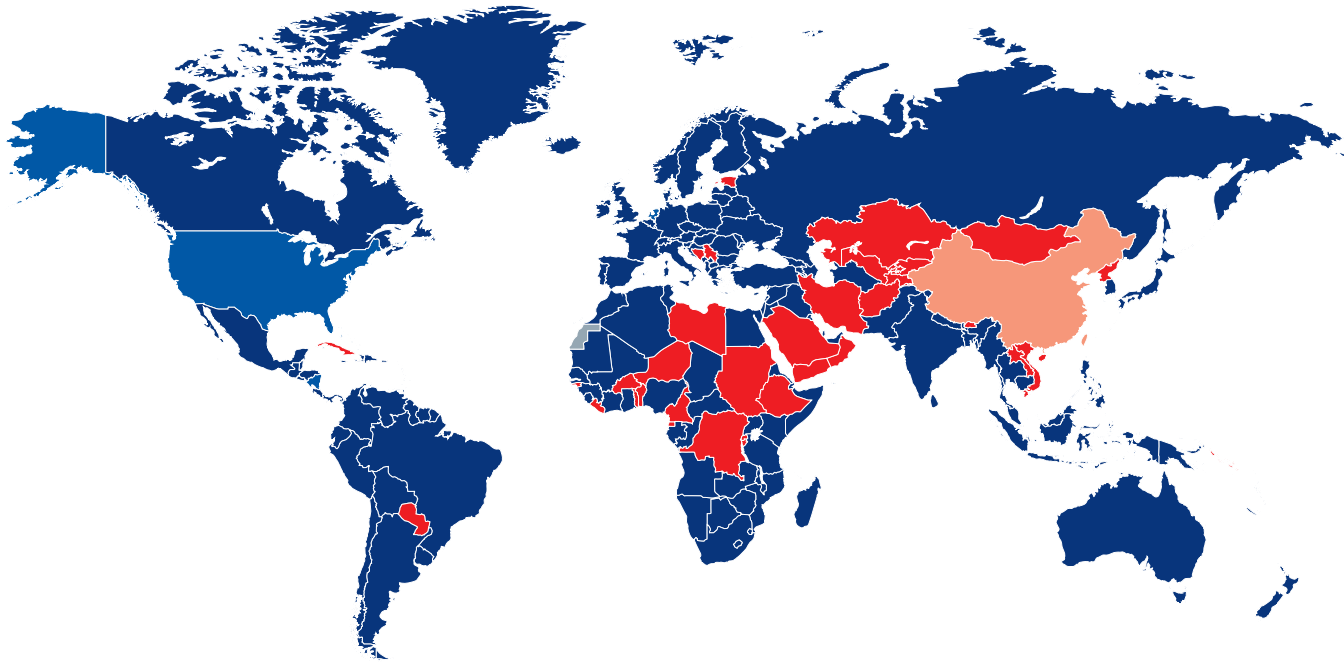
Do countries trade more with the US or China?

In 2000, US President Bill Clinton gave a speech at Johns Hopkins University, explaining why he was backing China’s entry into the World Trade Organisation (WTO). He argued the deal was in the US’s economic interests and could lead to change within China, too: “If you believe in a future of greater openness and freedom for the people of China, you ought to be for this agreement.”

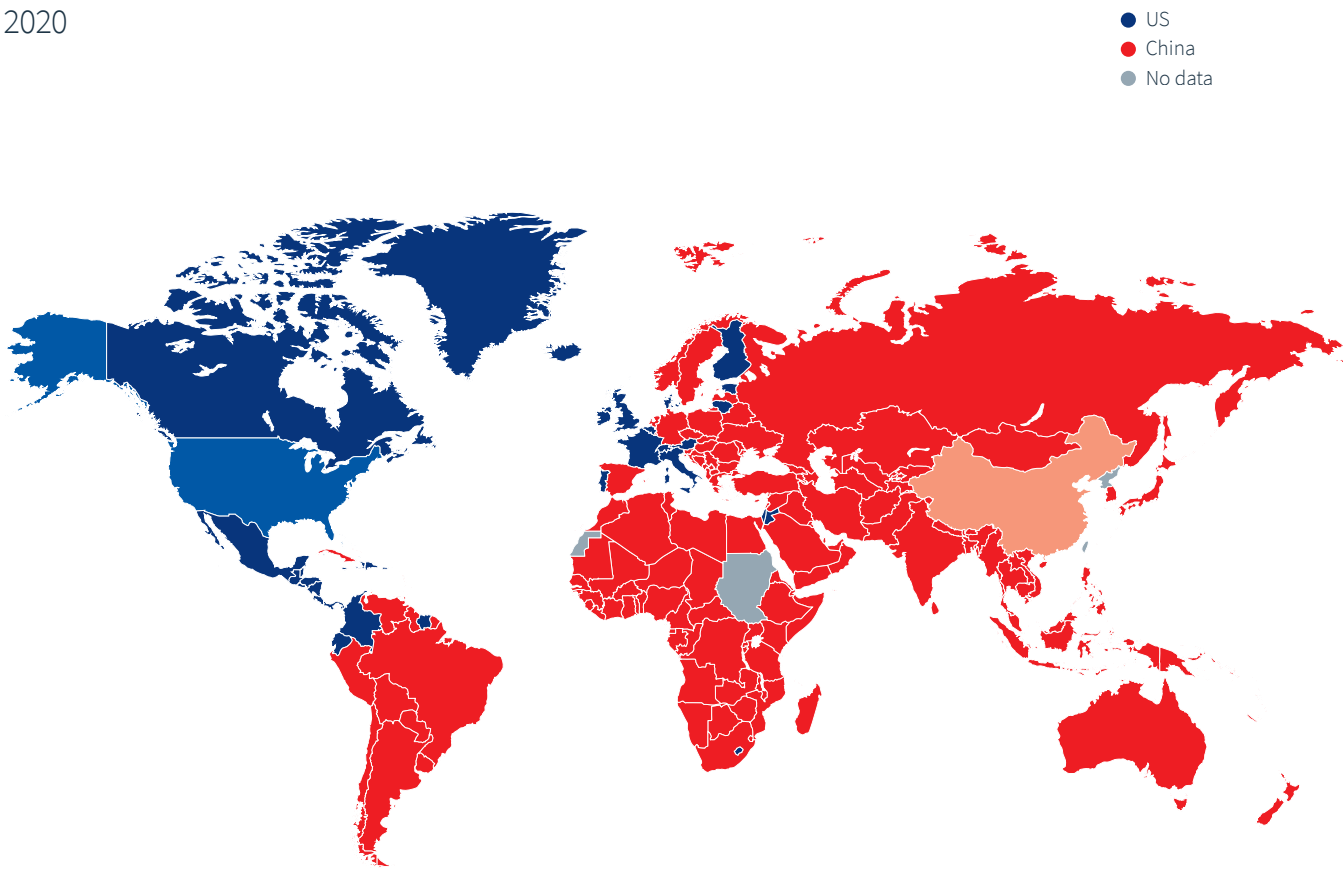
Clinton was right that entering the WTO would raise living standards in China, but the country’s authoritarian turn under Xi Jinping shows he was wrong on freedom. Whether the US will continue to benefit economically is also open to debate – these maps show how China has displaced the US as the major trading partner of countries across the world.

