THE LITTLE BOOK OF DATA 2

JOINING THE DOTS

AVIVA INVESTORS

The Little Book of Data 2

Joining the dots

DECEMBER 2019

Foreword

Igor Stravinsky once said: “To listen is an effort, and just to hear is no merit. A duck hears also.” It is the same with seeing. We can observe at a superficial level, but not necessarily understand.

This is the second edition of our Little Book of Data. We are indebted to the permissions granted throughout; Alexander Radtke’s Warning Stripes and Craig Taylor’s Coral Cities stand out as particular gems.

This book comes with two large caveats. The first is that we don’t have room to include or cover all the important issues of the day. We have done our best to collate and curate, but it is an impossible task. Second is the data we don’t see. What counts cannot always be counted, so to understand the world we often have to look beyond the data that is easily rendered. Important trends will lie submerged from our view. The ability to think critically – to question assumptions, methodologies and gut reactions – is going to be crucial in the years ahead.

We cannot remove the effort involved with seeing and understanding, but by paying more attention to visual representations of data we can reduce some of the burden – particularly as the information age continues to drown us all. Enjoy.

Euan Munro
CEO, Aviva Investors

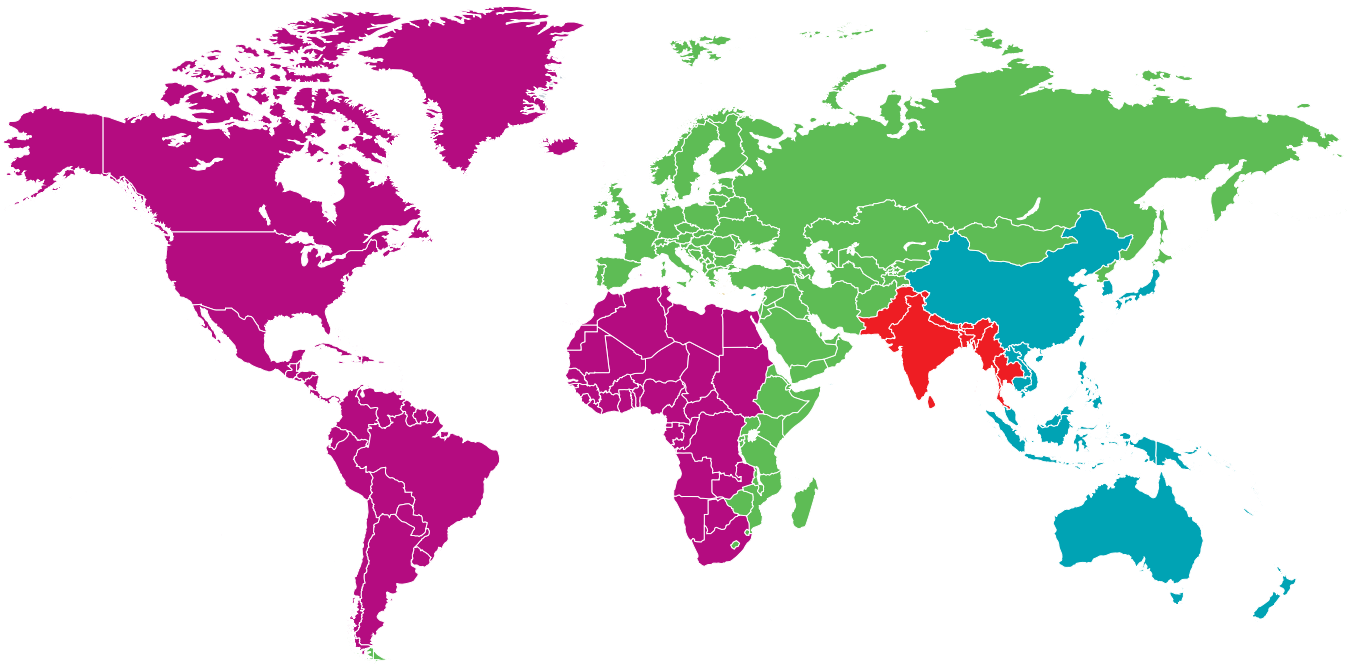
Index

Big picture

Visual depictions of major macro trends to help investors gain perspective and distinguish the key developments taking place across the globe.

A whole new world

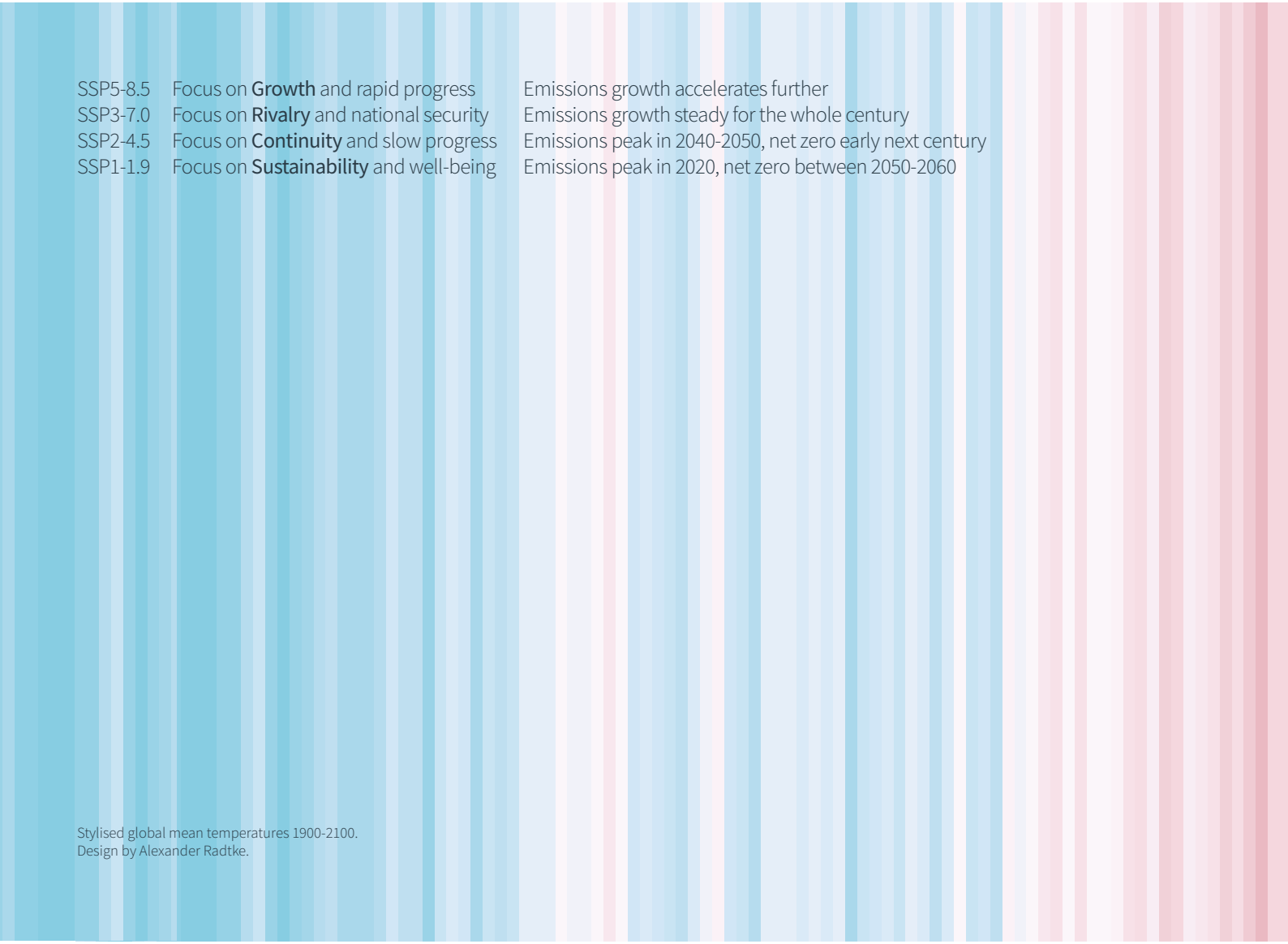
The world divided into four regions with equal populations



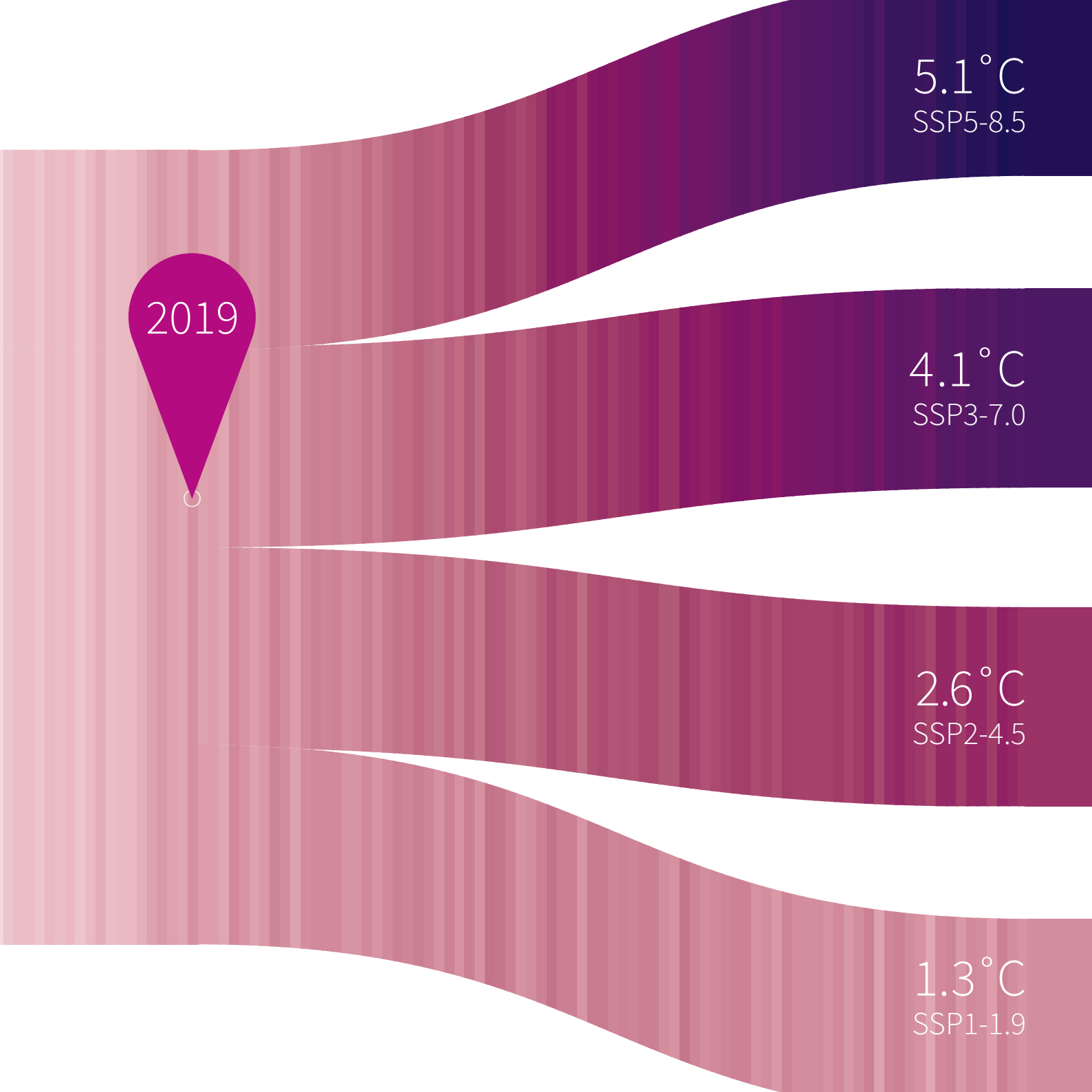
The 31 countries (worth) of China

Warning stripes (1900-2100)

SSP5-8.5	Focus on **Growth** and rapid progress	Emissions growth accelerates further
SSP3-7.0	Focus on **Rivalry** and national security	Emissions growth steady for the whole century
SSP2-4.5	Focus on **Continuity** and slow progress	Emissions peak in 2040-2050, net zero early next century
SSP1-1.9	Focus on **Sustainability** and well-being	Emissions peak in 2020, net zero between 2050-2060

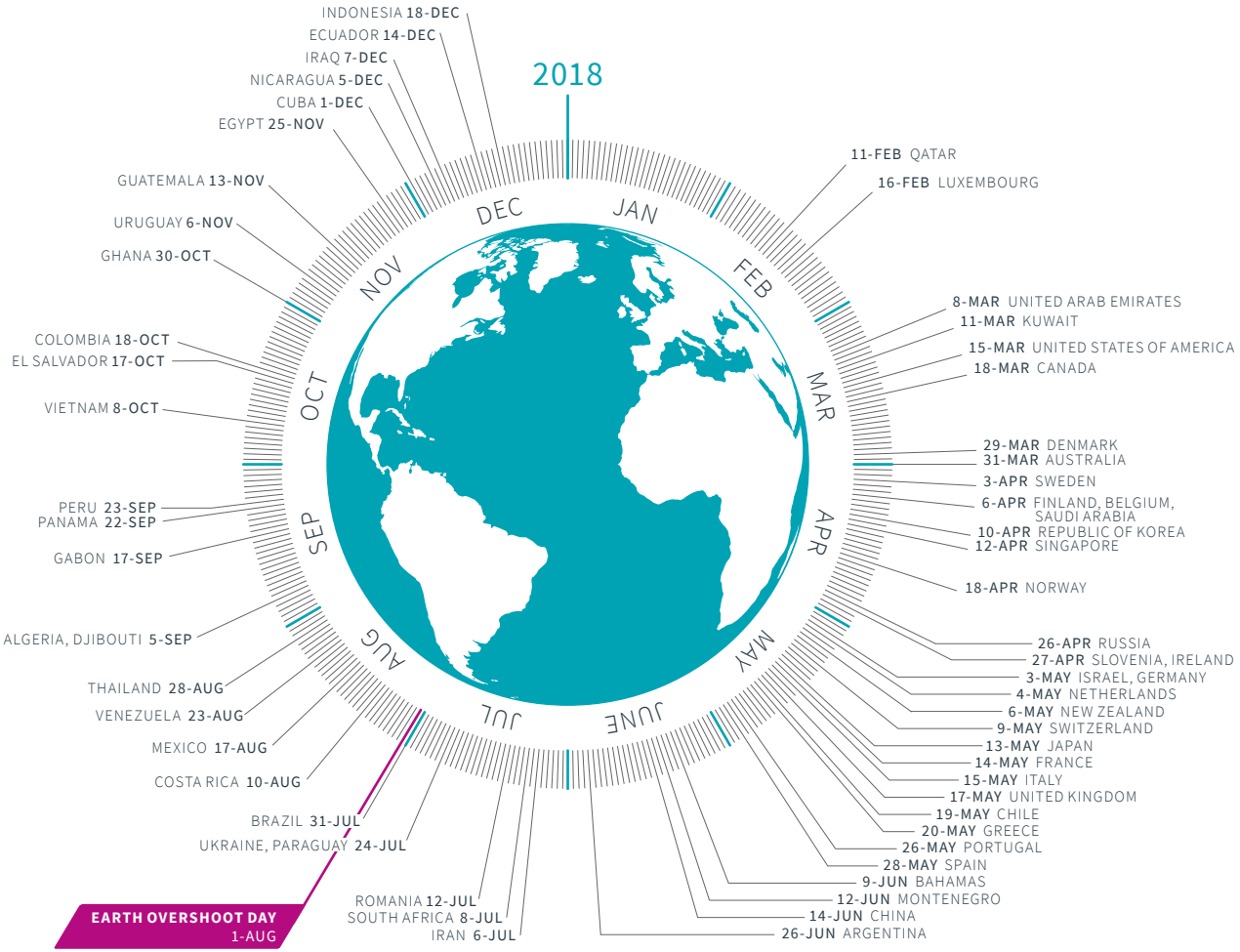


Stylised global mean temperatures 1900-2100.
Design by Alexander Radtke.


2019
5.1˚C
SSP5-8.5
4.1˚C
SSP3-7.0
2.6˚C
SSP2-4.5
1.3˚C
SSP1-1.9

On borrowed time

Unsustainable resource consumption by country



There are some races you want to win, and others you don't.

Earth Overshoot Day is the calendar date on which humanity's resource consumption for the year exceeds Earth's capacity to regenerate those resources that year. In 2018, it was August 1. The date for 2019 was July 29.

A country's Overshoot Day is the date on which Earth Overshoot Day would fall if all of humanity consumed like the people in that country. In other words, and as illustrated in this visualisation, countries closer to December 2018 have a far better ecological footprint than those closer to the beginning of the year.