China versus US trade, 2000

In per cent of debtor GDP



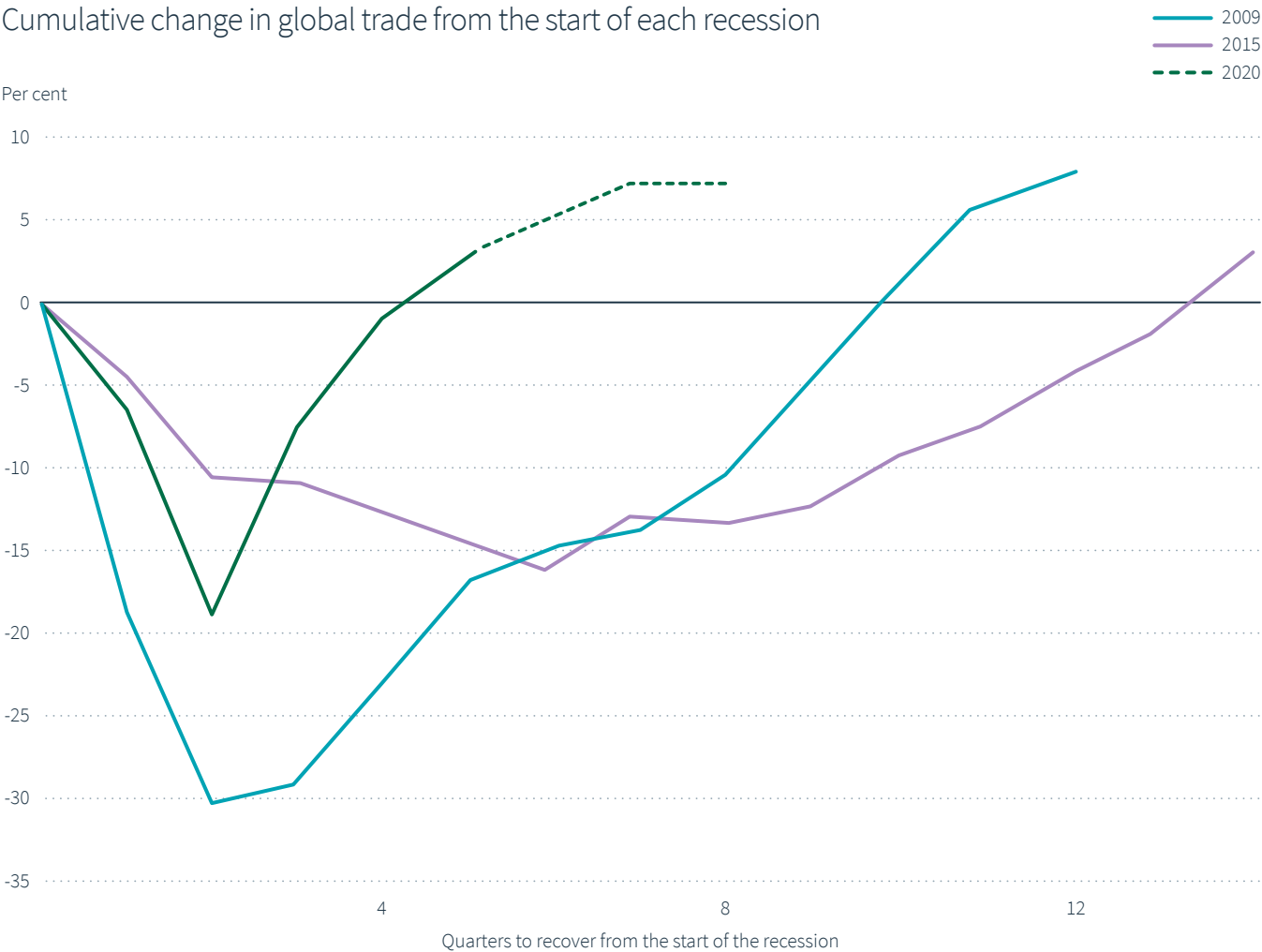
2020



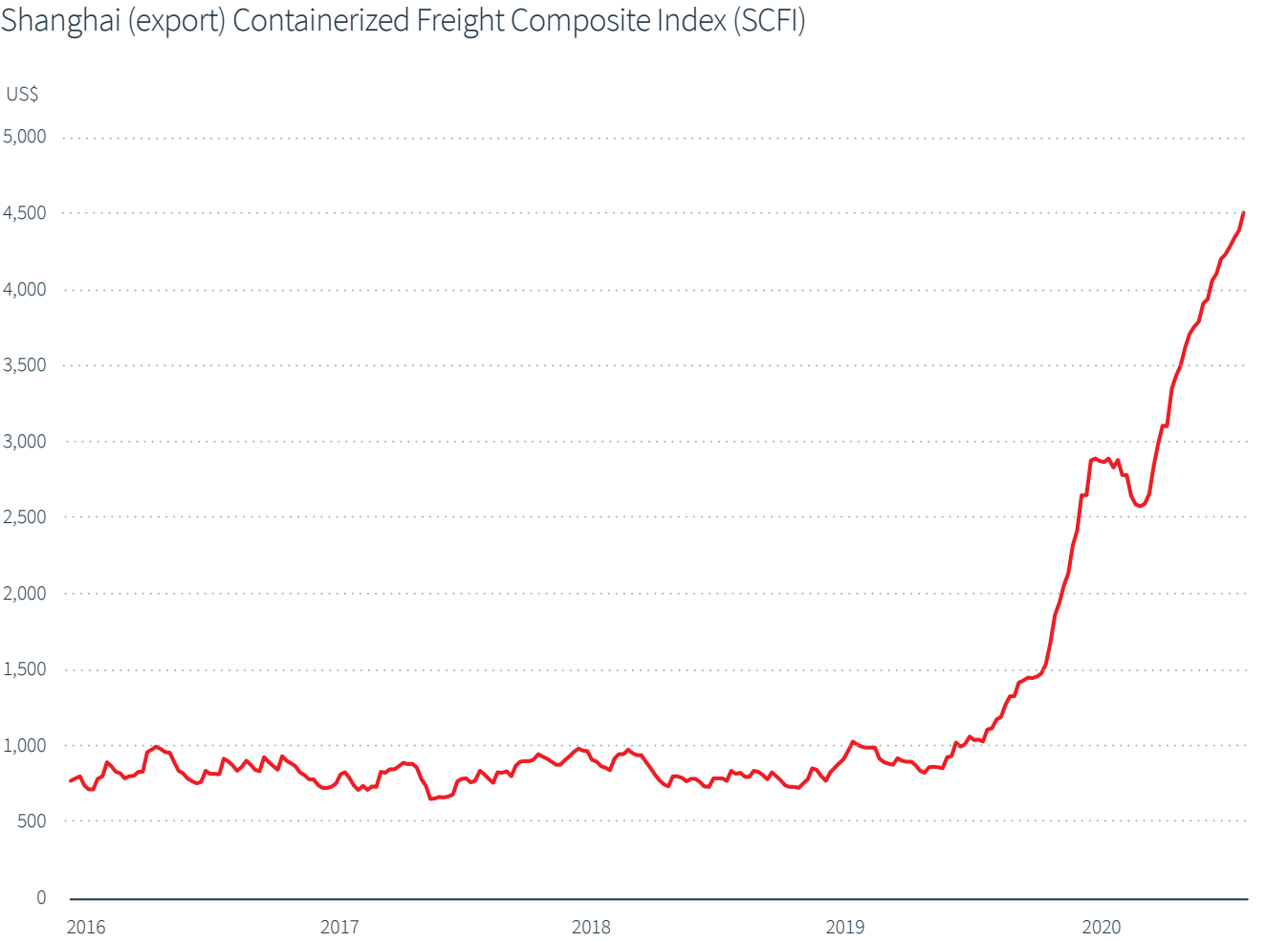
Trade bounces back...

...but at what cost?

The chart below shows global trade recovered much quicker post-COVID than after two other recent slowdowns – in 2009, following the financial crisis, and in 2015, when a slump in commodities prices and a downturn in Chinese industrial production hit activity.



But the resumption of trade doesn't come cheap. The chart below shows how the cost of container shipping from China to the US has spiked amid booming demand. There is also evidence shipping firms may be delaying adding capacity, due to uncertainty over whether new ships will be compliant with future climate regulation.



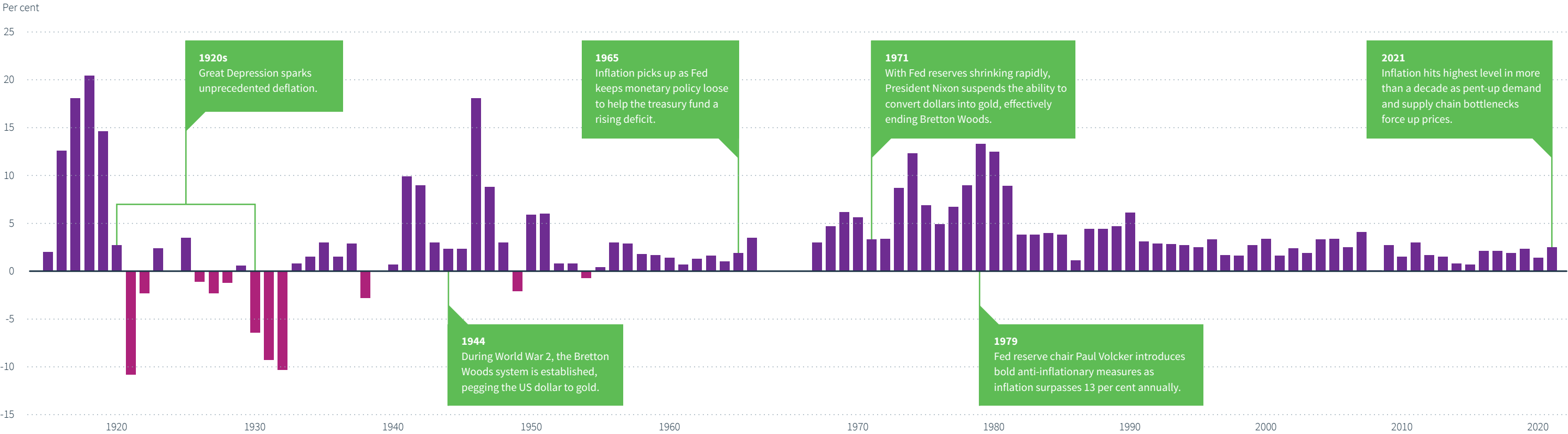
US inflation timeline

Could the US be entering a new economic chapter?

US inflation has trended steadily lower for the past four decades. The process began with the appointment in 1979 of Paul Volcker to lead the Federal Reserve. He jacked up interest rates to squeeze inflation out of the economy. While the policy was controversial, it ultimately proved successful and led to the Fed being able to conduct policy free of political interference. Deflationary forces were boosted by several other factors, notably the diminishing influence of unions and globalisation.

However, rising global commodity prices, supply chain bottlenecks, and pent-up demand in the domestic economy have forced US inflation to a 13-year high. While a return to the sky-high rates Volcker was appointed to tackle may be a distant prospect, weighing up how high inflation will rise is arguably the most important call investors need to make at present.

US annual inflation rate

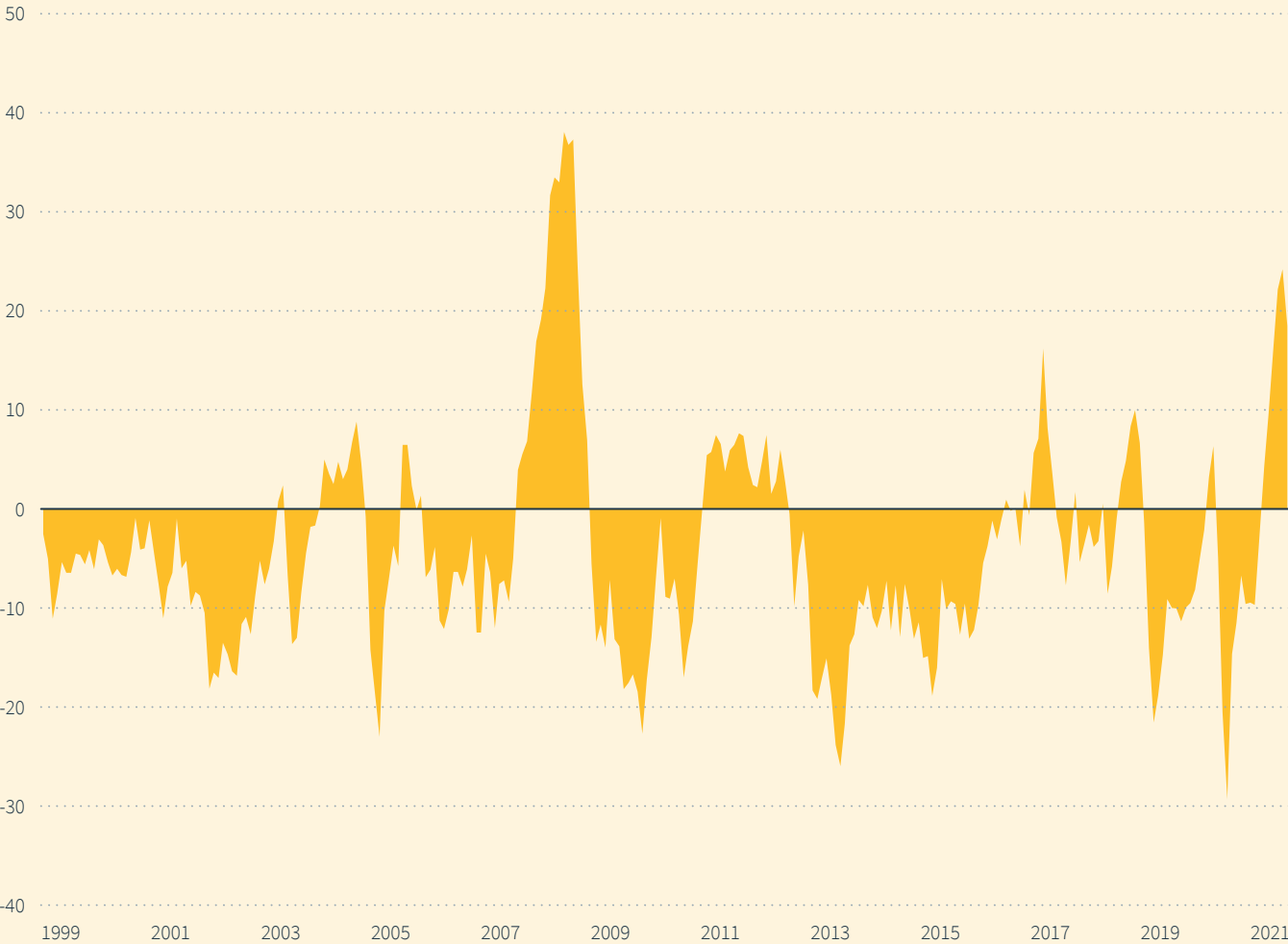


EM inflation catches market off guard

Inflation surprise index highest since 2008

Citigroup EM Inflation Surprise Index

Basis points



Citigroup's Inflation Surprise Index for emerging markets, which measures inflation figures relative to market expectations, recently hit its highest level since 2008. Investors have clearly underestimated inflation risk in these countries, and it looks like price pressures are set to rise further.

At the start of 2021, there was a widespread view interest rates in emerging nations, as in the developed world, would remain depressed as monetary authorities allowed their economies to heal from the deep damage wrought by the pandemic.

Just six months later, investors have been caught by surprise. As economies re-open, the notion inflation will prove transitory is being challenged. But whereas some central banks in the developed world are poised to look through price pressures, their emerging market counterparts are less likely to.

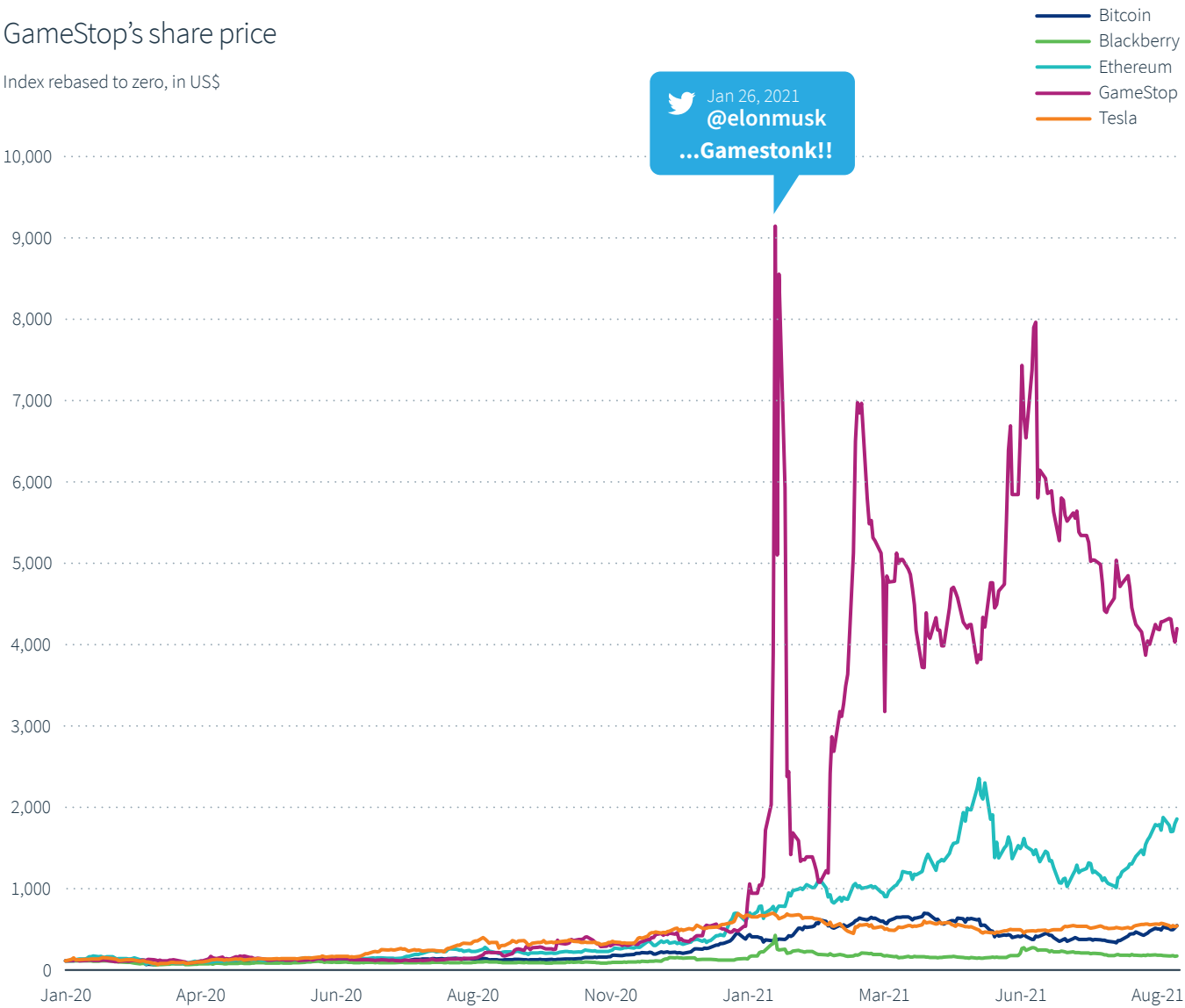
The GameStop saga

A brief history of a meme stock

The popularity of GameStop, which sells shrink-wrapped video games, had dwindled in recent years as consumers moved online. However, an army of novice investors flocked to GameStop last winter after Tesla founder Elon Musk tweeted a link to a Reddit page recommending the investment. The company's shares surged as much as 1,600 per cent in January 2021 as an unprecedented stock market battle developed, pitting amateur investors against hedge funds scrambling to cover losing bets.

GameStop's share price

Index rebased to zero, in US\$



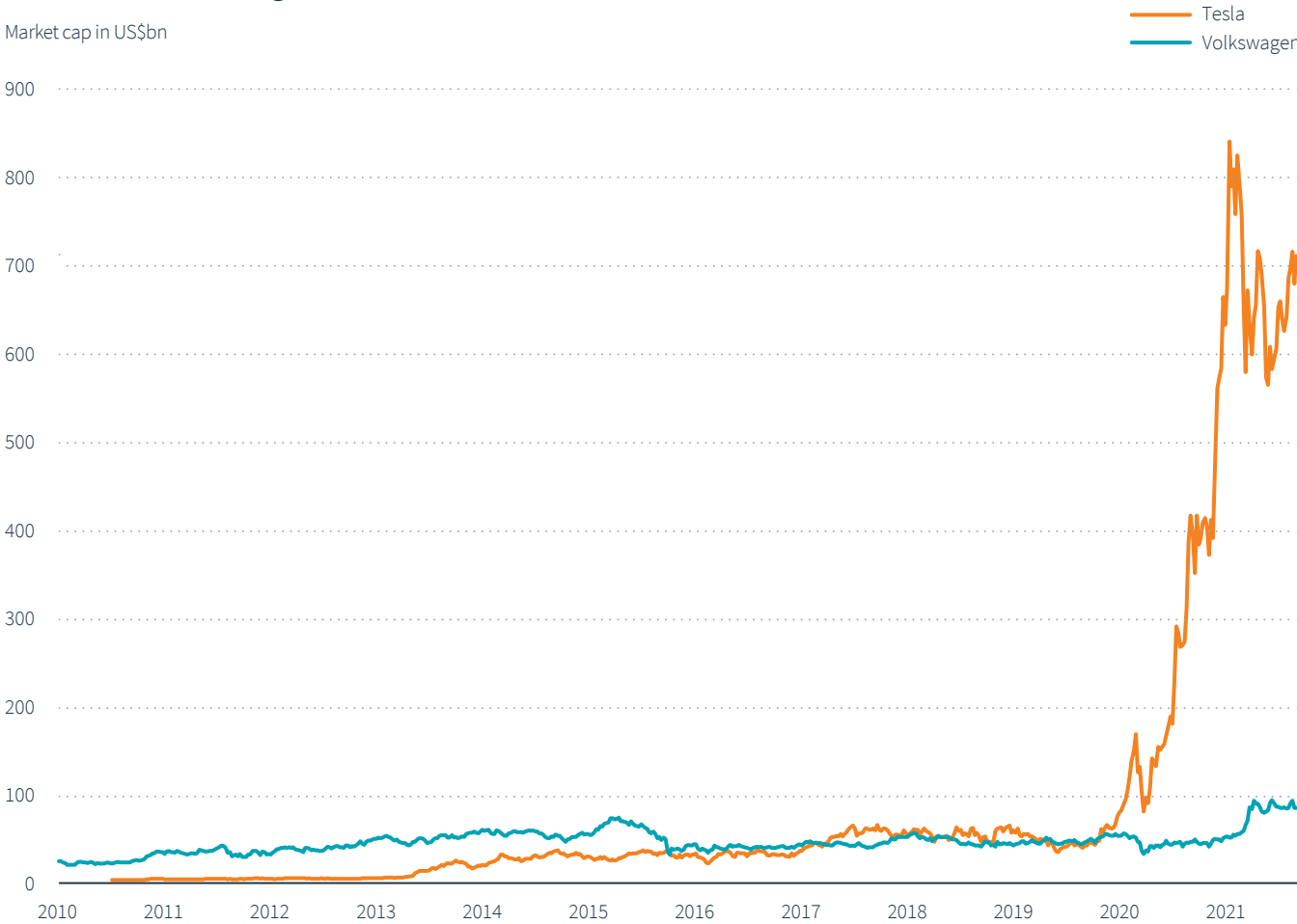
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Electric dreams