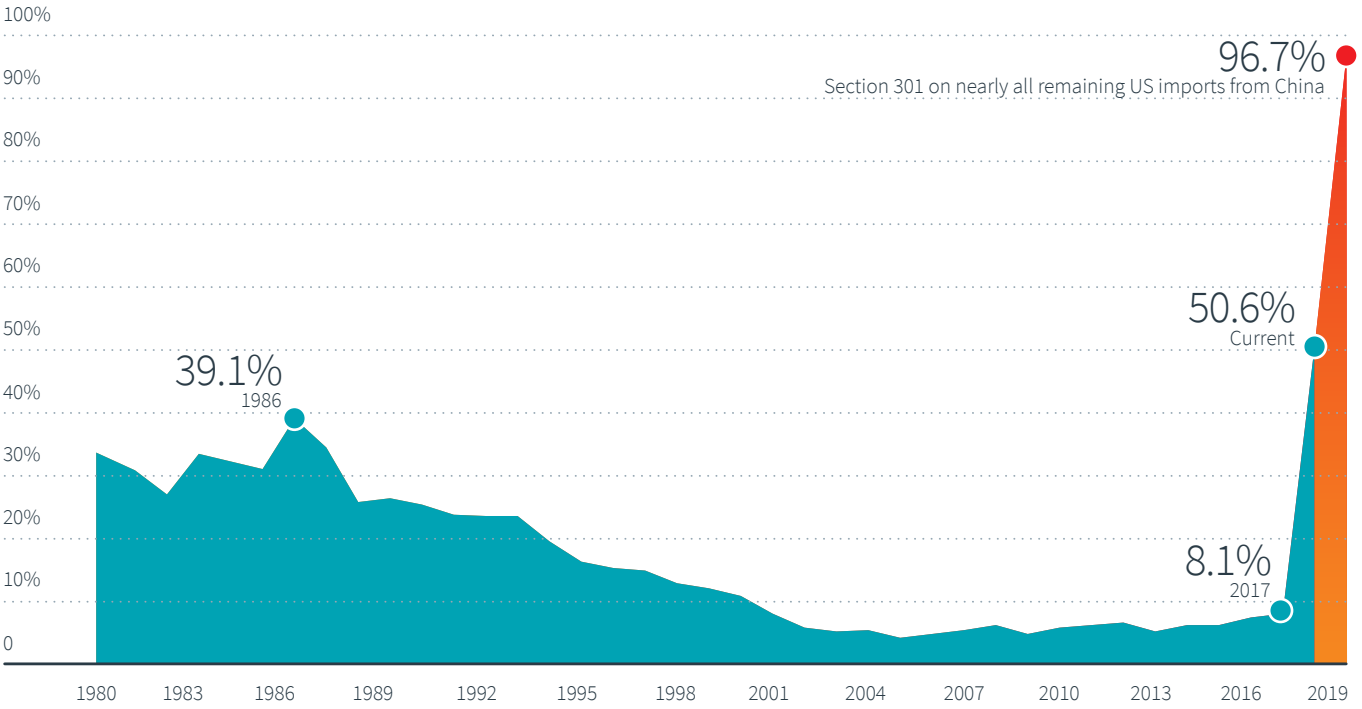
“Tariffed”: Trading blows

“Trade wars are good, and easy to win,” boasted US President Donald Trump in March 2018. As his trade spat with China continues, it is clear they are anything but.

In total, over 50 per cent of US imports from China became subject to special US trade protection by the end of 2018.

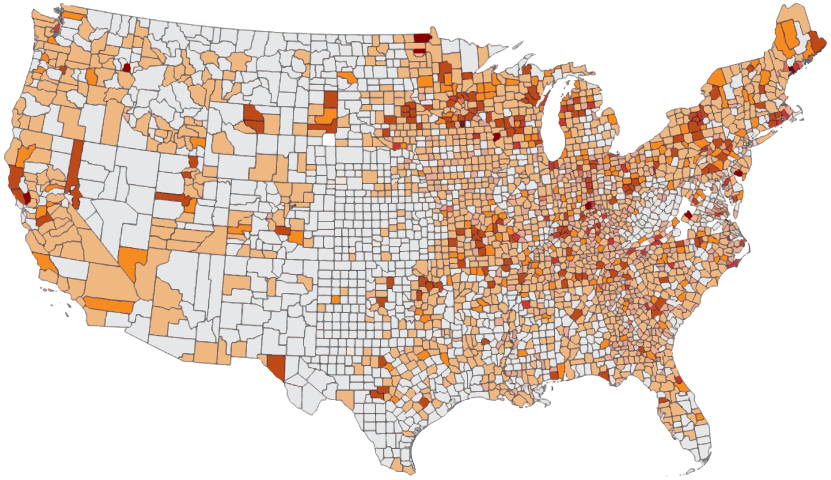
It is not just the size of the tariffs imposed by the US that matters, but also the amount of imports impacted. Special protection has been imposed on imports from China for decades. However, the full historical context shows the sheer scale of this trade spat.

Share of US goods imports from China covered by special forms of tariff and non-tariff protection



China's carefully calibrated retaliation

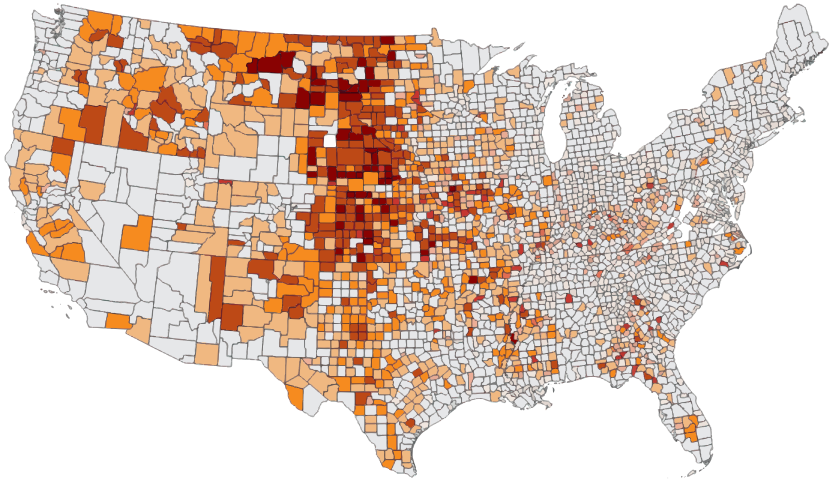
The charts below reveal a clear strategy on China's part to target the US Rust Belt, as measured by the distribution of share of county level export-trade volumes affected by retaliation measures by the EU and China.



European Union

EU TARIFFS

- 0.000 - 0.003
- 0.003 - 0.008
- 0.008 - 0.011
- 0.011 - 0.035
- 0.035 - 0.083



China

CN TARIFFS

- 0.000 - 0.050
- 0.050 - 0.090
- 0.090 - 0.130
- 0.130 - 0.180
- 0.180 - 0.270

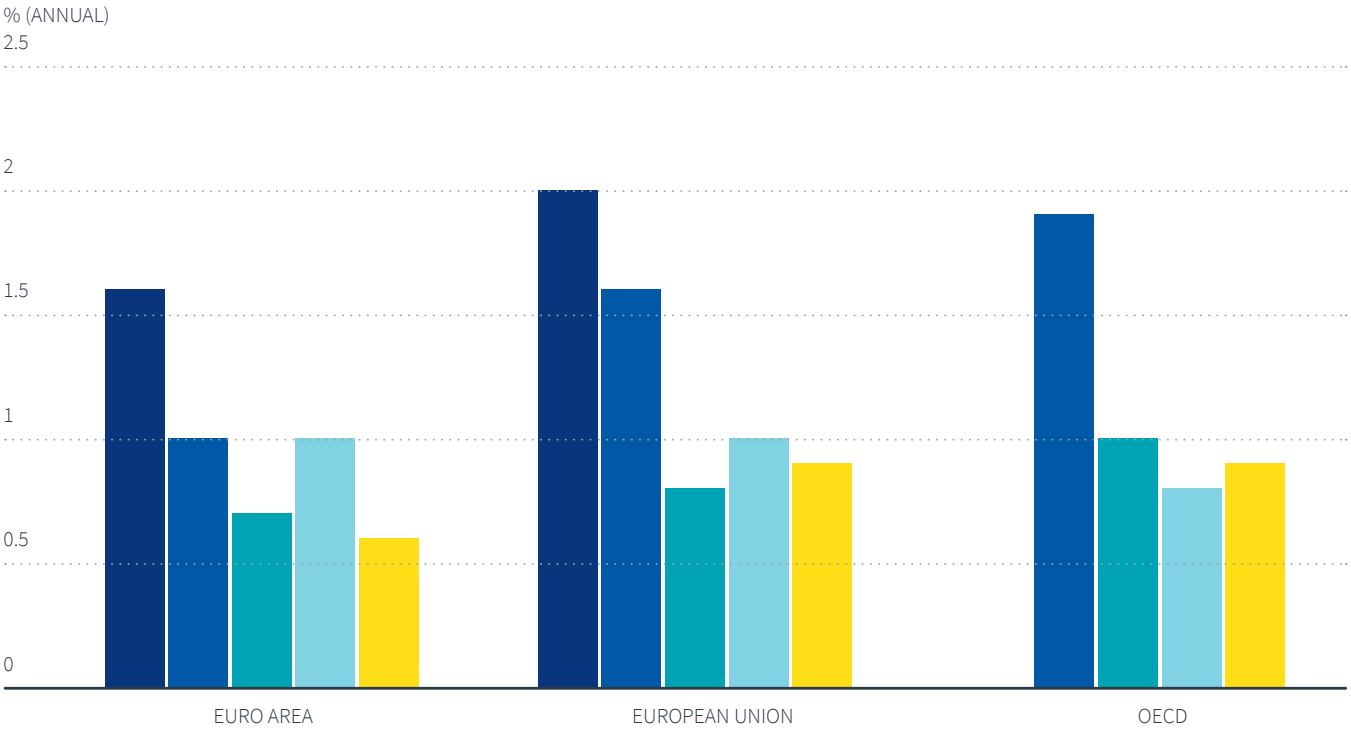
If you want something doing…

- 1995-2000
- 2000-2005
- 2005-2010
- 2010-2014
- 2014-2018

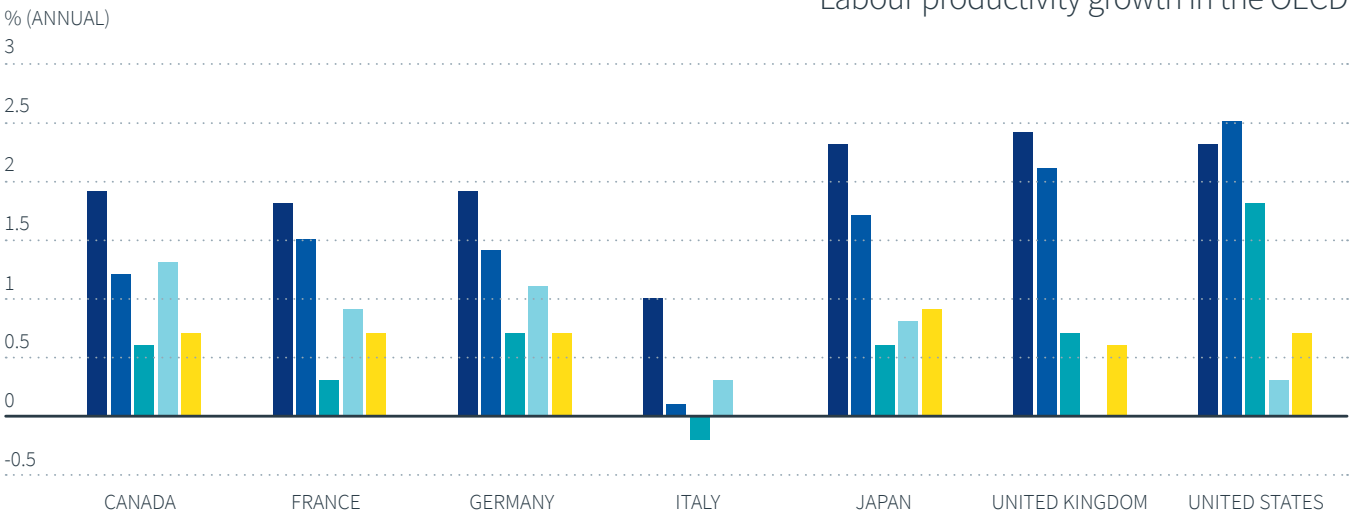
Declining productivity rates present one of the most perplexing puzzles of economics over the last decade or so. As technology improves, innovation and efficiency gains should bolster the production of goods and services per hour worked. But the opposite appears to be happening.

The reasons are contentious, but getting to the root causes is essential for progress. Productivity affects a range of important measures such as national competitiveness, living standards, trade performance and economic growth. As economist Paul Krugman says: “Productivity isn’t everything, but in the long run it is almost everything.”