The rise of Tesla

Tesla’s share price has risen sharply since 2020, with investors buying into the growth story told by the company’s founder, Elon Musk. Of course, efforts to decarbonise industries and the potential for electric power to help meet the goals of the Paris Agreement have provided a tailwind too. Tesla’s market capitalisation since 2017 has grown larger than all other major carmakers, including the European giants Volkswagen, BMW, Daimler, Renault and Peugeot.

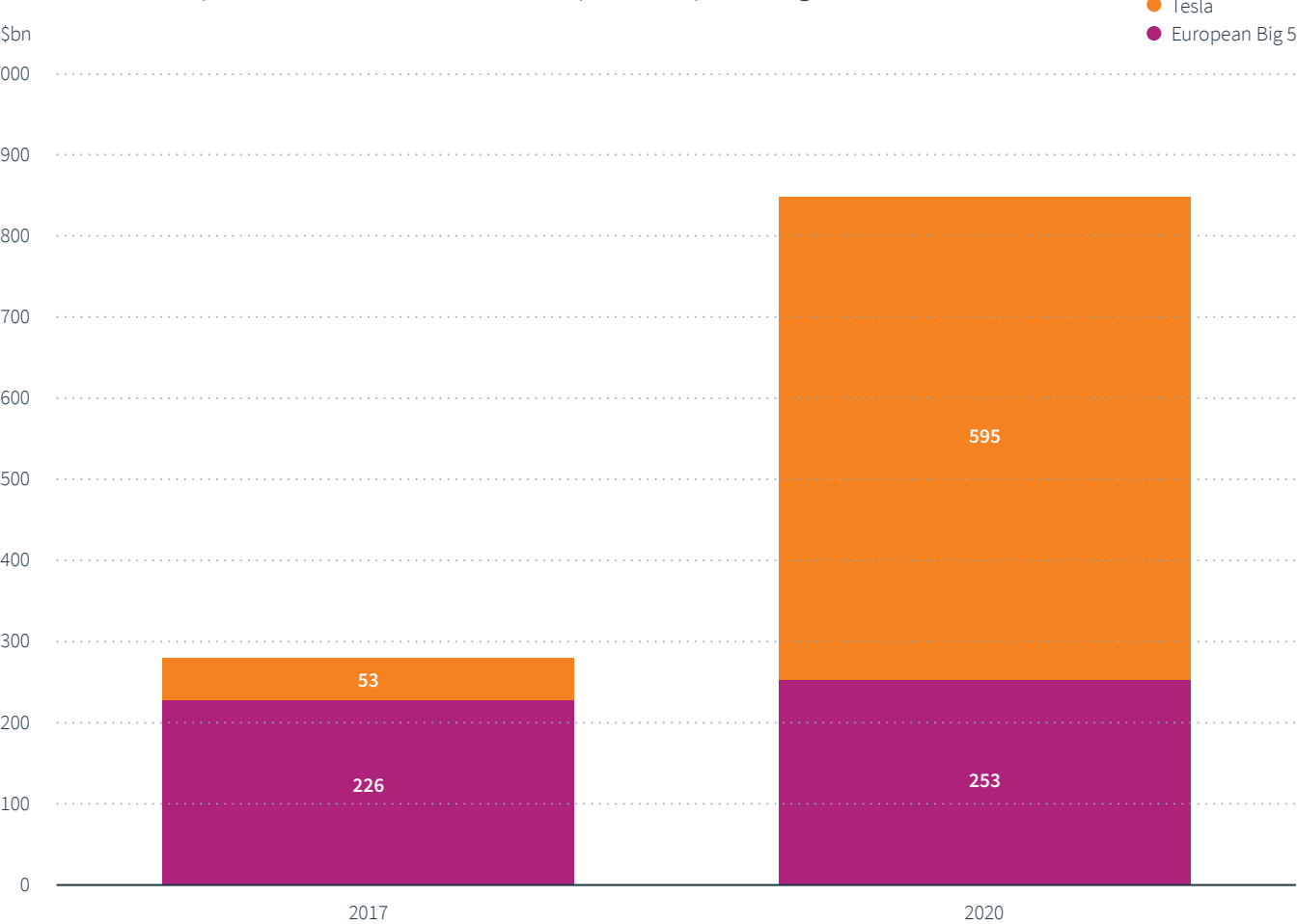
Tesla versus Volkswagen



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But while Musk is innovative he is also unpredictable – in November 2021 he took to Twitter to ask his followers whether he should sell a portion of his stock, knocking the company’s share price. How will such stunts affect Tesla’s market performance over the longer term?

Tesla market cap versus combined market cap of European ‘Big Five’

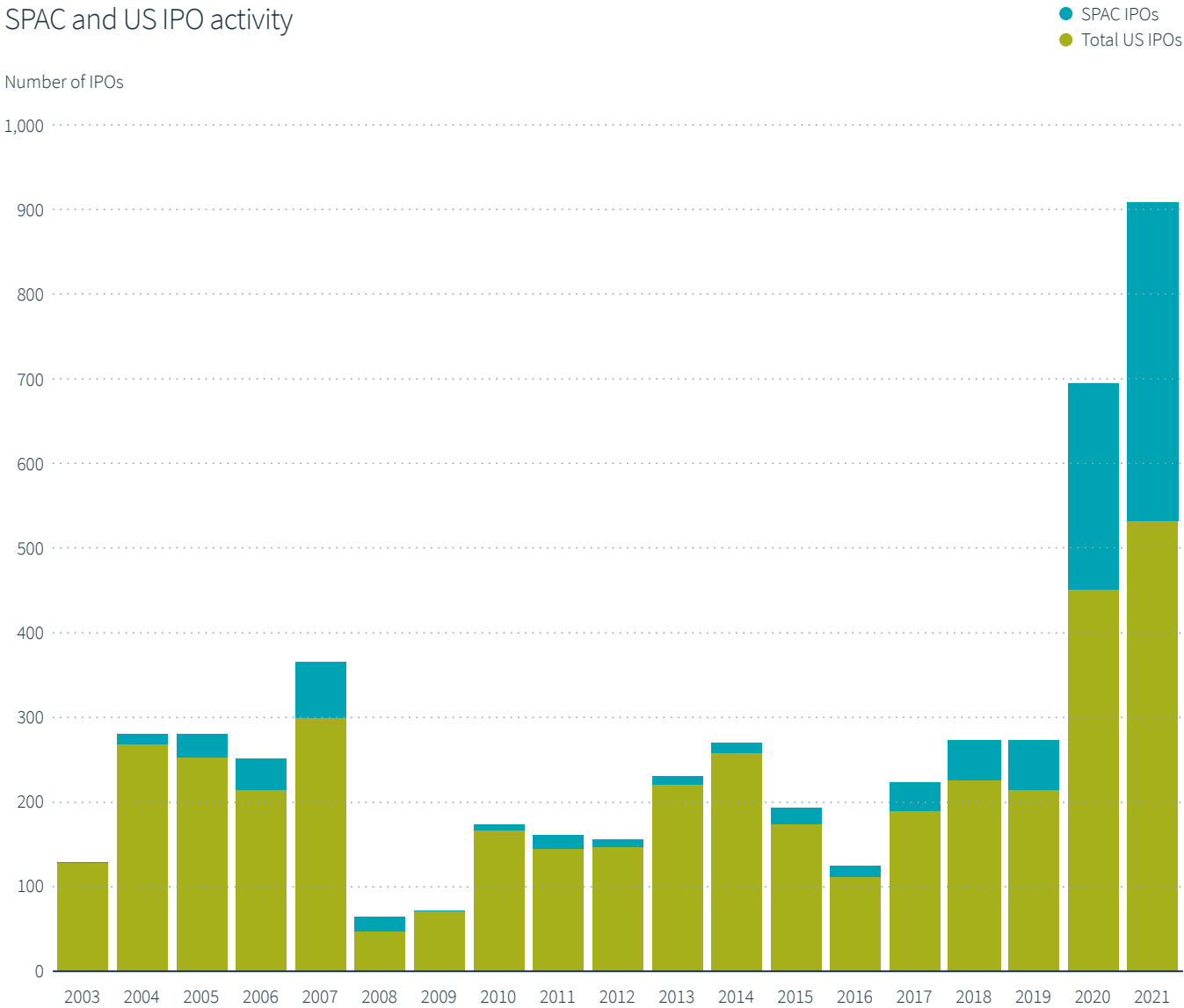


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Speculative SPACs

A new kind of public offering

SPAC and US IPO activity



Special-purpose acquisition companies (SPACs) are an innovation in initial public offerings. They offer a completely different way to take companies public.

Often called “blank cheque companies” – and sometimes, less positively, a “poor man’s private equity” – SPACs are effectively publicly traded companies that have been formed with the sole purpose of merging or acquiring other companies. As the chart shows, usage of SPACs has grown considerably over the last couple of years.

Though the investment vehicles have been around for some time, the renewed interest in them creates relative newness and, when combined with both information asymmetry and moral hazard, makes regulators nervous. Caveat emptor (let the buyer beware).

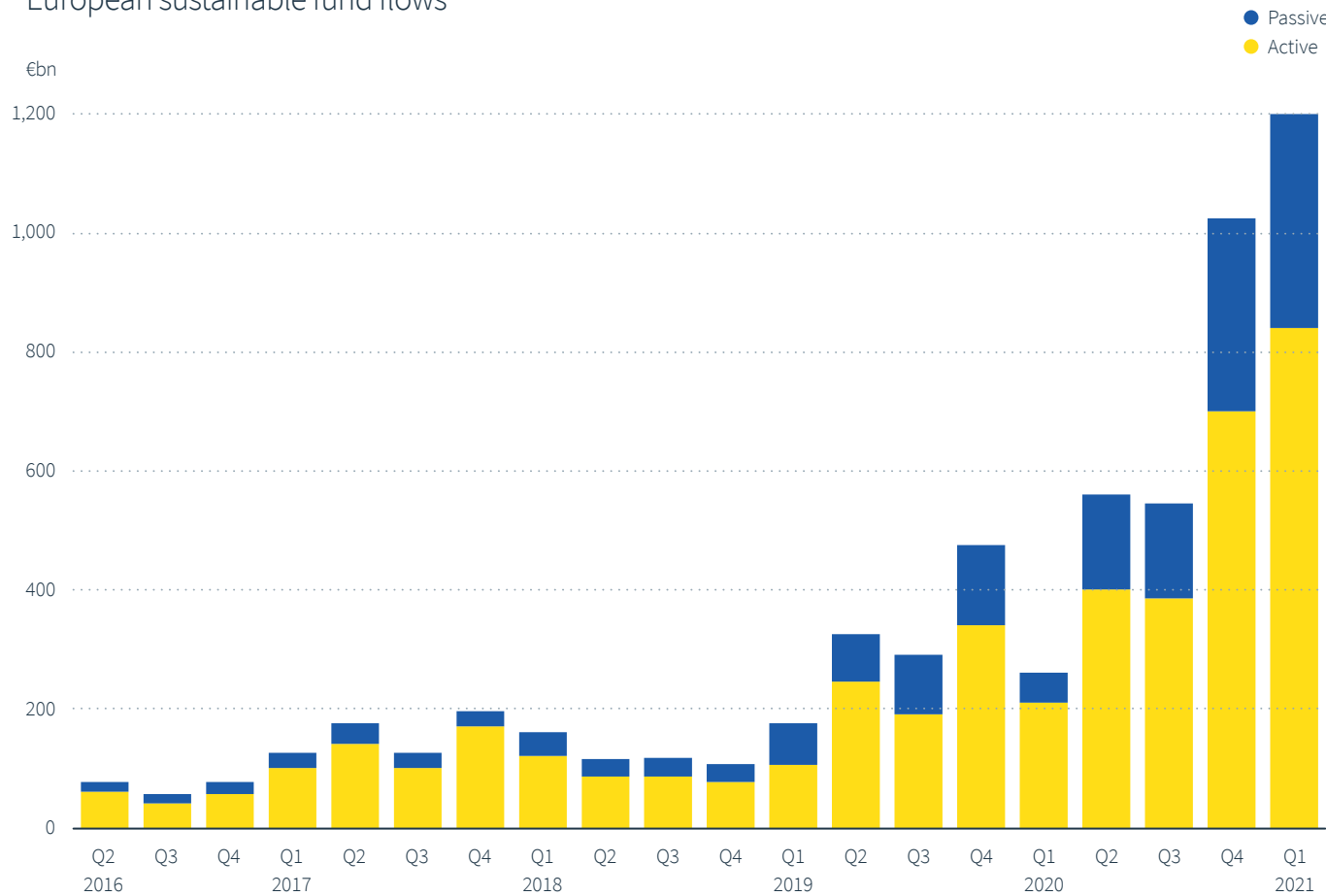
The ESG investing boom

The markets' growing interest in climate and social purpose

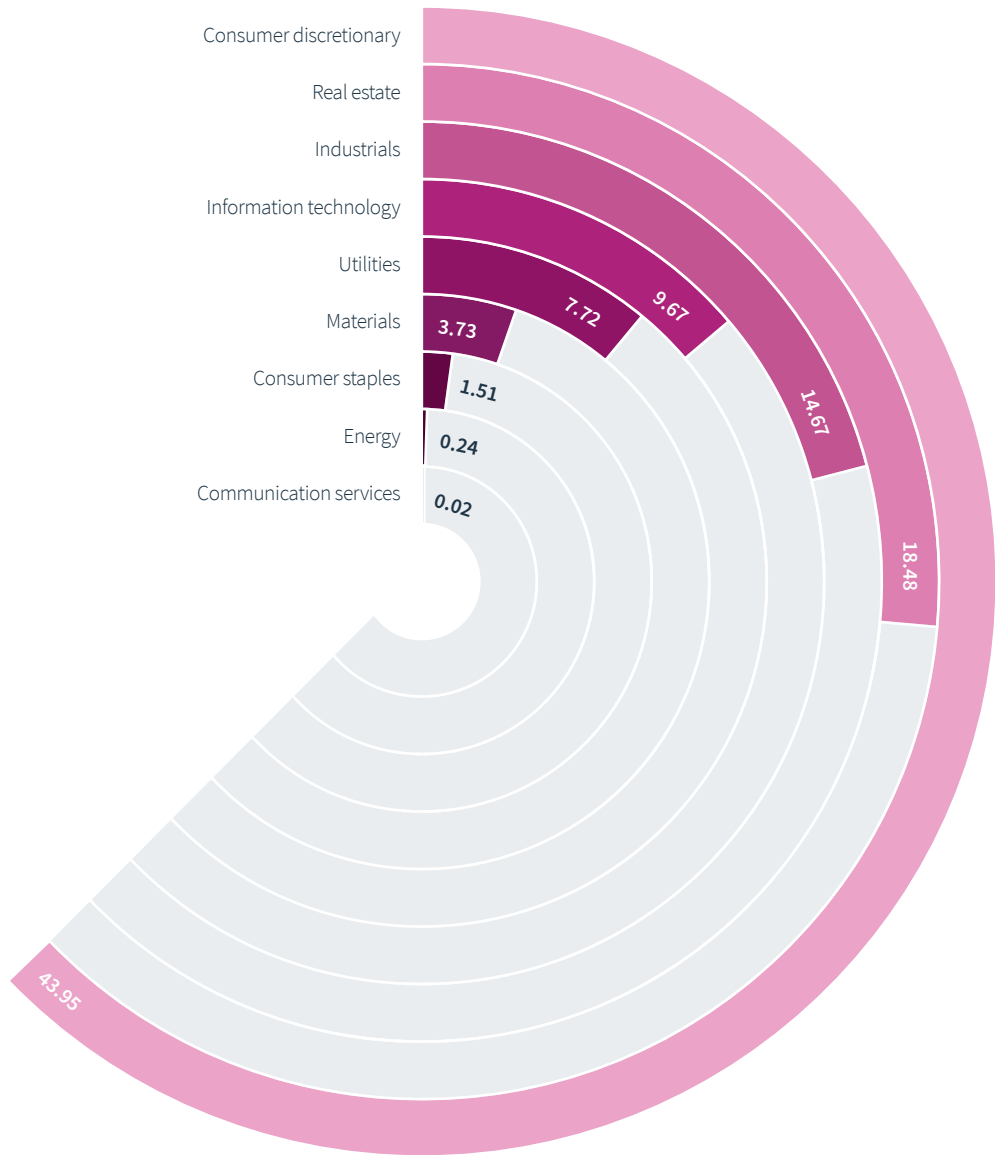
2020 was a watershed year for ESG investing. The number of ESG investors has sprung up like mushrooms after the rain – the societal impact of the pandemic, climate change and the Black Lives Matter movement all combined to amplify interest.

The sustainable fund market rapidly grew during the year and reached a milestone of €1 trillion in assets under management in Europe alone. This means it grew almost ten-fold in the past decade, up from €112 billion at the end of 2010. However, just looking at the MSCI Global Environment Index, it's clear that the ESG universe is strongly biased towards certain sectors.