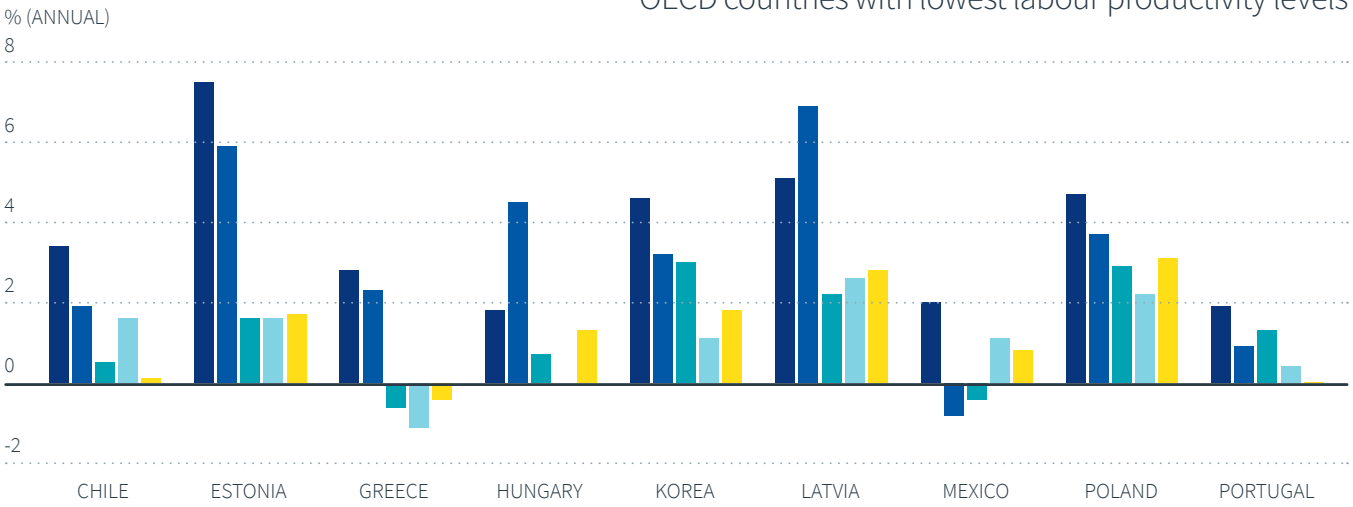
Labour productivity growth in the OECD



Labour productivity growth in the OECD

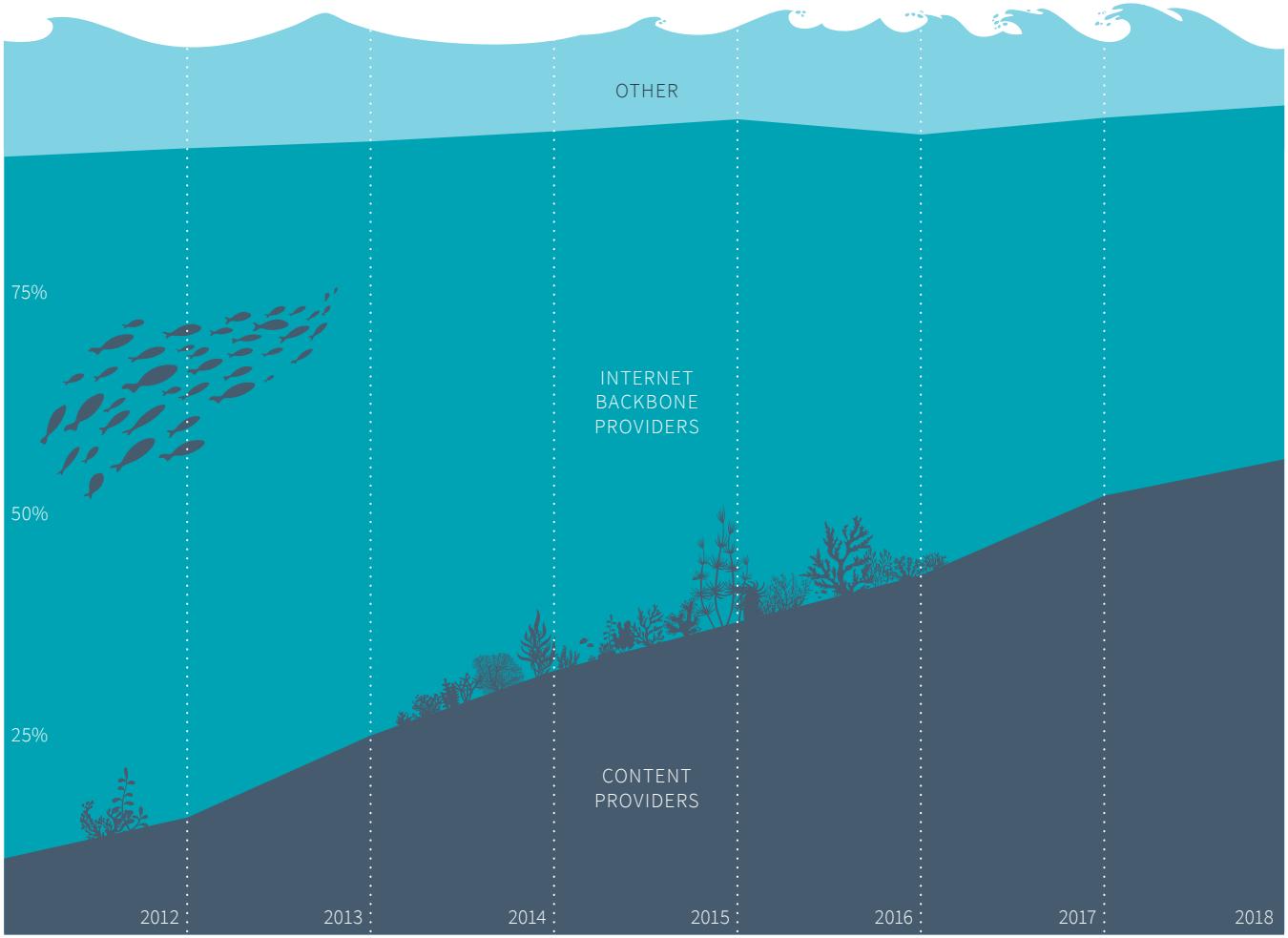


OECD countries with lowest labour productivity levels



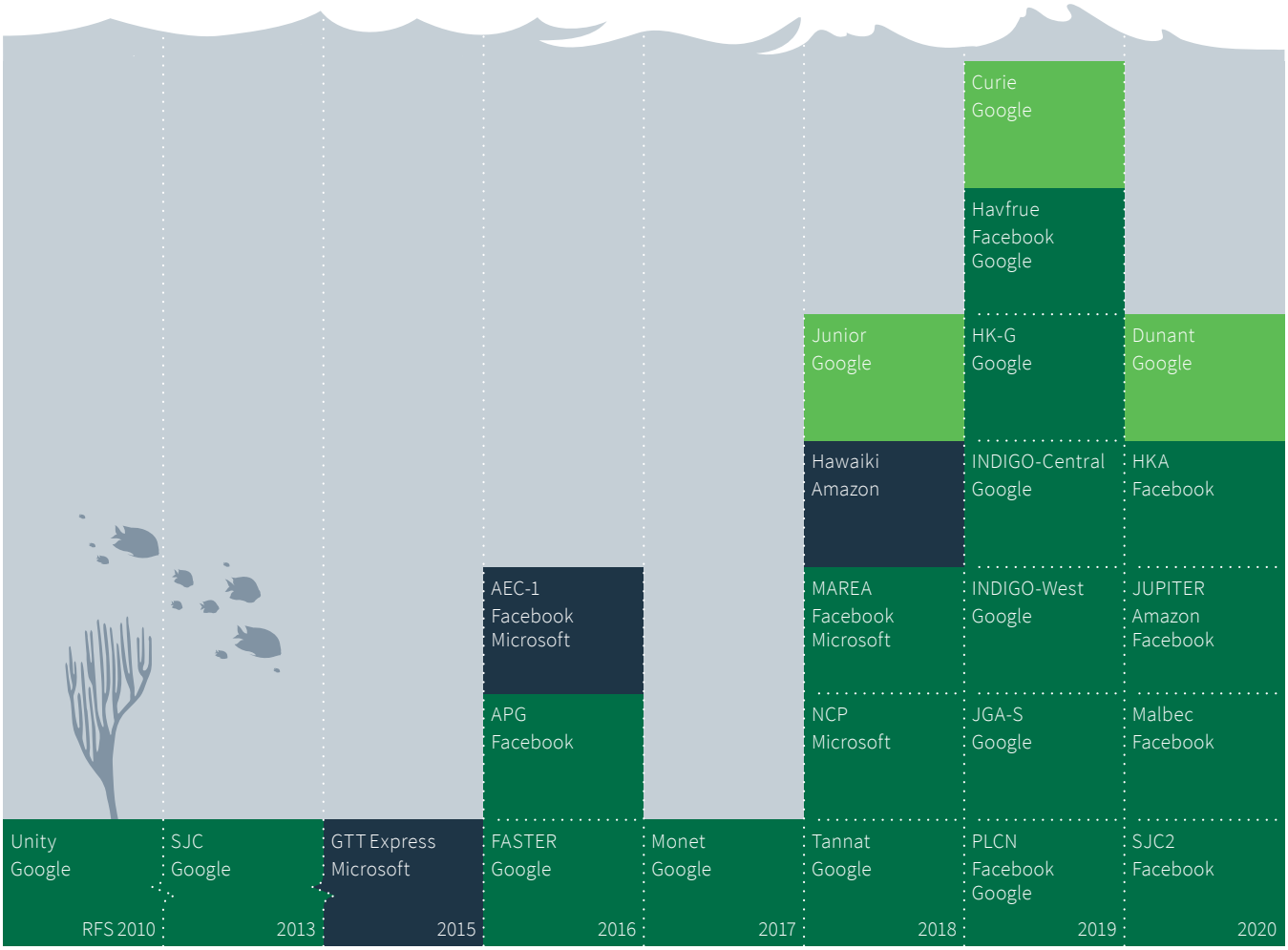
Data that lies beneath
Bandwidth consumers

Content providers – Google, Facebook, Amazon and Microsoft – have invested in fibre-optic undersea cables at an unprecedented scale. Between 2013 and 2017, they added capacity at a compound annual rate of at least 75 per cent. In 2018, Google became the first non-telecom company to privately own an intercontinental cable.



Content provider investments

The implications are far-reaching. Big Tech already controls a vast amount of data underpinning the global economy. What happens when these companies also control the infrastructure to carry that data?



AI: The real deal or a Mechanical Turk?

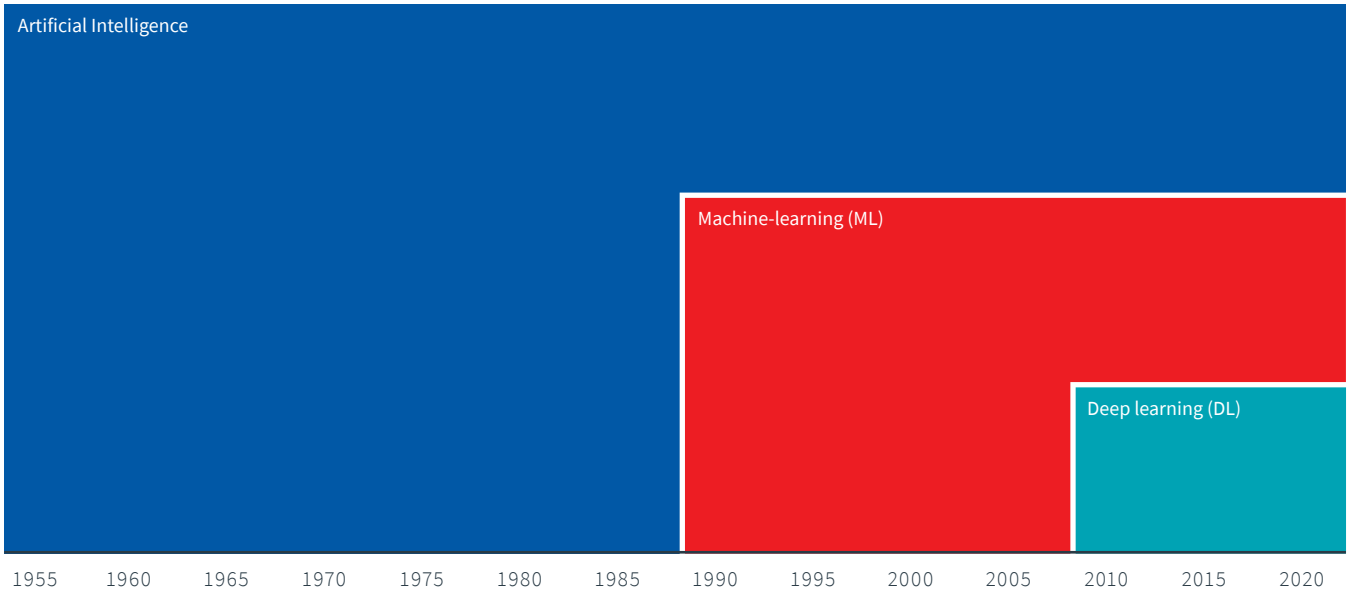
The evolution of AI: Deep learning

Artificial intelligence has been around for more than 60 years. However, machine-learning techniques have enabled programs to learn through training instead of programming only, giving us the tools to solve real-world challenges more accurately.

More recently, deep learning has delivered breakthrough results in various fields. Networks of artificial neurons process data in order to extract features and optimise variables relevant to a given problem. Most importantly, results improve through training – just as they would if handled by a real brain!

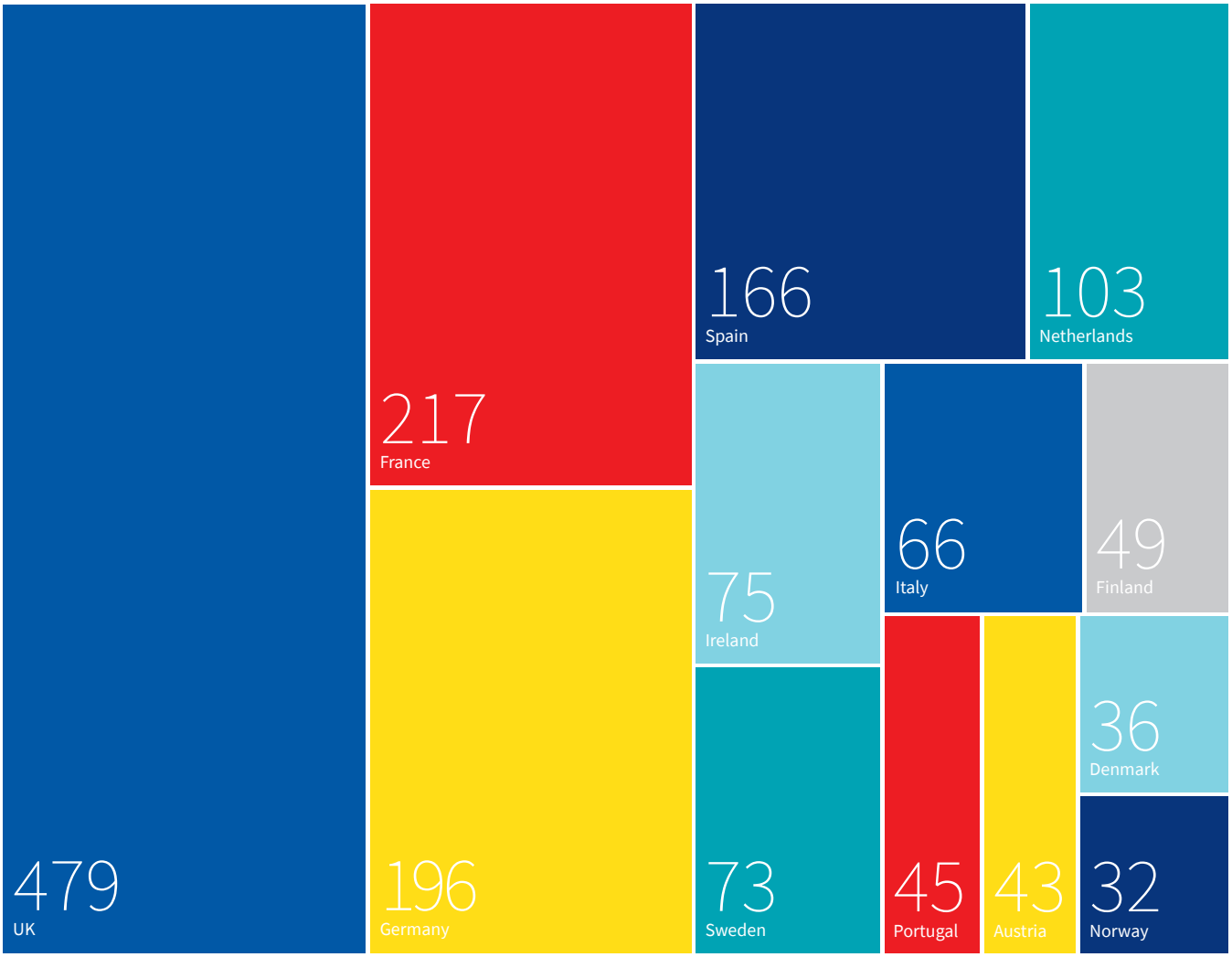
Although the current political climate might predict some brain drain in the UK, the country is still by far the European powerhouse for AI and deep learning entrepreneurship. However, in the 'gold rush' to profit from all things AI, there are question marks around what is merely purported, as opposed to genuinely authentic AI.

Timeline of AI



The UK is the heart of European AI entrepreneurship

Number of registered AI companies



Connected thinking

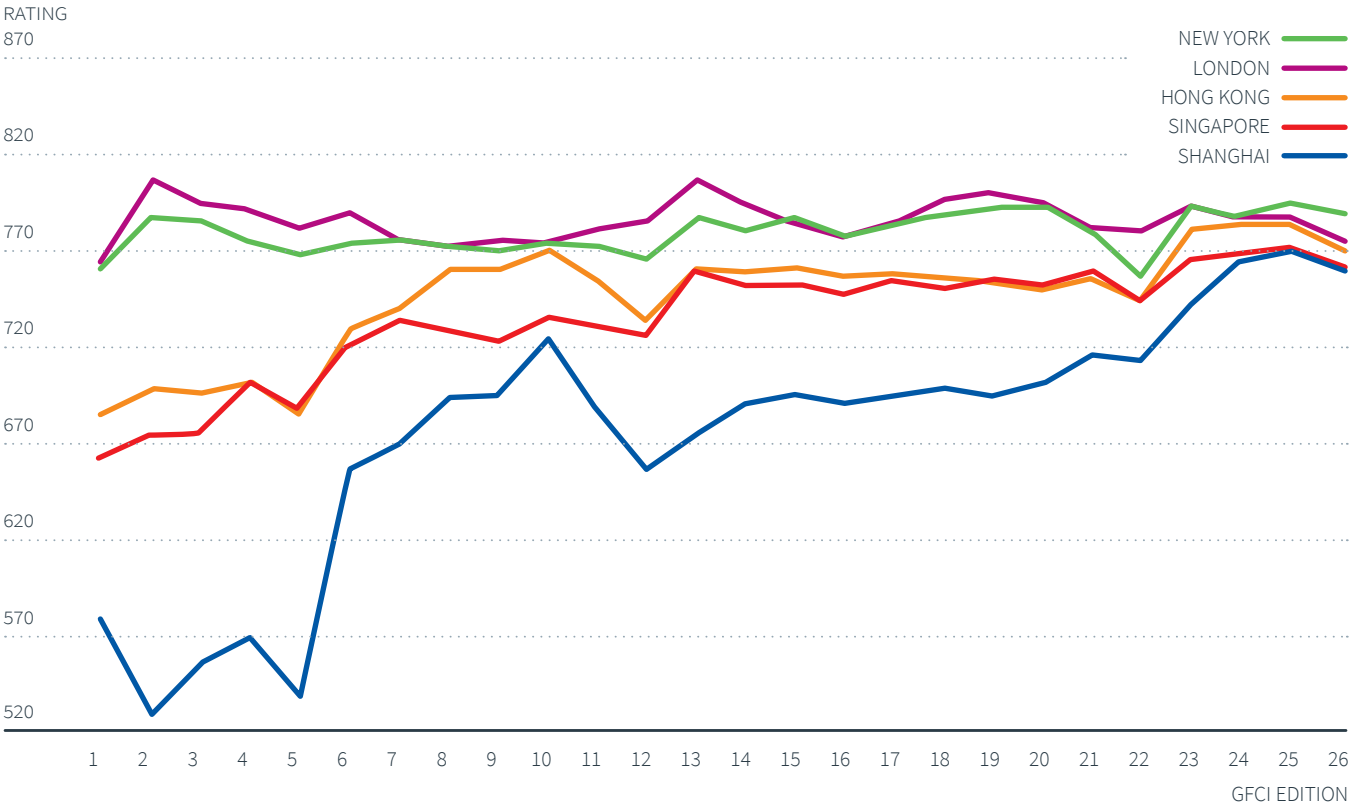
As the challenges facing individuals and society become ever more complex, understanding relationships and deep connections will be key.