European sustainable fund flows



MSCI Global Environment Index sector weights, per cent

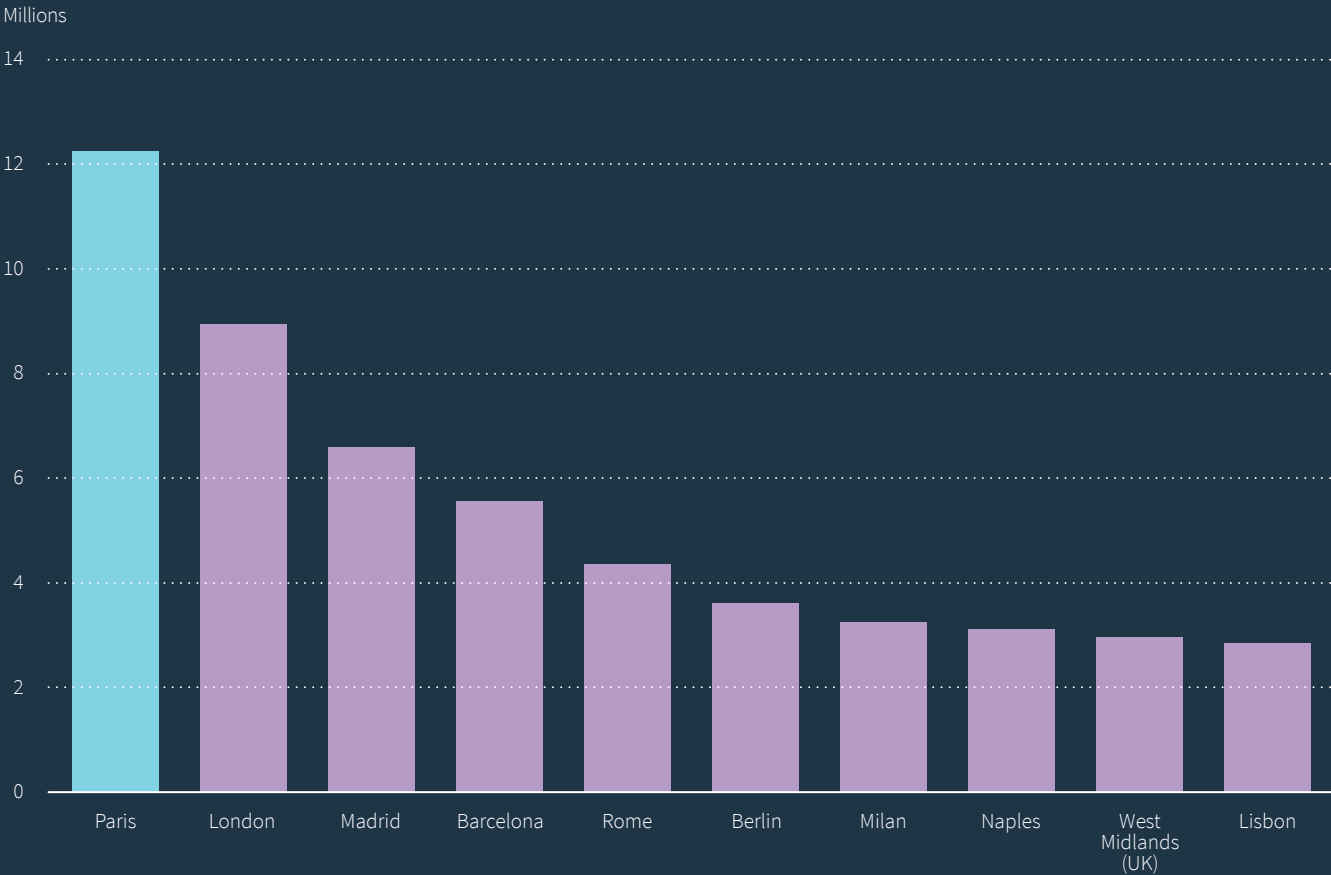


Paris, mon amour

An attractive office market

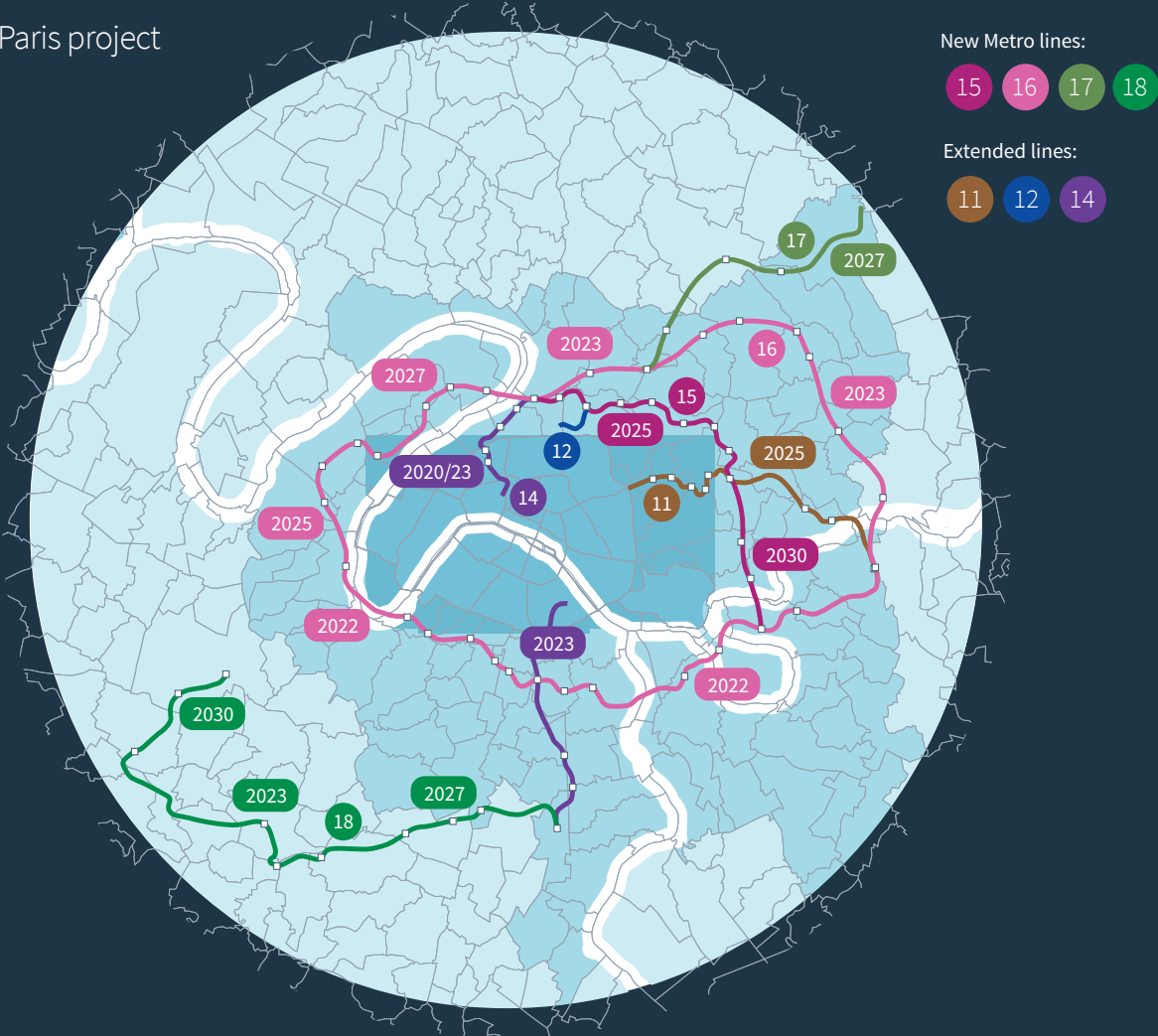
Scale is one of Paris’s outstanding attributes. With a population of approximately 12 million in the Greater Paris region, it is one of Western Europe’s two megacities, alongside London. It is the largest regional economy in Europe and also accounts for 30.3 per cent of French GDP, despite representing 18.2 per cent of the population.

Total population of selected European regions, 2018



Paris has embarked on the most ambitious infrastructure project in Europe, dubbed Grand Paris, which will create a ring network to enable suburb-to-suburb connections without having to travel through the centre of the city. The project envisages four new metro lines encompassing 200 kilometres of new track and 68 new stations, with passenger volumes of two million per day. The project could potentially transform the real estate markets in the Greater Paris region, with the office sector specifically well positioned to benefit.