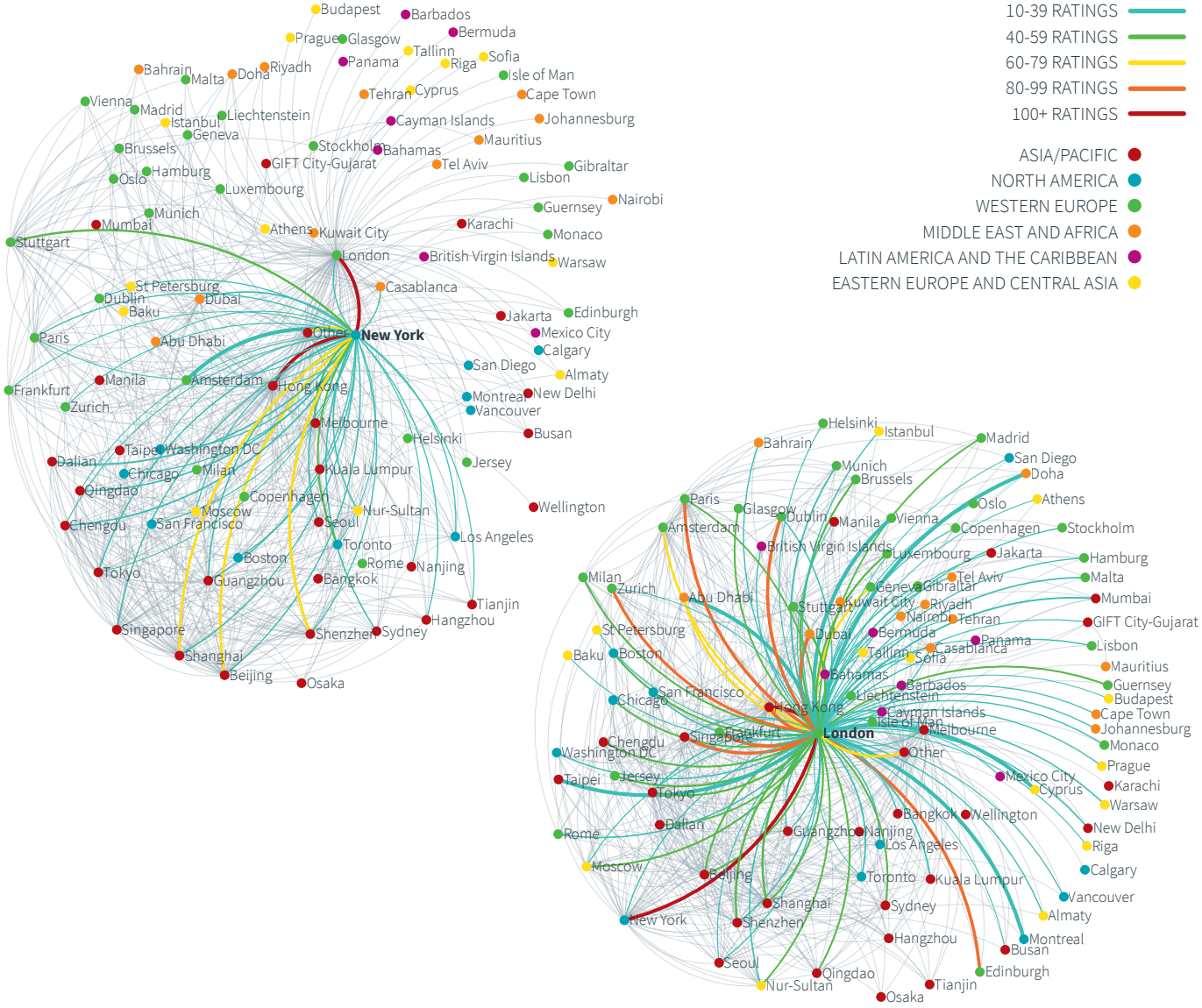
Financial centres: Competitive and connected

Finance is often described as the piping infrastructure for economic growth. Understanding the linkages between different hubs is therefore of critical importance.

The charts here are taken from 'The Global Financial Centres Index', which is now in its 26th edition.

The top five centres: GFCI ratings over time




10-39 RATINGS
40-59 RATINGS
60-79 RATINGS
80-99 RATINGS
100+ RATINGS
ASIA/PACIFIC
NORTH AMERICA
WESTERN EUROPE
MIDDLE EAST AND AFRICA
LATIN AMERICA AND THE CARIBBEAN
EASTERN EUROPE AND CENTRAL ASIA
New York
London
Budapest
Barbados
Bermuda
Prague
Glasgow
Tallinn
Panama
Riga
Sofia
Bahrain
Malta
Doha
Riyadh
Isle of Man
Vienna
Tehran
Cyprus
Cape Town
Madrid
Liechtenstein
Istanbul
Cayman Islands
Johannesburg
Geneva
Mauritius
Brussels
Stockholm
Bahamas
GIFT City-Gujarat
Tel Aviv
Gibraltar
Oslo
Hamburg
Lisbon
Luxembourg
Guernsey
Nairobi
Munich
Mumbai
Athens
Kuwait City
Karachi
Monaco
Stuttgart
British Virgin Islands
Warsaw
St Petersburg
Casablanca
Dublin
Dubai
Baku
Jakarta
Edinburgh
Other
Mexico City
Paris
Abu Dhabi
Calgary
San Diego
Almaty
Manila
Amsterdam
Hong Kong
Montreal
New Delhi
Frankfurt
Vancouver
Zurich
Melbourne
Busan
Helsinki
Taipei
Washington DC
Dalian
Chicago
Milan
Kuala Lumpur
Jersey
Qingdao
Copenhagen
Wellington
Moscow
Nur-Sultan
Chengdu
San Francisco
Seoul
Los Angeles
Toronto
Boston
Rome
Nanjing
Tokyo
Guangzhou
Bangkok
Tianjin
Hangzhou
Singapore
Shenzhen
Sydney
Shanghai
Beijing
Osaka
Helsinki
Istanbul
Madrid
Bahrain
San Diego
Munich
Doha
Brussels
Paris
Glasgow
Athens
Dublin
Manila
Vienna
Oslo
Amsterdam
Copenhagen
Stockholm
British Virgin Islands
Luxembourg
Jakarta
Hamburg
Milan
Zurich
Tel Aviv
Malta
Abu Dhabi
Geneva
Gibraltar
Mumbai
Stuttgart
Kuwait City
Riyadh
GIFT City-Gujarat
St Petersburg
Nairobi
Tehran
Dubai
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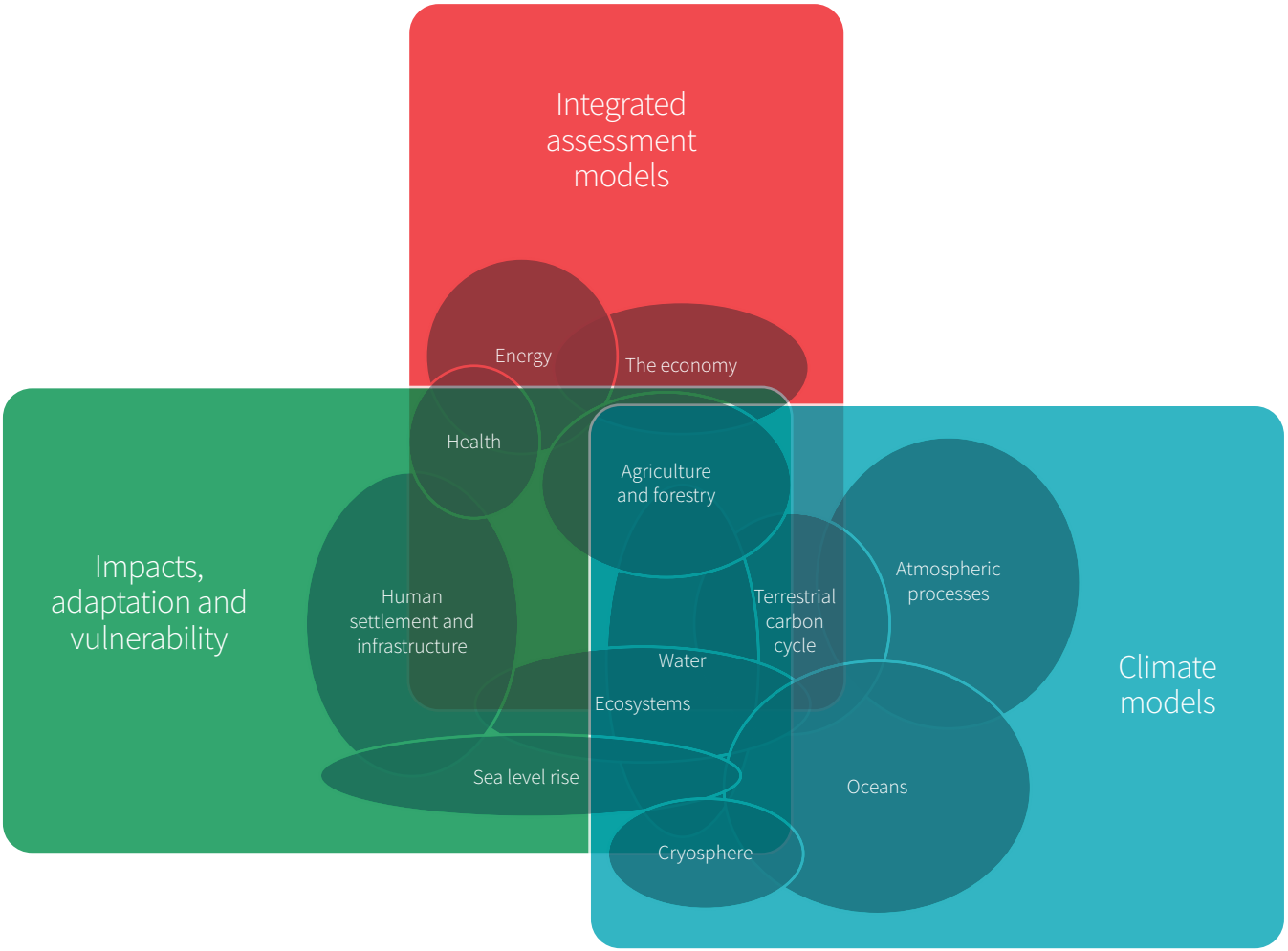
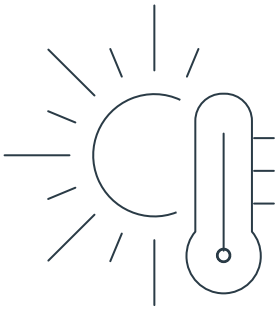
Tallinn
Casablanca
Sofia
Mauritius
Bahamas
Barbados
Guernsey
Chicago
San Francisco
Liechtenstein
Budapest
Hong Kong
Cayman Islands
Cape Town
Isle of Man
Frankfurt
Melbourne
Johannesburg
Chengdu
Singapore
Other
Monaco
Washington DC
Prague
Mexico City
Jersey
Karachi
Taipei
Cyprus
Tokyo
Warsaw
Bangkok
Wellington
Dalian
New Delhi
Rome
Guangzhou
Nanjing
Riga
Los Angeles
Moscow
Calgary
Beijing
Toronto
Kuala Lumpur
Vancouver
Shanghai
Sydney
Almaty
New York
Shenzhen
Hangzhou
Montreal
Busan
Seoul
Qingdao
Edinburgh
Nur-Sultan
Tianjin
Osaka

Climate modelling is beyond complex

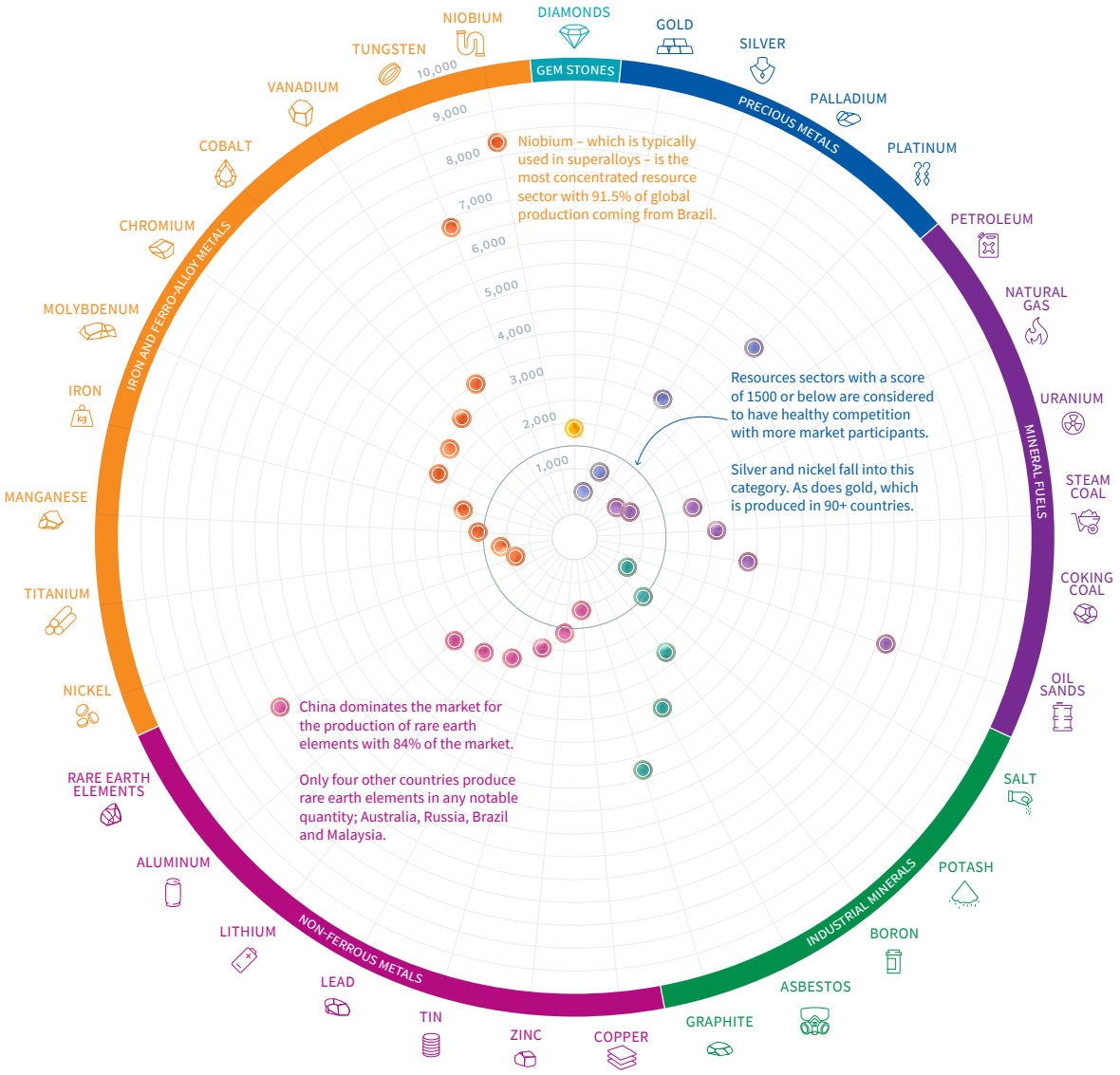




In the last four decades, the models used by climate scientists have developed enormously. “In a typical forecast there are about a billion discrete equations,” according to leading climate mathematician Professor Chris Budd.

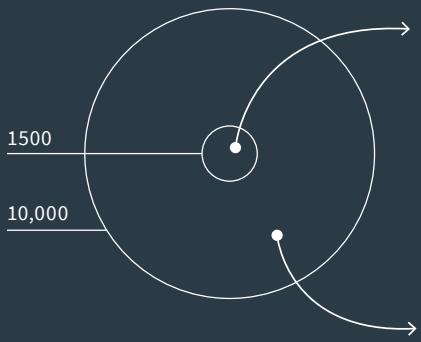
Complex. Interrelated. Margin for error. There’s plenty to grapple with.

Rare earths


NIOBIUM
DIAMONDS
GOLD
SILVER
TUNGSTEN
GEM STONES
PRECIOUS METALS
PALLADIUM
VANADIUM
PLATINUM
COBALT
PETROLEUM
CHROMIUM
NATURAL GAS
MOLYBDENUM
IRON AND FERRO-ALLOY METALS
URANIUM
IRON
MINERAL FUELS
STEAM COAL
MANGANESE
COKING COAL
TITANIUM
OIL SANDS
NICKEL
SALT
RARE EARTH ELEMENTS
POTASH
ALUMINUM
INDUSTRIAL MINERALS
BORON
LITHIUM
ASBESTOS
NON-FERROUS METALS
LEAD
GRAPHITE
TIN
ZINC
COPPER
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
Niobium – which is typically used in superalloys – is the most concentrated resource sector with 91.5% of global production coming from Brazil.
Resources sectors with a score of 1500 or below are considered to have healthy competition with more market participants.
Silver and nickel fall into this category. As does gold, which is produced in 90+ countries.
China dominates the market for the production of rare earth elements with 84% of the market.
Only four other countries produce rare earth elements in any notable quantity; Australia, Russia, Brazil and Malaysia.

Rare earth elements are vital components in the electronic gadgets we use every day – but these resources are not evenly distributed across the globe.

This graphic uses the Herfindahl-Hirschman Index, a measurement of market concentration, to show which mineral sectors are competitive and which are monopolistic. Minerals closer to the centre of the circle are more competitive markets; those on the outer rim are monopolies. The market for rare earths is dominated by a single country: China.



Anything below a score of 1500 indicates a competitive marketplace.

EXAMPLE:

The market for petroleum is extremely competitive, with an HHI score of 686. There are many companies extracting petroleum all over the world.

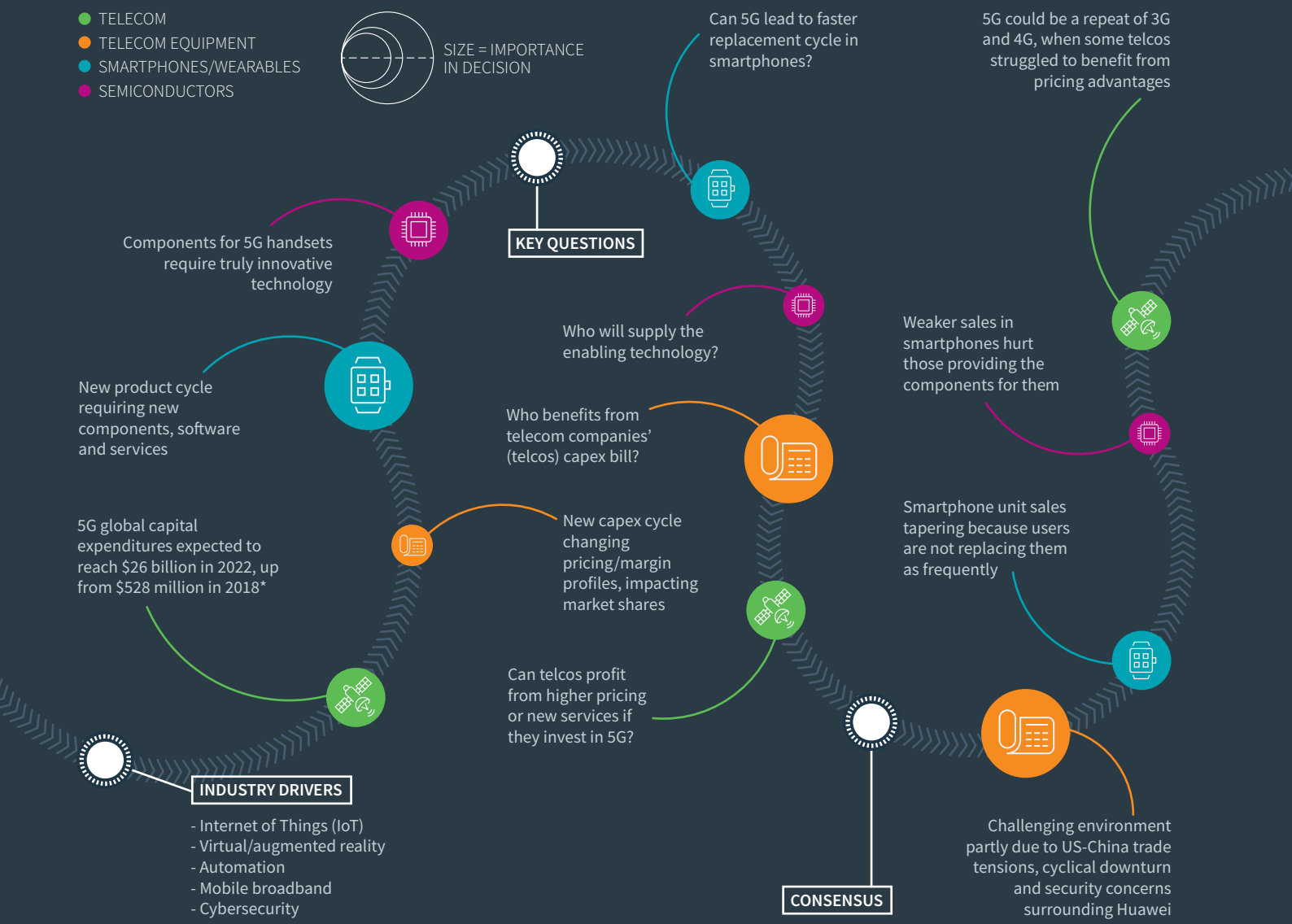
The closer the score is to 10,000 the closer the market is to a monopoly.

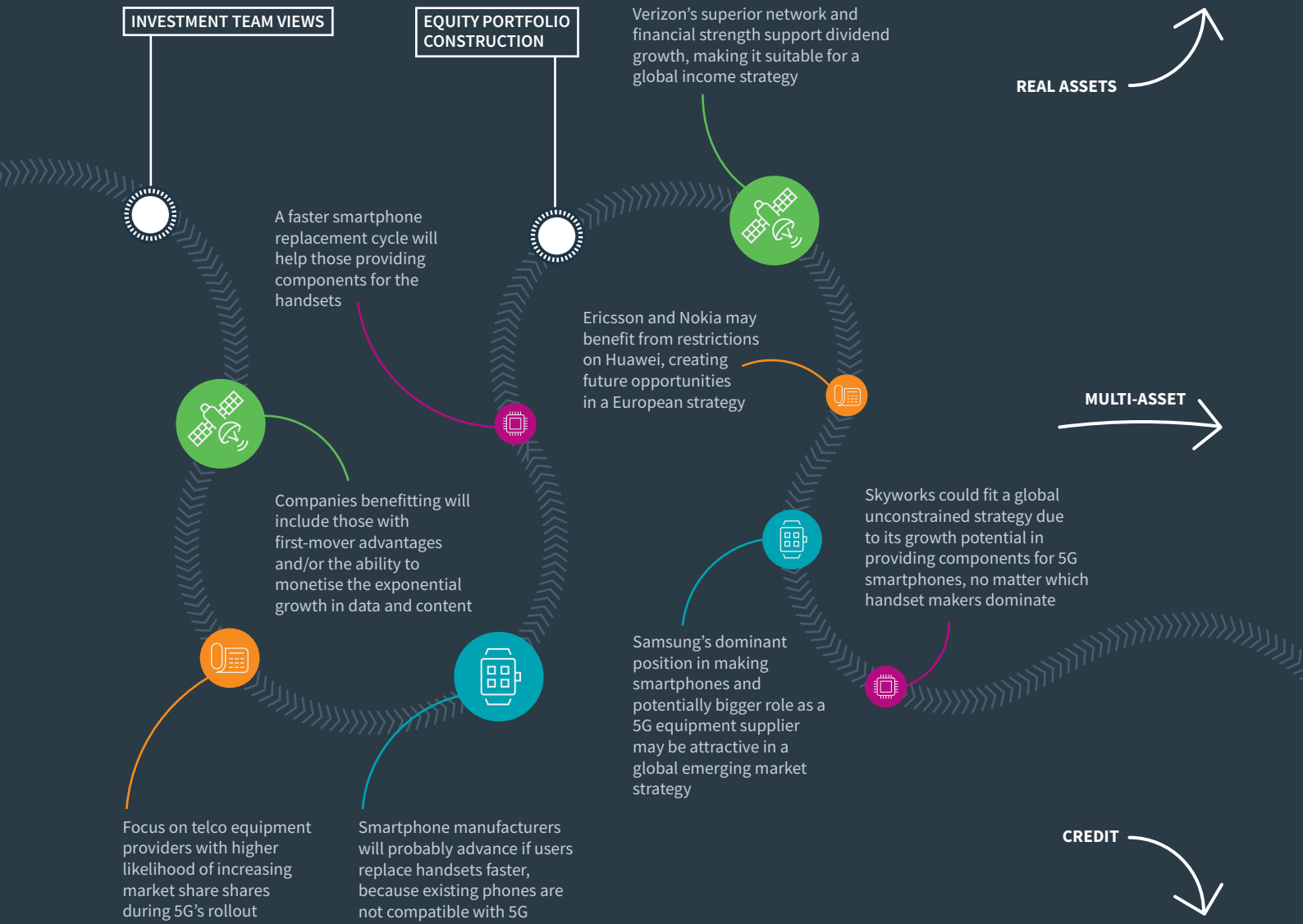
EXAMPLE:

In contrast, major oil sands reserves are limited to just two countries: Canada and Venezuela. As such, the oil sands market operates closer to a monopoly, with an HHI score of 6871.

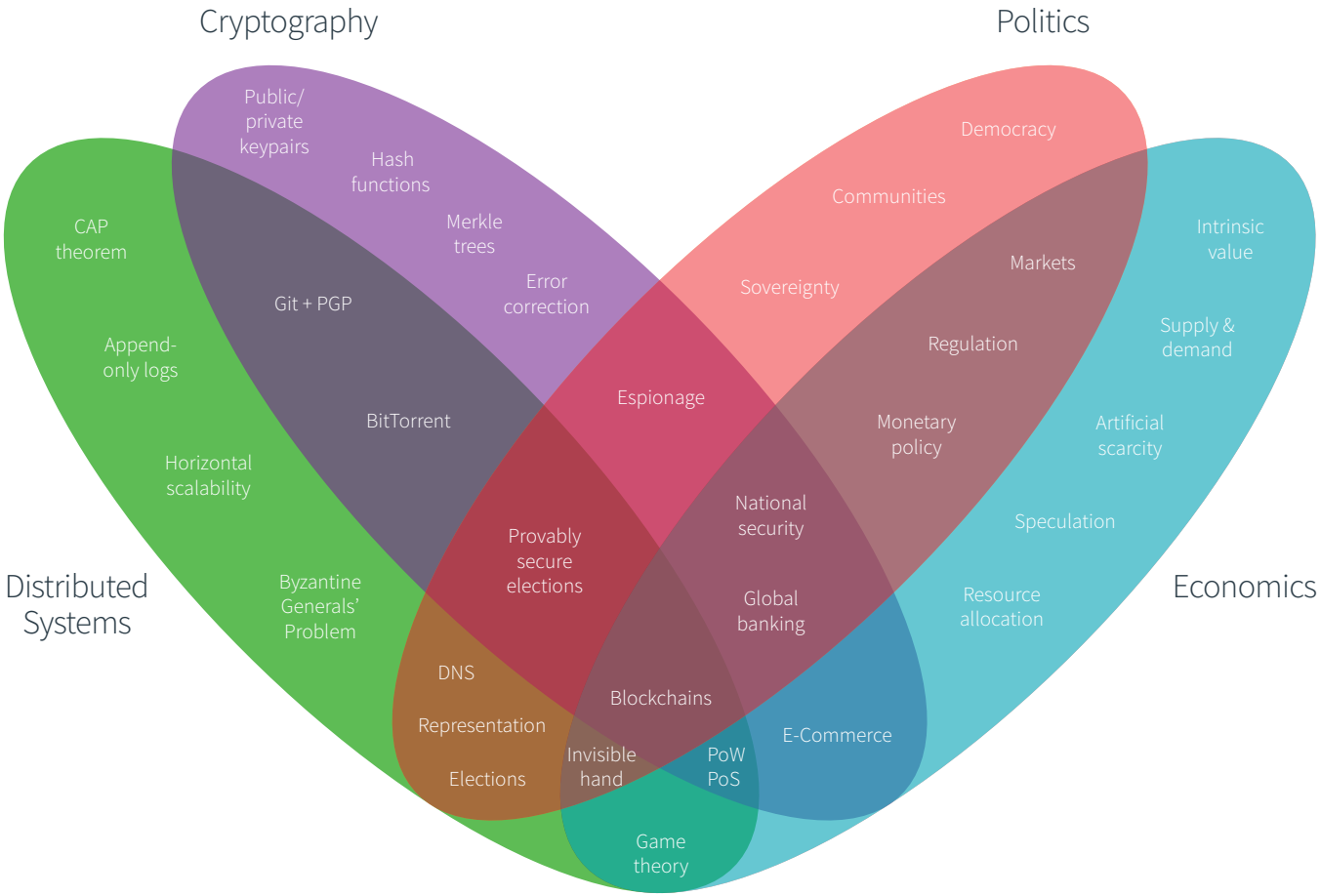
5G: An anatomy of an equity investment idea

An example of connected thinking in action from our equity team




INVESTMENT TEAM VIEWS
EQUITY PORTFOLIO CONSTRUCTION
Verizon's superior network and financial strength support dividend growth, making it suitable for a global income strategy
REAL ASSETS
A faster smartphone replacement cycle will help those providing components for the handsets
Ericsson and Nokia may benefit from restrictions on Huawei, creating future opportunities in a European strategy
MULTI-ASSET
Companies benefitting will include those with first-mover advantages and/or the ability to monetise the exponential growth in data and content
Skyworks could fit a global unconstrained strategy due to its growth potential in providing components for 5G smartphones, no matter which handset makers dominate
Samsung's dominant position in making smartphones and potentially bigger role as a 5G equipment supplier may be attractive in a global emerging market strategy
Focus on telco equipment providers with higher likelihood of increasing market share shares during 5G's rollout
Smartphone manufacturers will probably advance if users replace handsets faster, because existing phones are not compatible with 5G
CREDIT

A question of trust: What's behind blockchain technology?



Tech-enabled trends such as social networking, the sharing economy and crowdfunding all rest on three basic levels of trust: trust in the idea; trust in the platform; and trust in other users. Blockchain – the world's first distributed trustless consensus algorithm behind cryptocurrencies – reduces that convention of building and managing trust a step further.

Users still need to trust the idea and the platform, but they no longer need to trust other users. The process making this possible is far too complex to detail here, but essentially connects existing and new concepts in both technical and social disciplines, as shown in the Venn diagram.

Whether society is ready for such a change remains to be seen. If you believe the anarchists, decentralising trust is the answer. However, the battle over where we place our trust is intensely political, as indicated by the global attempts to regulate – and even co-opt – cryptocurrency exchanges, chipping away at one of Blockchain's main advantages around decentralisation. Don't give up on our innate reliance on institutions and norms to create our trust frameworks just yet.

Multiple intelligences: The power of neurodiversity

“Everyone is a genius. But if you judge a fish by its ability to climb a tree, it will live its whole life believing that it is stupid.”

Albert Einstein

In his landmark book *Frames of Mind: The Theory of Multiple Intelligences*, Howard Gardner proposed eight (later revised to nine) abilities related to intelligence. His theory represented a significant leap forward in how we judge people's intelligence, demanding we look beyond the simple IQ test that focuses heavily on logical and verbal strengths.

The importance of harnessing neurodiversity is becoming increasingly critical for companies and organisations.

Urbanisation

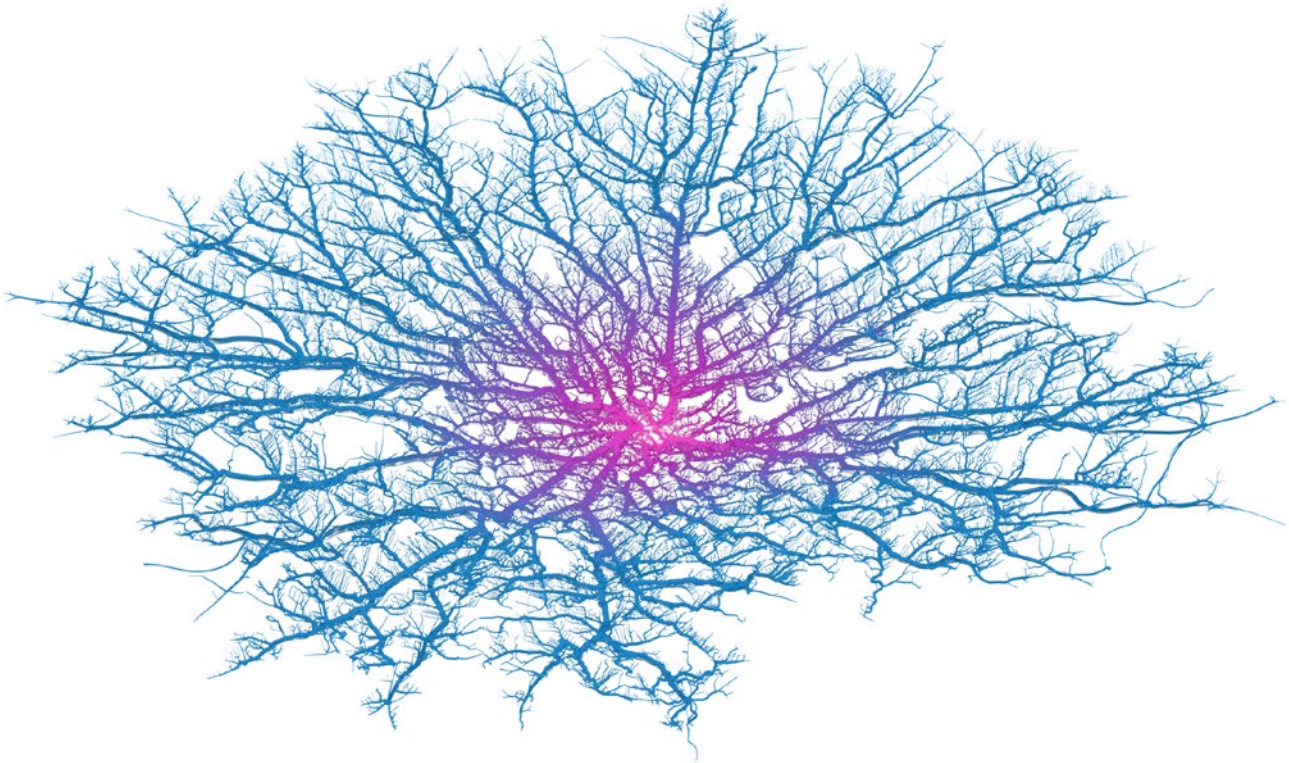
Understanding that 70 per cent of the global population are set to reside in urban areas by 2050, as well as the nuances that lurk below the surface, will be key to effective policy and overall decision-making.