The Grand Paris project

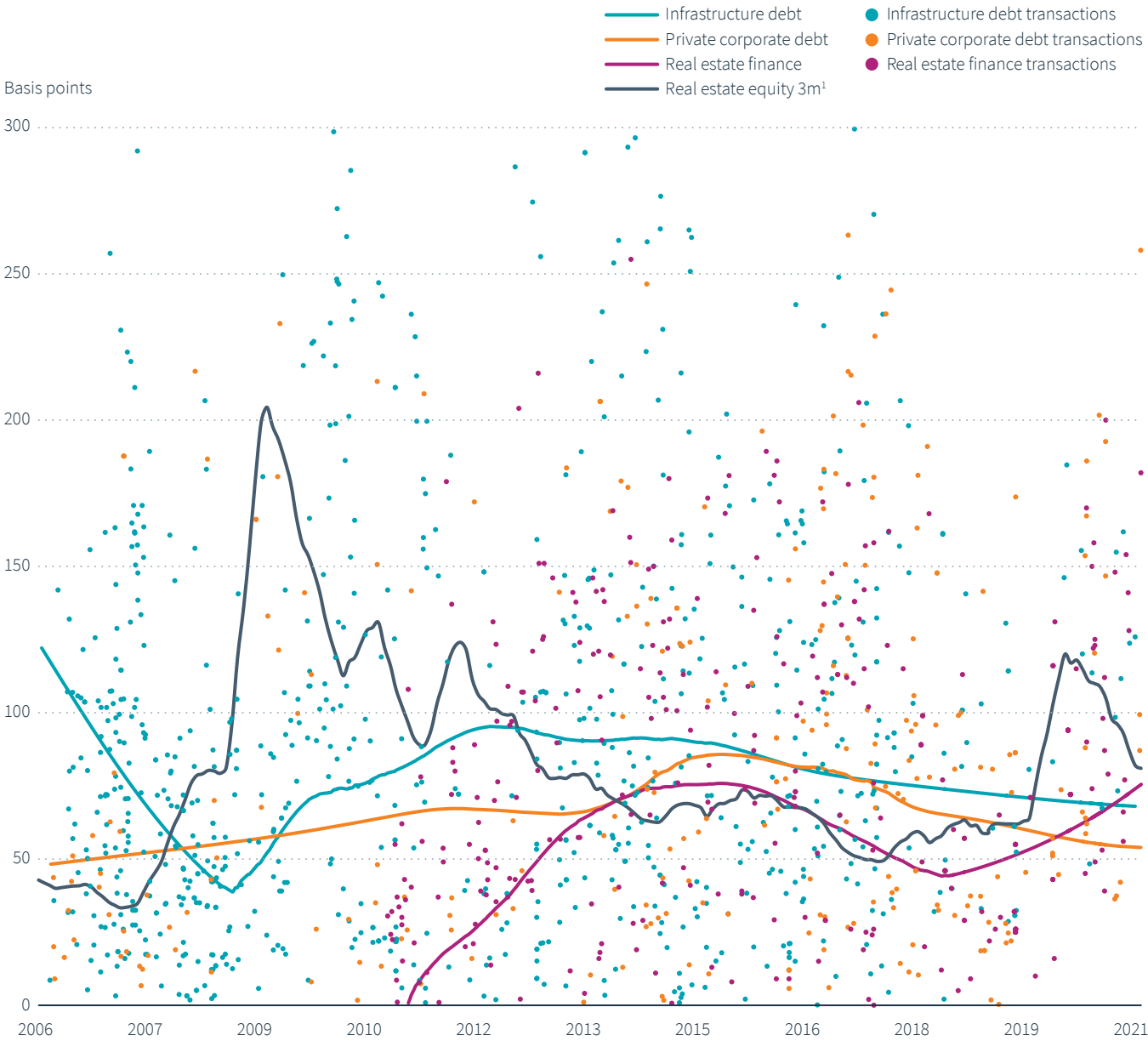


The hunt for yield

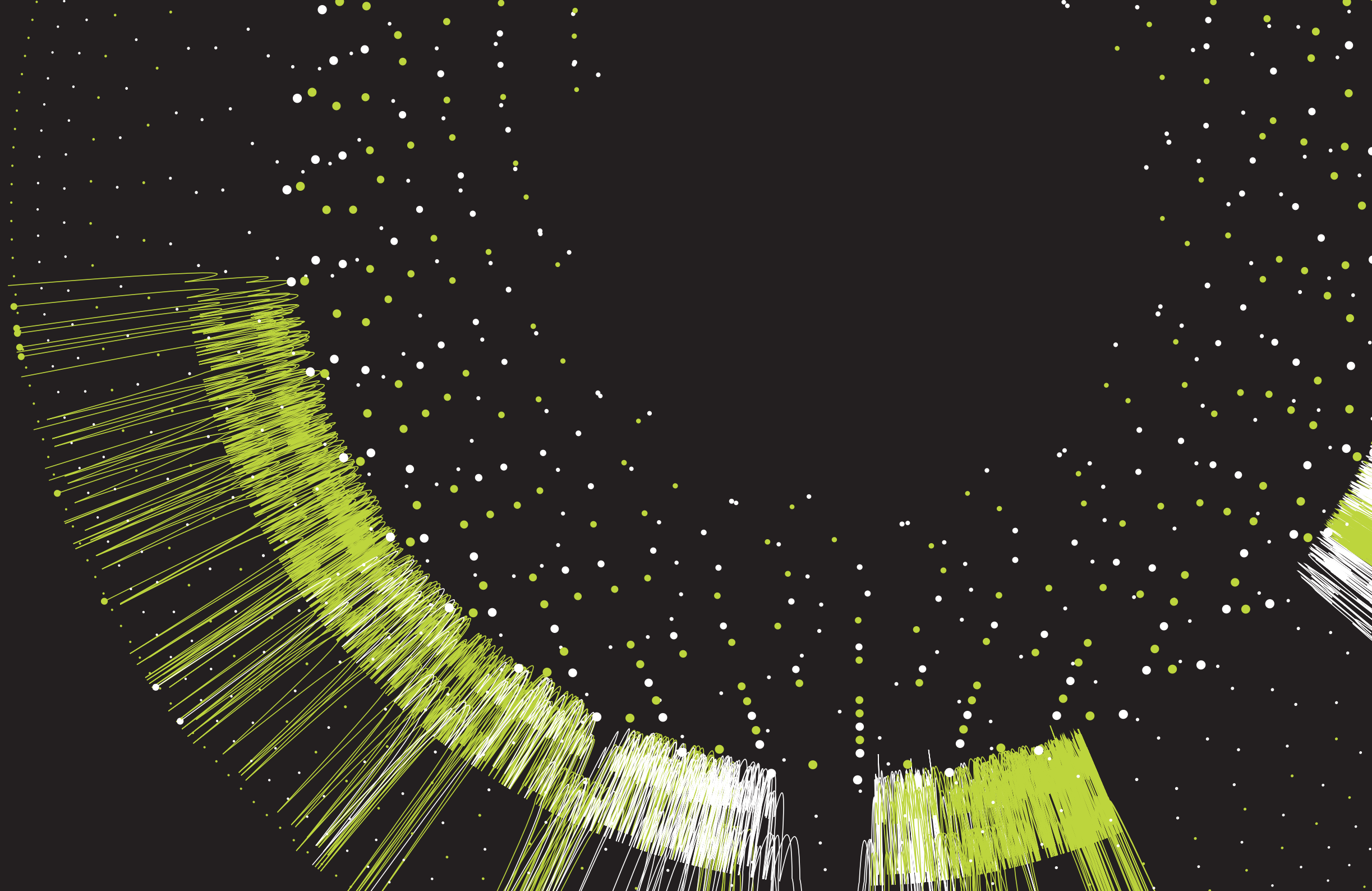
Illiquidity premia in private markets

The economic shockwaves of the COVID-19 pandemic have been most acutely felt in real estate equity. Yet, even though the short-term occupier outlook is negative, the medium-term view is more encouraging. In part, support is provided by the wide spread between ten-year government bond yields and initial property yields in continental Europe and UK real estate.

It seems it will take more than a pathogen to dampen investors' desire for yield, and the illiquidity premium offered by real assets will continue to play an important role in portfolios.



Appendix



Sources and notes

The bigger picture	02-03	Foreword	Note: 1. ‘Seeds of a UK property crisis?’, Financial Times, June 12, 2015.	38	You are not alone	Anthony Gooch and Francesca Colombo, ‘Addressing the hidden pandemic: The impact of the COVID-19 crisis on mental health’, The Forum Network, May 7, 2021.	
	08-09	Asia rises (again)	Robert Muggah, 2021. Linked to: Robert Muggah and Ian Goldin, ‘Terra incognita: 100 maps to survive the next 100 Years’, Penguin, Random House, 2021.	39	You are not alone	Recreation of ‘Archisolation’ from Federico Babina, as featured in Lynda Gratton, ‘Managing people: How to do hybrid right’, Harvard Business Review, May–June 2021 Issue.	
	10-11	Waves of sickness	Data from Johns Hopkins CSSE, WHO, national sources, and FT research. Featured in ‘Coronavirus tracker: the latest figures as countries fight the COVID-19 resurgence’, Financial Times, August 20, 2021. Note: North America includes Canada, Bermuda, Greenland and St Pierre and Miquelon.	40-41	Variants versus vaccines	Data is FT analysis of data from Johns Hopkins CSSE, as featured in: John Burn-Murdoch and David Pilling, ‘Delta variant takes hold in developing world as infections soar’, Financial Times, July 18, 2021. Note: Cases shifted forward to account for lag between infection and death.	
	12-13	Jumping the species barrier	Christine Kreuder Johnson, et al., ‘Spillover and pandemic properties of zoonotic viruses with high host plasticity’, Scientific Reports, October 2015, 5(1):14830.	43	How protected am I?	Data is FT analysis of data from Public Health England. Featured in: Oliver Barnes and John Burn-Murdoch, ‘Why are fully vaccinated people testing positive for COVID?’, Financial Times, July 23, 2021. Note: Risk of catching and dying from COVID-19 is the population fatality rate, e.g., before vaccines roughly 1% of all 80-year-olds in England had died from COVID-19.	
	14	Economies bounce back	‘Gross domestic product (GDP)’, U.S. Bureau of Economic Analysis, June 24, 2021.	44	COVID-19 worsens inequality	Resolution Foundation, April 26, 2021.	
	15	Economies bounce back	‘OECD economic outlook, volume 2020 issue 1’, OECD Economic Outlook 107 database, January 1, 2020.	45	COVID-19 worsens inequality	Data is Resolution Foundation analysis of YouGov, UK Adults Age 18 to 65 and The Coronavirus (COVID-19) - January 2021 wave. Featured in: Torsten Bell, ‘The COVID certainty: more savings for the rich, more debt for the poor’, Resolution Foundation, June 30, 2021. Note: Base = 3,384; all adults ages 18-65 with valid income data (apart from the ‘all adults’ category where the base is 6,389). Family income distribution based on equivalised, disposable benefit unit incomes among 18-65-year-old adults, excluding families containing retired adults or nonworking adult students. These figures have been analysed independently by the Resolution Foundation, including the calculation of income quintiles.	
	16-17	Deep cuts	Fran Girling, et al., ‘Global humanitarian assistance report 2021’, Development Initiatives, June 22, 2021. Note: RCRC = The International Red Cross and Red Crescent Movement.	46	Pathogens, pandemics and permanent taxes	Bank of England, March 2020.	
	18-19	Ghost towns	‘COVID-19 community mobility reports’, Google. Data as at August 19, 2021.	48-49	Pandemic preparedness	Amanda Glassman and Eleni Smitham, ‘Financing for global health security and pandemic preparedness: Taking stock and what’s next’, Center for Global Development, March 8, 2021. Note: Additional funded categories = D.3 Reporting; P.3 Antimicrobial resistance; P.5 Food safety; P.6 Biosafety and biosecurity; R.3 Linking health and security; R.4 Medical countermeasures and personnel deployment; Chemical events; Point of entry (PoE); Radiation emergencies.	
	20	The fight for rights	Nazifa Alizada, et al., ‘Autocratization turns viral: Democracy report 2021’, V-Dem Institute, March 2021.	Data and technology	52	When the chips are down	Antonio Varas, et al., ‘Government incentives and US competitiveness in semiconductor manufacturing’, BCG and Semiconductor Industry Association, September 2020.
	21	The fight for rights	Martynas Jočys, ‘How free are different world regions?’, Beautiful Economics, December 9, 2020.		53	When the chips are down	Antonio Varas, et al., ‘Strengthening the global semiconductor supply chain in an uncertain era’, BCG and Semiconductor Industry Association, April 2021. Note: DAO = Discrete, Analog and Other.
22	The Party line	Refinitiv Datastream, Aviva Investors. Data as at August 30, 2021.	54		Crypto stokes the chip shortage	Amazon, Keepka, Coindesk, The Economist. Data as at June 2019.	
24-25	Shifting sands	OECD, Aviva Investors. Data as at August 2021. Note: Sand, gravel and crushed rock are for construction.	56-57		Bitcoin’s carbon footprint	Cambridge Bitcoin Electricity Consumption Index (CBECI). Data as at August 2021.	
26	The levy breaks	‘World development report 2020: Trading for development in the age of global value chains’, World Bank, 2020. Note: Data includes average subnational rates.	59		Data boom	Japan Internet Exchange Co., Ltd. Data as at June 4, 2021.	
27	The levy breaks	‘Statutory corporate income tax rate: 2021’, OECD, August 19, 2021.	60		Do you need to send that email?	Sarah Griffiths, ‘Why your internet habits are not as clean as you think’, BBC, March 6, 2020.	
28-29	The heat is on	V. Masson-Delmotte, et al., ‘Climate change 2021: The physical science basis. Contribution of working group I to the sixth assessment report of the Intergovernmental Panel on Climate Change’, IPCC, 2021. Note: SSP = Shared Socioeconomic Pathway. These five scenarios are referred to as SSPx-y, where ‘SSPx’ refers to socio-economic trends underlying the scenario, and ‘y’ refers to the approximate level of radiative forcing (the change in energy flux in the atmosphere, as measured in watts/metre²) resulting from the scenario in the year 2100. The socio-economic trends mapped in the scenarios are as follows: SSP 1: Sustainability – Taking the green road; SSP2: Middle of the Road; SSP3: Regional Rivalry – A rocky road; SSP4: Inequality: A road divided; and SSP5: Fossil-fueled Development: Taking the highway. See the IPCC’s report for further details.	62-63		Don’t feed the troll	#StatusOfMind: Social media and young people’s mental health and wellbeing’, Royal Society for Public Health, May 2017. Note: FoMO = Fear of Missing Out.	
30-31	Living beyond (and below) our means	Dan O’Neill, et al., ‘A good life for all within planetary boundaries’, Nature Sustainability 1, 88-95, 2018.	64-65		Connection costs	Data from ‘Worldwide mobile data pricing 2021’, cable.co.uk, 2021. Originally designed by Enrique Mendoza-Tincopa.	
COVID-19	35	Sssshh!	Heather Galloway and Javier Sala, ‘Coronavirus: A room, a bar and a classroom: how the coronavirus is spread through the air’, El Pais, October 28, 2020. Images featured on the page by Luis Almodóvar. Note: Example period of time is two minutes, 15 minutes and one hour. Each dot represents a dose of respiratory particles capable of infecting someone if inhaled.				
	36-37	A journal of the plague	‘Autos de choque’, Diario visual de la cuarentena, March 18, 2021.				