Coral cities

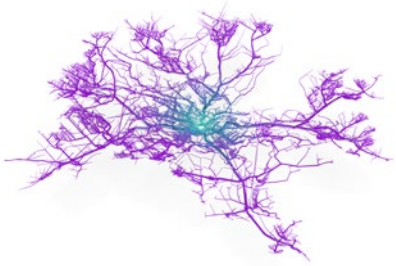
"The varying patterns of urban forms are inherently dictated by their road network; a complex, seemingly organic connection of links moving people across their city. Like branches of coral they have a pattern and a function." – Craig Taylor, Ito World

Taylor calculated how far you can travel (by car) from each city centre in 30 minutes. The resulting 'coral formations' show transport data in a new way. Each strand effectively shows the veins and arteries of a city, representing a possible route from the centre.

Coral cities provide a unique perspective on how we move around some of the world's greatest metropoles.

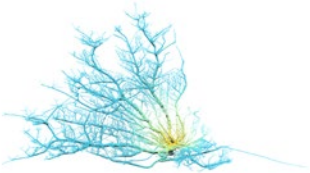


LONDON

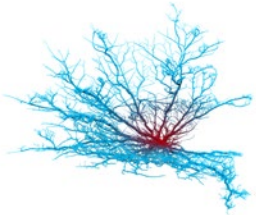


AMSTERDAM

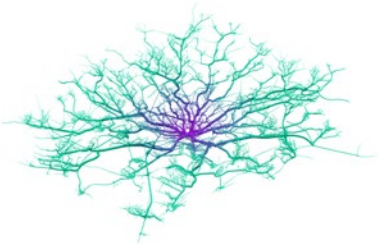
BERLIN



COPENHAGEN

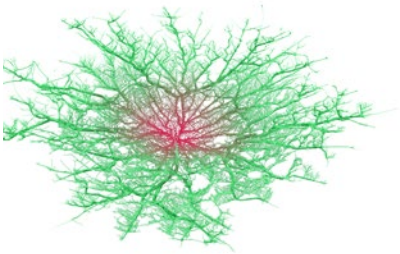


DUBLIN

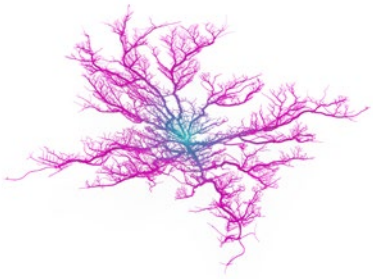


FRANKFURT

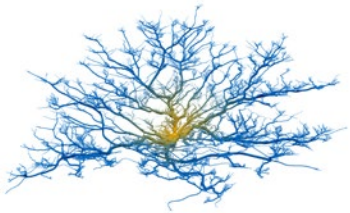
HAMBURG



PARIS



STOCKHOLM



STUTTGART

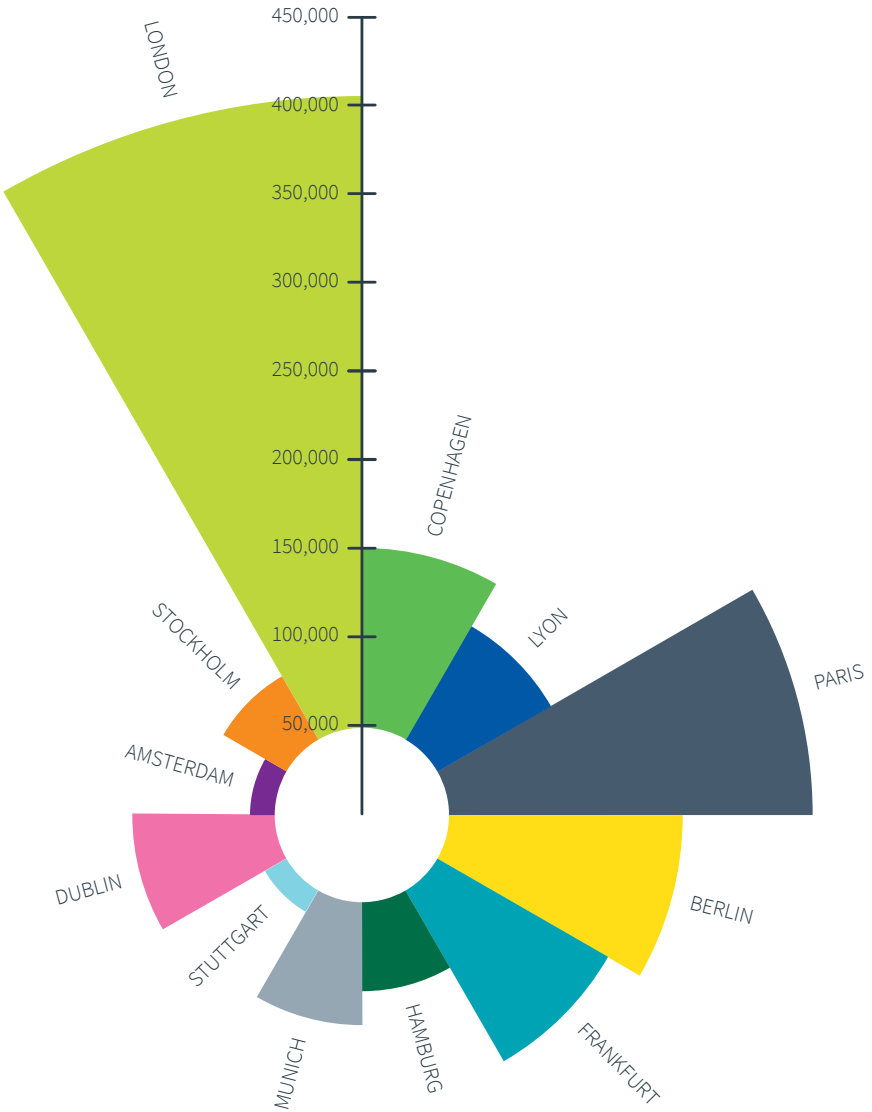
European cities: Talent, clusters and scale

The role of a city is vastly different to 50 years ago. Many of Europe's great cities grew up in an era of industrialisation, when competition was heavily driven by input costs. Locations benefited from qualities such as a natural harbour, access to a navigable river, proximity to sources of fuel (usually coal) and access to labour, suppliers and consumers.

Today, a city's success is driven by its ability to facilitate information sharing to nurture idea creation. Competitive advantage no longer rests on access to inputs but on making more productive use of them. This requires continuous innovation.

Cities set to thrive, particularly in an era of knowledge capitalism, are those that manage to attract talent, establish or maintain clusters of value-add economic activity, and leverage the agglomeration effects that occur when firms and people locate in close proximity.

Total number of students by city

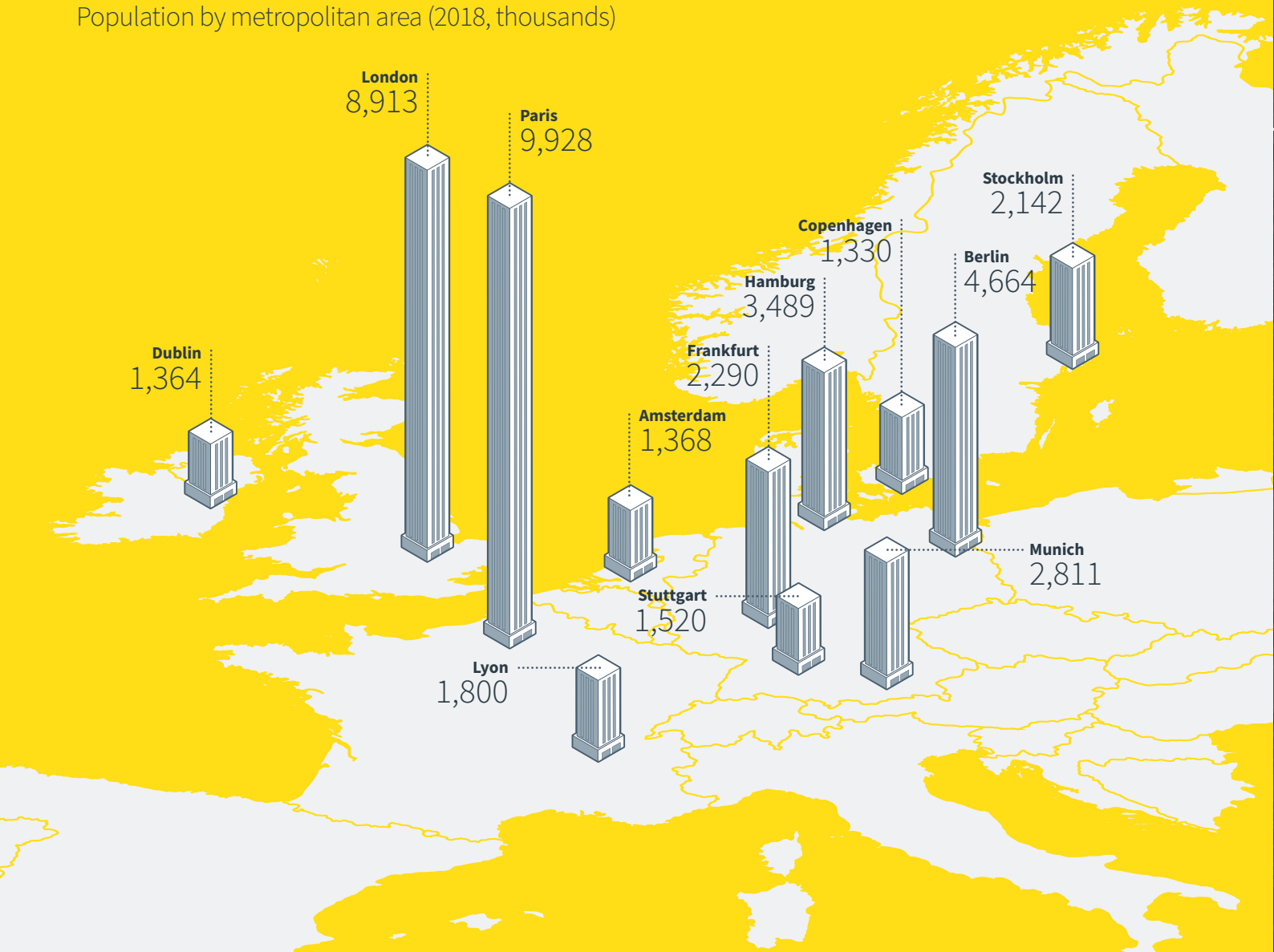


European cities: Talent, clusters and scale

Europe's megacities

Europe's two megacities, Paris and London, have a significantly higher Future City score than other cities in the region. Both act as magnets for global talent and their scale gives them a major competitive advantage. They have the right credentials to drive growth in an era of knowledge capitalism and both have office markets characterised by significant constraints to new development, signalling scope for sustained rental growth over the long run.

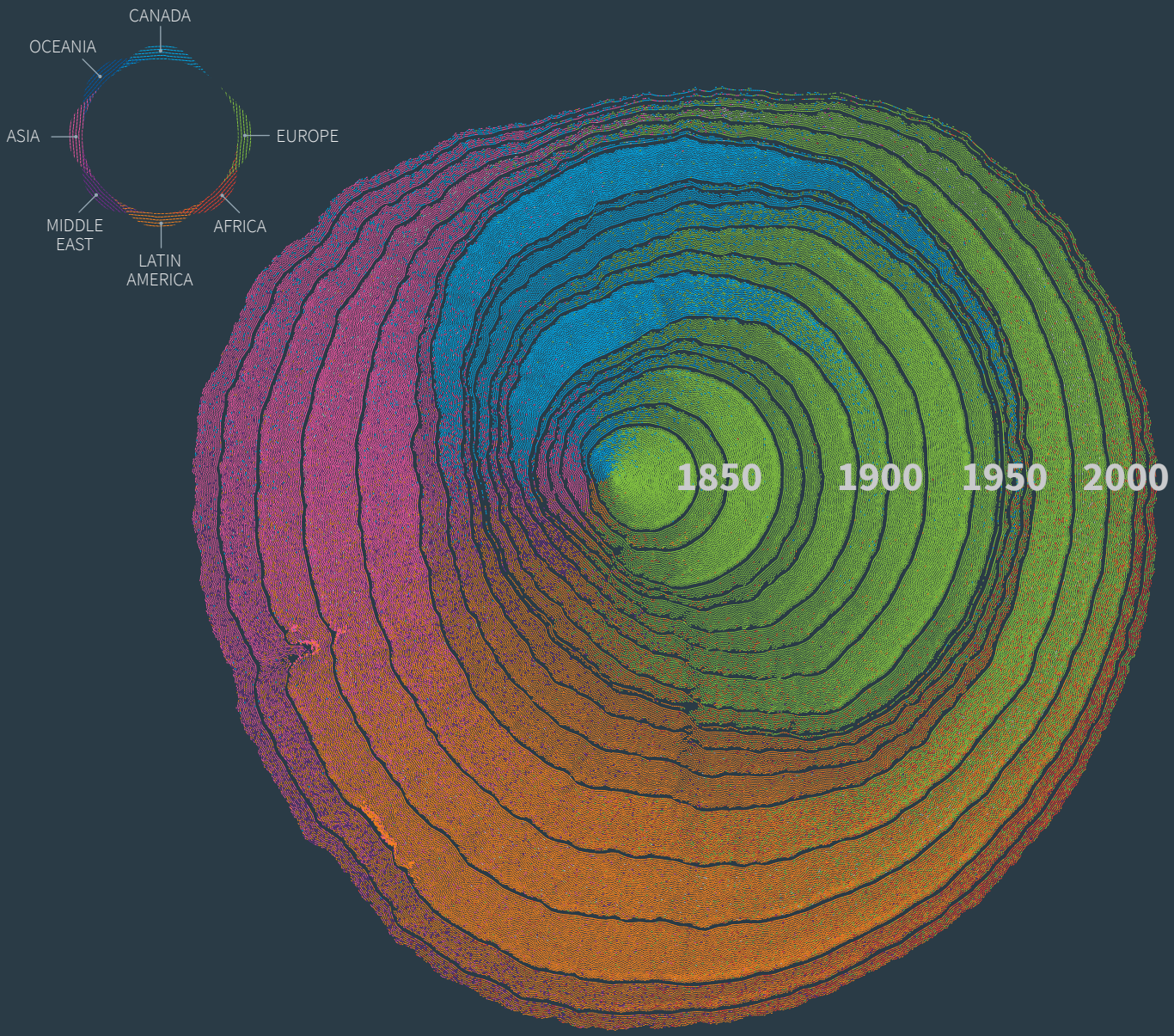
Population by metropolitan area (2018, thousands)




ANGEL
EUSTON
CLERKENWELL
BLOOMSBURY
ST. LUKE'S
HOLBORN
SPITALFIELDS
ST PAUL'S
AND
FLEET STREET
ALDGATE
AND
BRICK LANE
CITY RIVER
TRAVEL
DIGITAL
PHARMA BIO-TECH
CREATIVE
FINANCE
BUSINESS SERVICES
PROPERTY

Dendrochronology

A new way of seeing two centuries of American immigration



The US has more immigrants than any other country. About 44 million people living there were born in another country, accounting for one in five of the global migrant population in 2017.

As indicated in this dendrochronology diagram, which treats each decade of immigration history in the US as a tree ring, the numbers swelled in the decades following the 1965 Immigration Act. (Previous policies were based on a national quota system.)

Not only did the rings become wider, but also more colourful, as immigrants arrived from a broader variety of countries in Asia, the Middle East and Latin America. They also favoured settling in the west and south over the north and northeast, with California and Texas receiving the highest immigrant population and New York a close third.