Sources and notes (cont’d)

Sustainability	66	Streaming killed the radio star... U.S recorded music revenues by format: 1973 to 2020, format(s): LP/EP, vinyl single, 8 - track and 20 more, RIAA, 2020.	96	An inhospitable environment Sharon Mai and Nye Cominetti, 'Ethnic minorities in the hospitality sector', Resolution Foundation, December 2020. Note: BAME = Black, Asian and minority ethnic.
	70	Danger zone 'Billion-dollar weather and climate disasters: Time series,' National Centers for Environmental Information (NCEI), July 9, 2021.	99	It's all connected 'Intersectionality: What is it and why it matters,' The University of British Columbia, March 8, 2021.
	72-73	Turning off the tap Tianyi Luo, et al., 'Aqueduct projected water stress country rankings', World Resources Institute, August 26, 2015.	100-101	The diversity deficit 'Missing pieces report: The board diversity census of women and minorities on Fortune 500 Boards, 6th edition', Deloitte LLP, Catalyst, Diversified Search, The Executive Leadership Council, the Hispanic Association on Corporate Responsibility, and Leadership Education for Asian Pacifics, June 8, 2021. Note: The companies included in the Fortune 100 and 500 change over time.
	74-75	On the move Mohammed Hussein and Mohammed Haddad, 'Visualising 70 years of refugee journeys', Al Jazeera, June 20, 2021. Data from UNHCR.	102	What's in a name? Morningstar, Aviva Investors. Data as at March 12, 2021.
	76	It's in the trees Carrie Dellesky, 'Carbon removal deployment scenarios', World Resources Institute, April 7, 2021. Note: Figures are based on data from the Working Paper, 'CarbonShot: Federal Policy Options for Carbon Removal in the United States.'	104-105	A web of neurodiversity Professor Amanda Kirby, 'Why do some young people miss out on getting a diagnosis of different neurodiverse conditions. . . or get the wrong one?' Do-IT Solutions Ltd., October 1, 2020. Updated July 2021. Note: APD = Auditory Processing Disorder; CP = Cerebral Palsy; FASD = Fetal Alcohol Spectrum Disorder; hEDS = Hypermobile type Ehlers-Danlos syndrome; TBI = Traumatic Brain Injury.
	77	It's in the trees Woodland Carbon Code, May 2021.	106-107	It's coming home Aviva Investors. Data as at August 2021.
	78-79	Less than (net) zero Black, R., et al., 'Taking stock: A global assessment of net zero targets', Energy & Climate Intelligence Unit and Oxford Net Zero, 2021. Note: Net-zero targets for countries are measured by emissions, regions and cities and states by population, and companies by sales. Scope 1, 2 and 3 categorise GHG emissions based on where they are emitted along a company's value chain. Scope 1: direct emissions; scope 2: indirect emissions from the generation of purchased electricity; scope 3: other indirect emissions, e.g. in supply chain or by customers' use of product.	110-111	Trading places Data from IMF Direction of Trade Statistics, as featured in: 'Joe Biden is determined that China should not displace America', The Economist, July 17, 2021.
	80	Law and climate (dis)order 'Climate-related litigation. By numbers', Freshfields Bruckhaus Deringer. Data from Sabin Center for Climate Change Law, Columbia University; Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science, correct to December 2019.	112	Trade bounces back... UNCTAD calculations based on national statistics. Featured in: 'Global trade's recovery from COVID-19 crisis hits record high', UNCTAD, May 19, 2021.
	81	Law and climate (dis)order Joana Setzer and Catherine Higham, 'Global trends in climate change litigation: 2021 snapshot', Grantham Research Institute on Climate Change and the Environment and the Centre for Climate Change Economics and Policy, July 2021.	113	Trade bounces back... Refinitiv Datastream. Data as at September 7, 2021.
	82	The halo effect Charlie Wigglesworth, et al., 'Buy social corporate challenge: Year 3 impact report', Social Enterprise UK, 2019.	114-115	US inflation timeline Macrotrends. Data as at June 10, 2021.
Diversity and inclusion	83	Don't trust the numbers MSCI, ISS, Aviva Investors. Data as at March 8, 2021.	116	EM inflation catches market off guard Macrobond. Data as at August 31, 2021.
	84-85	Carbon pricing is on the rise... 'State and trends of carbon pricing 2021', The World Bank, May 2021. Note: Prices for illustrative purpose only. China national ETS, Mexico pilot ETS and UK ETS are not shown in this graph as price information is not available for those initiatives.	118	The GameStop saga Refinitiv Datastream. Data as at August 20, 2021.
	86-87	More from less Max Roser, 'The argument for a carbon price: Six countries that achieved strong economic growth while reducing CO ₂ emissions', Our World in Data, June 1, 2021.	120	Electric dreams Refinitiv Datastream. Data as at September 2, 2021.
	88-89	How safe is your energy supply? Data originally published by Sovacool, et al., 2016; and Markandya, A., and Wilkinson, P., 2007. Featured in Hannah Ritchie, 'What are the safest and cleanest sources of energy?', Our World in Data, February 10, 2020.	121	Electric dreams Bloomberg and Aviva Investors. Data as at May 11, 2021.
	90	Charting a just transition Dan O'Neill, et al., 'A good life for all within planetary boundaries', Nature Sustainability 1, 88-95, 2018. Note: The Y axis tracks companies' progress on social metrics such as education and electricity access; the X axis shows the extent to which they are exploiting natural resources to do so.	122	Speculative SPACs 'SPAC and US IPO activity', SPAC Analytics, July 2021.
	94-95	Race, class and opportunity in America Raj Chetty, et al., 'Race and economic opportunity in the United States: an intergenerational perspective', The Quarterly Journal of Economics, Volume 135, Issue 2, Pages 711–783, May 2020.	124	The ESG investing boom Hortense Bioy, 'Sustainable fund flows hit new record', Morningstar, May 5, 2021.
			125	The ESG investing boom MSCI, Aviva Investors. Data as at September 2021.
			126	Paris, mon amour Oxford Economics, 2018.
			127	Paris, mon amour Aviva Investors, March 2021.
			129	The hunt for yield ICE BoA Merrill Lynch, Bloomberg, Aviva Investors. Data as at September 1, 2021. Note: 1. Illiquidity premium required for private real estate equity transactions taking into account the time period it takes to sell and achieve a fair value. Indicative time period: 3 months.

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