With the Trump administration's immigration policies, though, the next decade could look very different.

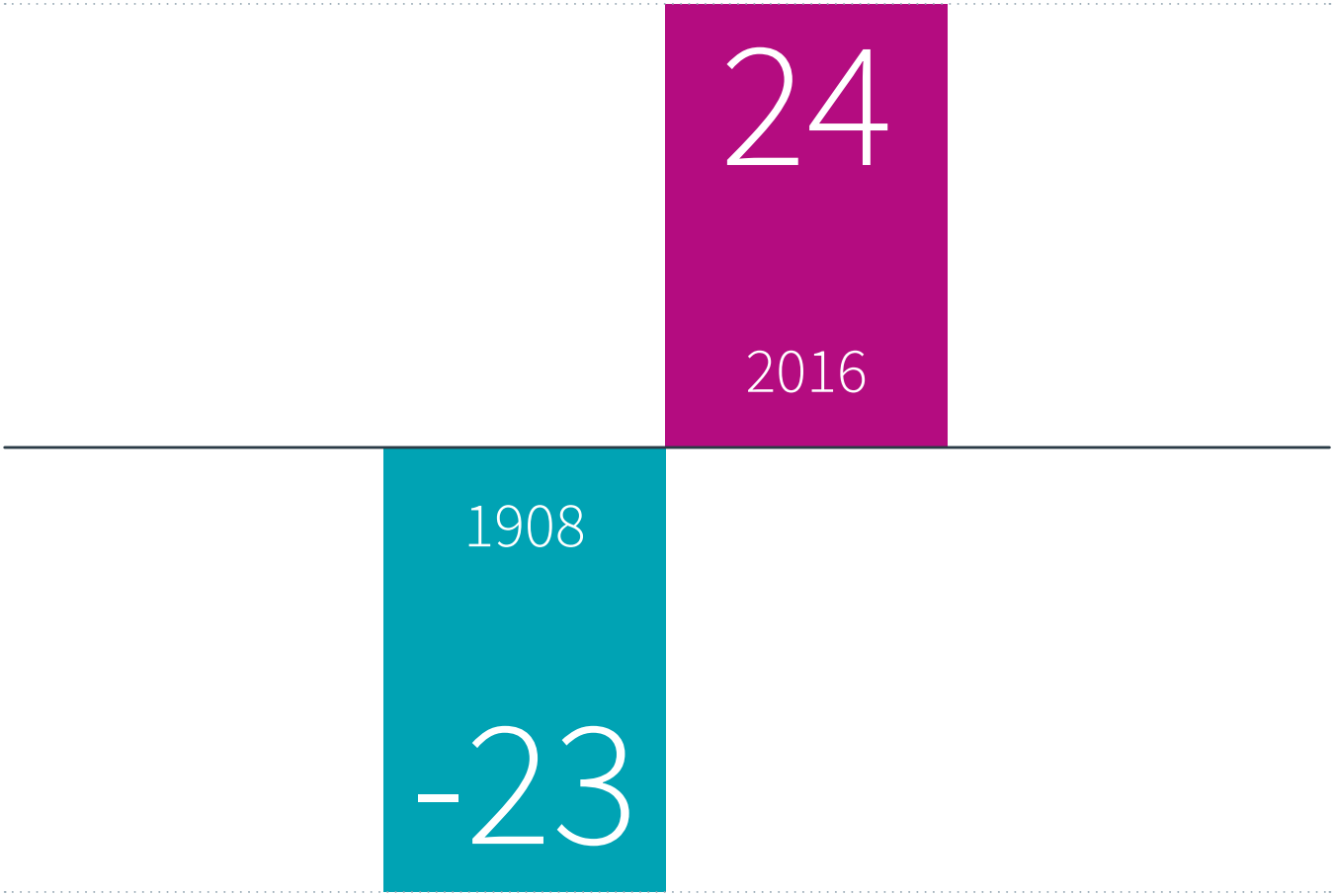
Retirement

The challenges facing retirees are multi-dimensional. While understanding the numbers is important, the quest for purpose and meaning in retirement should also shape our thinking.

Have we reached peak retirement?

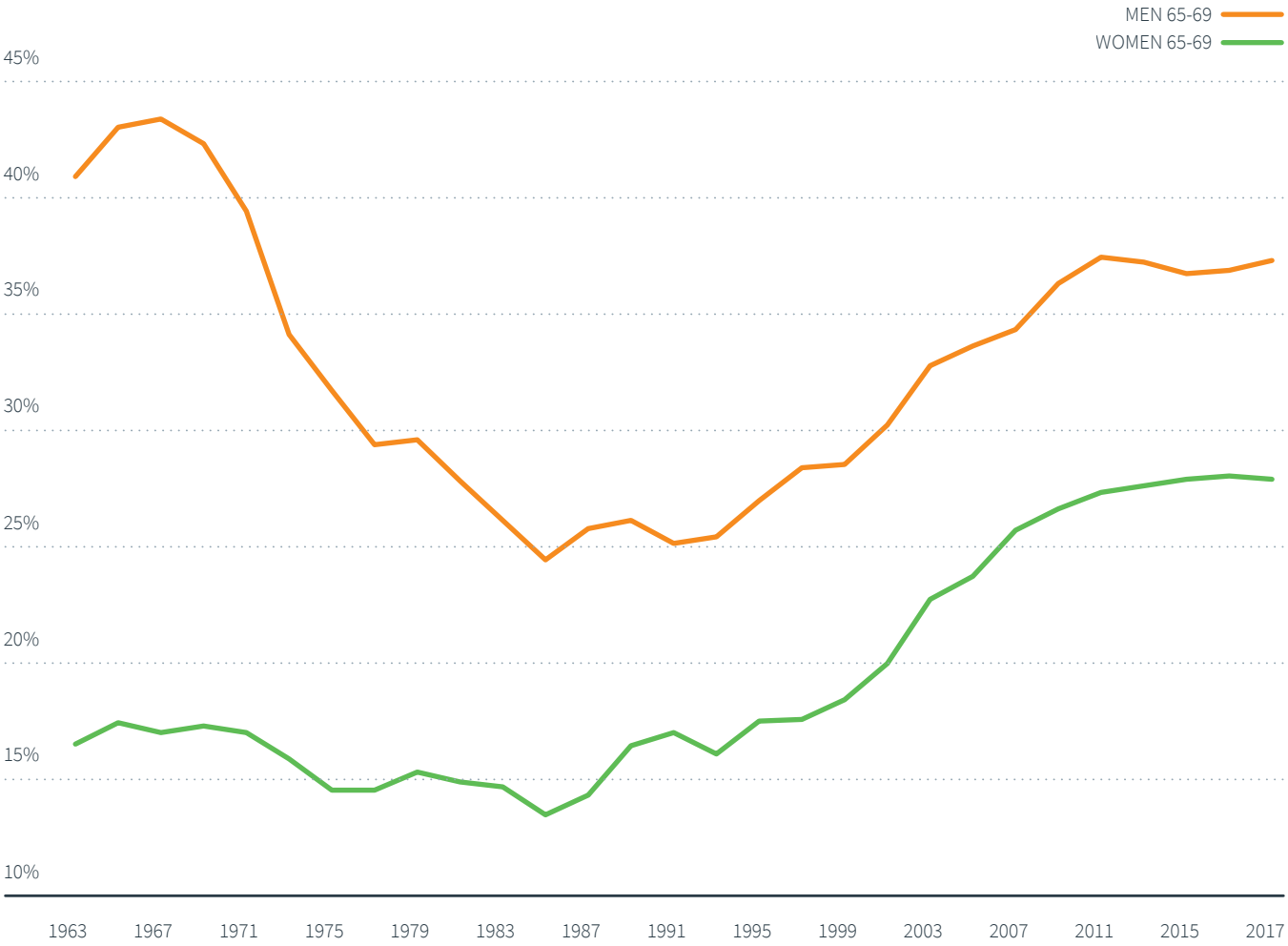
Average years spent in retirement

The idea that in one's sixties it might be time to step out of work and retire into a life of leisure is relatively recent. Just over a century ago, people in the UK died on average 23 years before the official retirement age.



Labour-force participation

Retiring at 60 is therefore a relatively new concept, and possibly a short-lived one. Looking at labour-force participation, the idea there is a single age at which everyone should retire is already outdated.



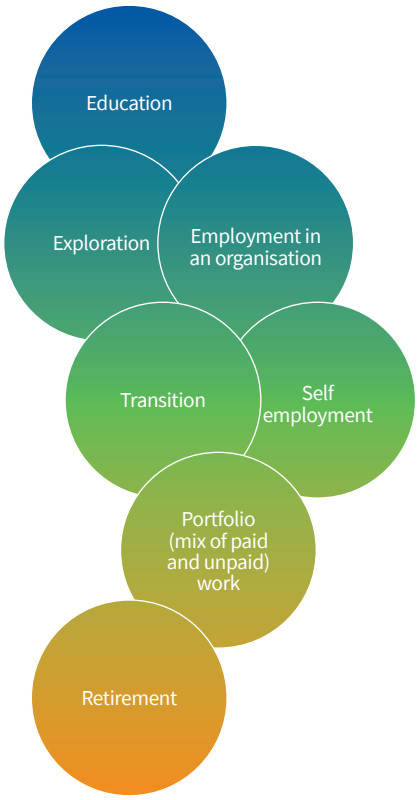
Multi-stage lives

If the notion of a multi-stage life is right, we should question the whole concept of a pension because of our need for assets at different times of our lives.

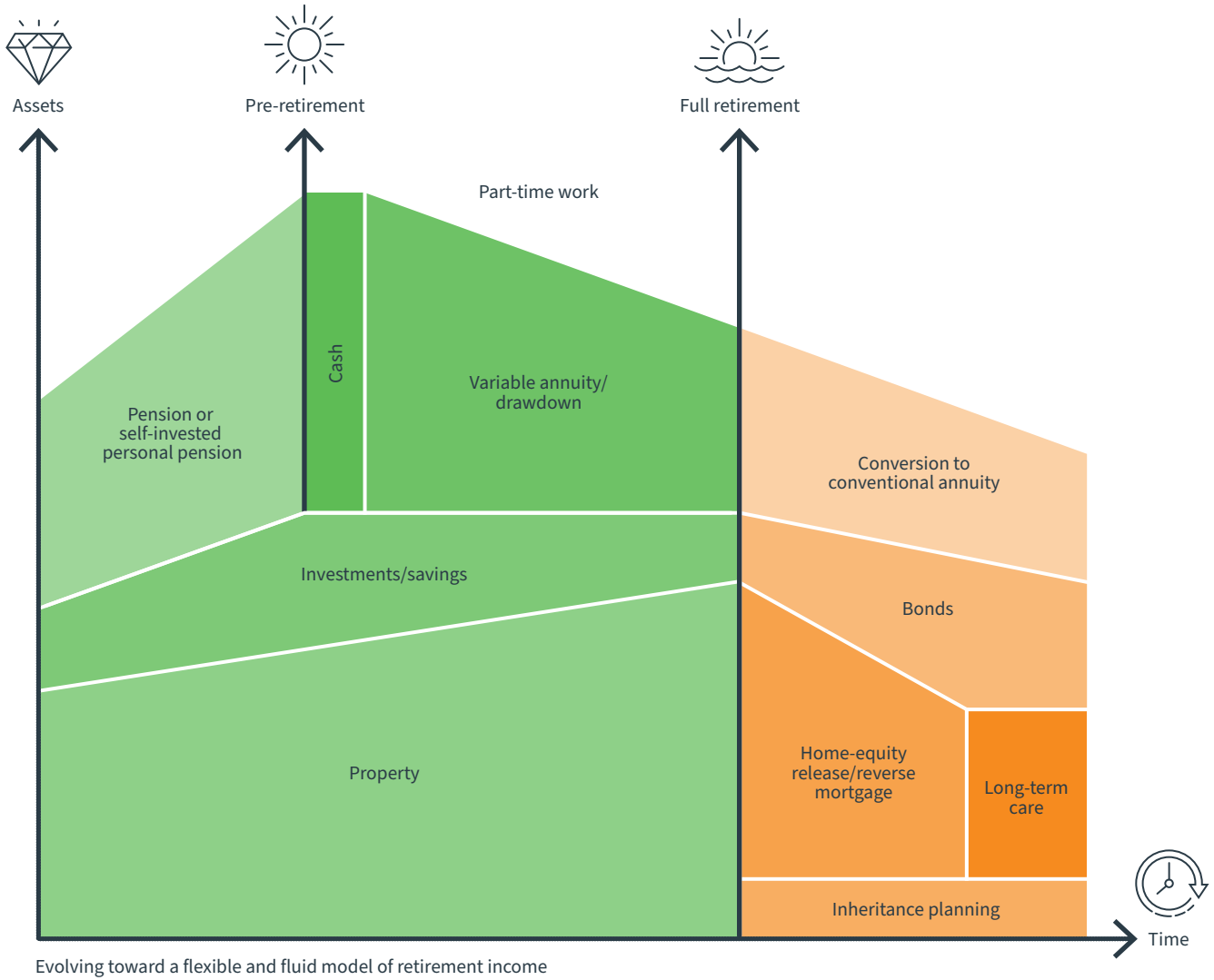
There is a whole covariance of assets we must look at: health, relationships and education, as well as work. This requires us to think differently about when we shuffle money from one period to another. That process is also going to be much more individualistic.

The three-stage model

The multi-stage life



From three to many stages of life



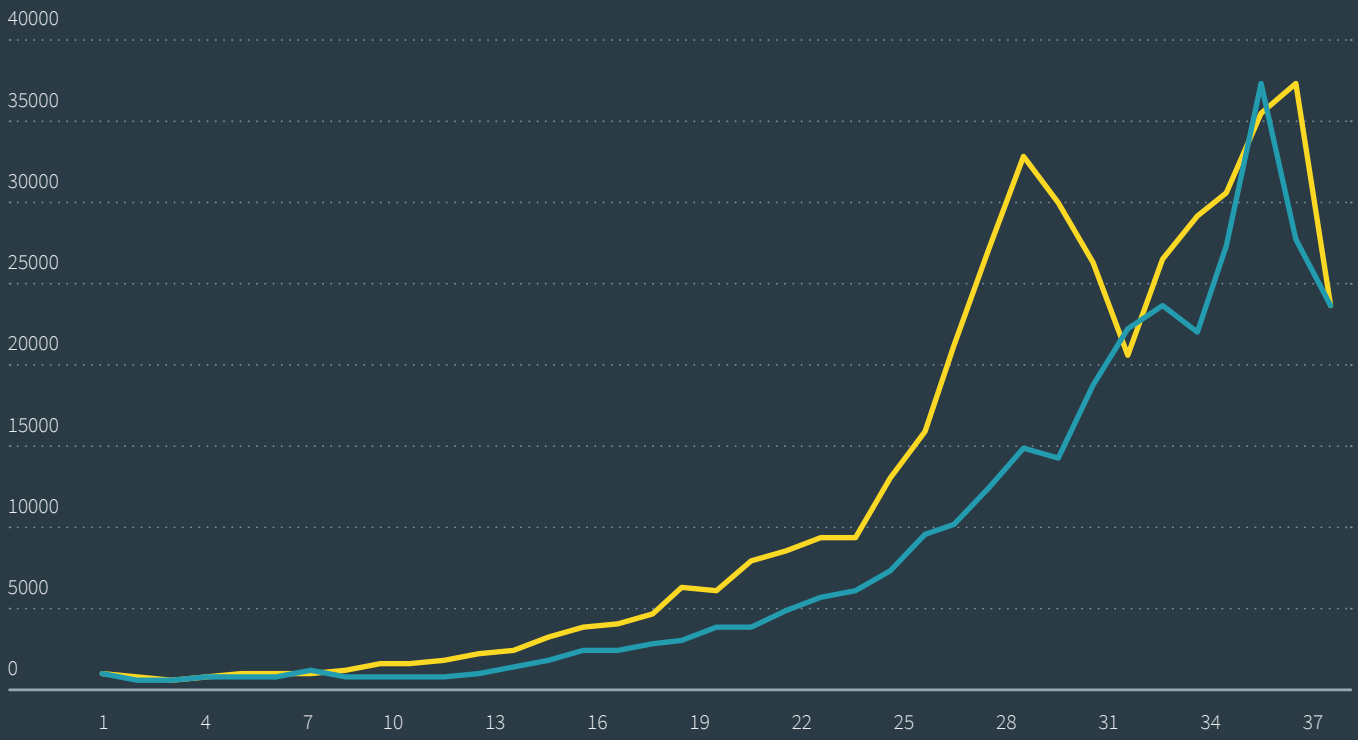
Evolving toward a flexible and fluid model of retirement income

Sequence of returns risk

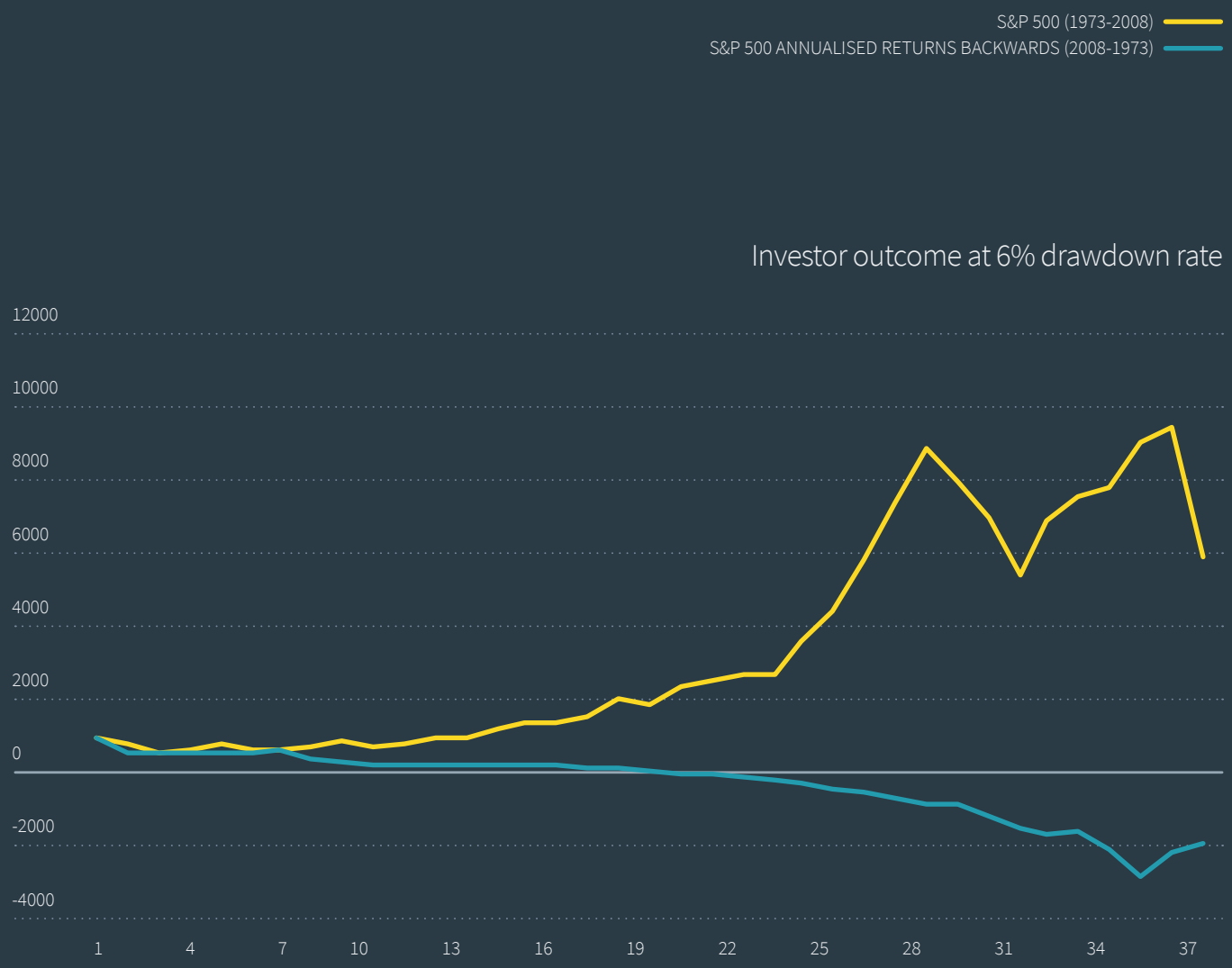
How to best convert assets into income from long-term savings? Nobel Prize winner Professor William Sharpe described this as "the nastiest, hardest problem in finance".

The problem for investors is that future 'unknowns' – like the pattern of returns – can lead to radically different outcomes. Drawing down on an illustrative portfolio invested in the S&P 500 (shown in yellow) or on a portfolio with returns stated in reverse order (in blue) can lead to materially different results. The order of returns matter as early losses can be hard to recover from.

S&P annual returns



Past performance is not an indicator of future performance, the value of investments can fall as well as rise.

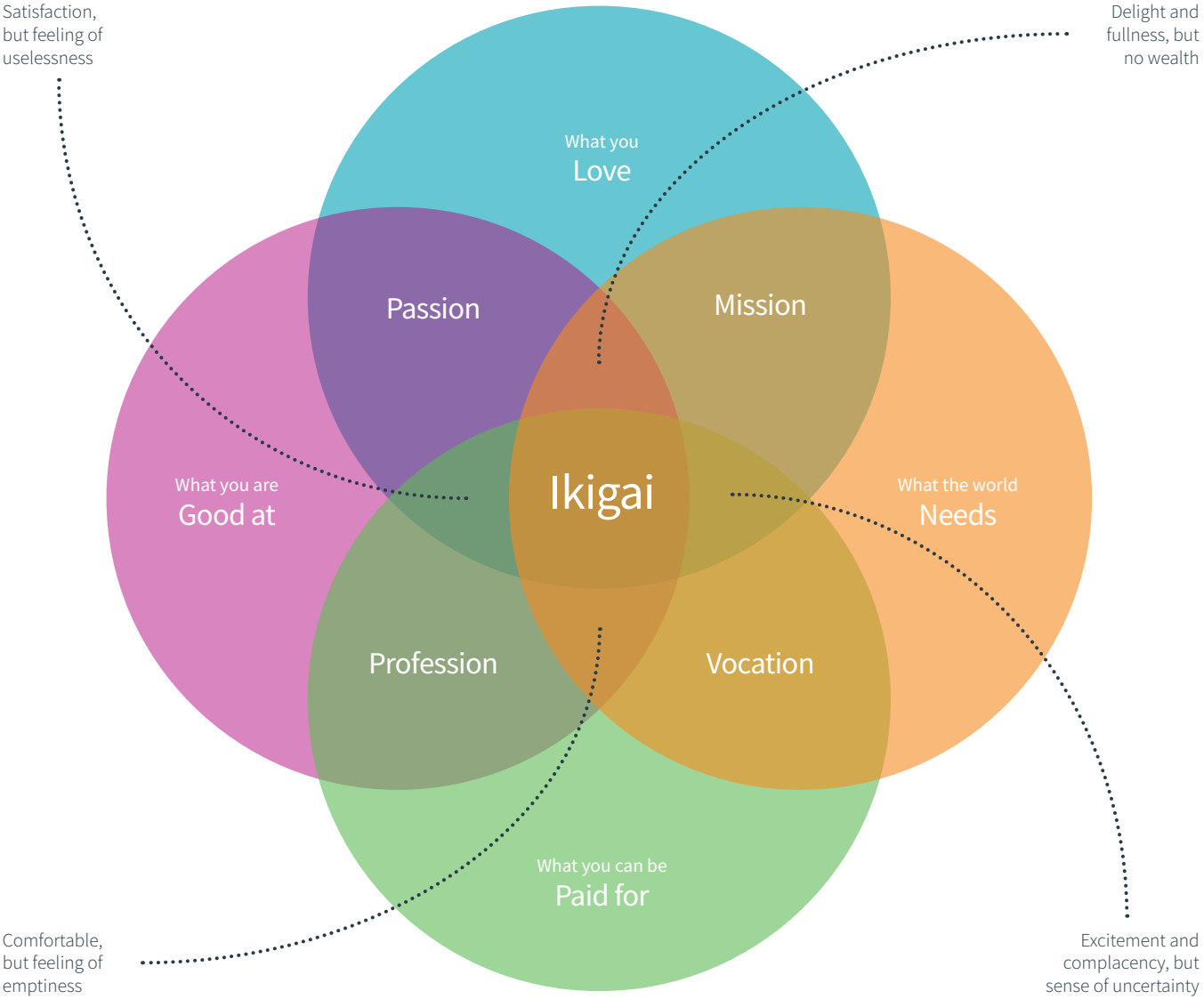

S&P 500 (1973-2008)
S&P 500 ANNUALISED RETURNS BACKWARDS (2008-1973)
Investor outcome at 6% drawdown rate
12000
10000
8000
6000
4000
2000
0
-2000
-4000
1
4
7
10
13
16
19
22
25
28
31
34
37

Ikigai: A reason for being

In Japan, the world's most aged society, a whole concept has emerged that tries to set out 'a reason for being'. Ikigai is an approach based on staying active, which is proving popular for the older generation, as well as those suffering from inertia or depression.

Ikigai suggests staying involved for as long as possible in different spheres of life, including work, leisure and vocational interests. The concept aligns with an old Japanese proverb: 'Only staying active will make you want to live a hundred years'.

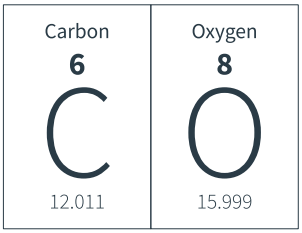
What is important about Ikigai is the way it encourages the elderly – and others – to search for balance and be actively engaged.


Satisfaction, but feeling of uselessness
Delight and fullness, but no wealth
What you Love
Passion
Mission
What you are Good at
Ikigai
What the world Needs
Profession
Vocation
What you can be Paid for
Comfortable, but feeling of emptiness
Excitement and complacency, but sense of uncertainty

Sustainability

There is no doubt climate change is happening, and the consequences of temperature increases are not only limited to environmental decay, but also economic. Companies and financial institutions have a major role to play in mitigating these impacts.

Dangerous anthropogenic interference (DAI)

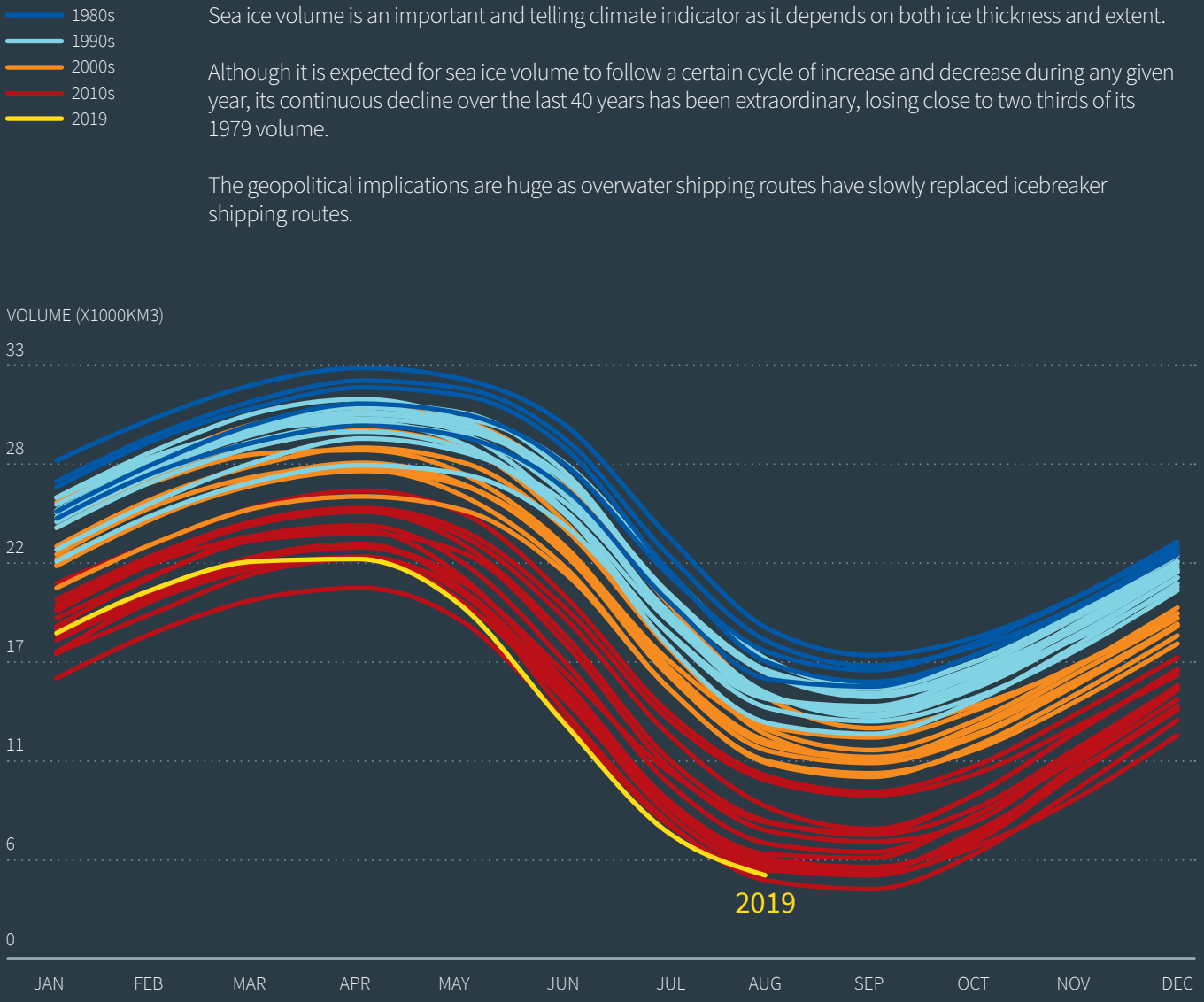


Just what you need – another acronym. Although there is no clear definition of what constitutes a DAI, it is pretty clear we achieved it. It is widely accepted that DAIs apply to events dramatic enough to cause the destruction of entire ecosystems, mass extinction or disrupt the world's food supply.

Take a look at the chart and make your own conclusions about our impact as humans.

The amount of carbon dioxide (CO_2) in the atmosphere varies, tending to cycle between 180 and 300 parts per million. CO_2 levels have risen dramatically since the industrial revolution. Humans' disruption of the carbon cycle means higher average temperatures and greater extremes.

Melting ice caps



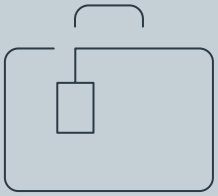
Sea ice volume is an important and telling climate indicator as it depends on both ice thickness and extent.

Although it is expected for sea ice volume to follow a certain cycle of increase and decrease during any given year, its continuous decline over the last 40 years has been extraordinary, losing close to two thirds of its 1979 volume.

The geopolitical implications are huge as overwater shipping routes have slowly replaced icebreaker shipping routes.

Arctic shipping routes are opening up

Do you really need that business trip?

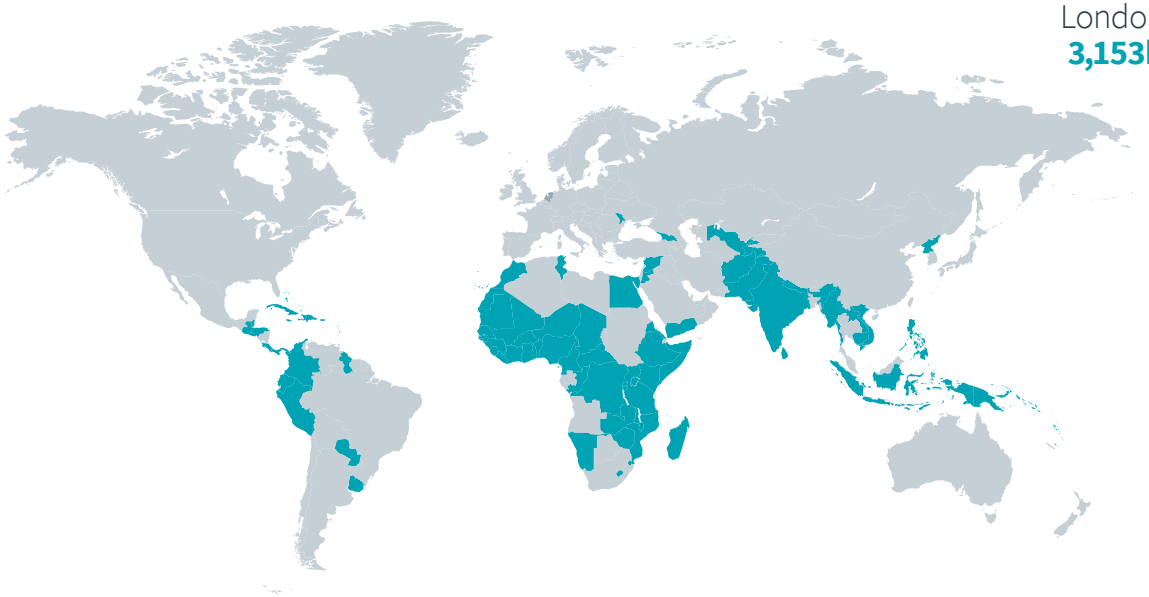


Passenger jets pump billions of tonnes of carbon dioxide into the atmosphere every year. The main polluters are travellers from rich countries.

This graphic compares per-passenger emissions on different routes with the annual carbon footprint of individuals in developing nations. A passenger on a return flight from London to Rome generates 234kg of CO2 – more than the average citizen in 17 countries emits in a whole year.

London-Rome
234kg CO2

London-Perth
3,153kg CO2

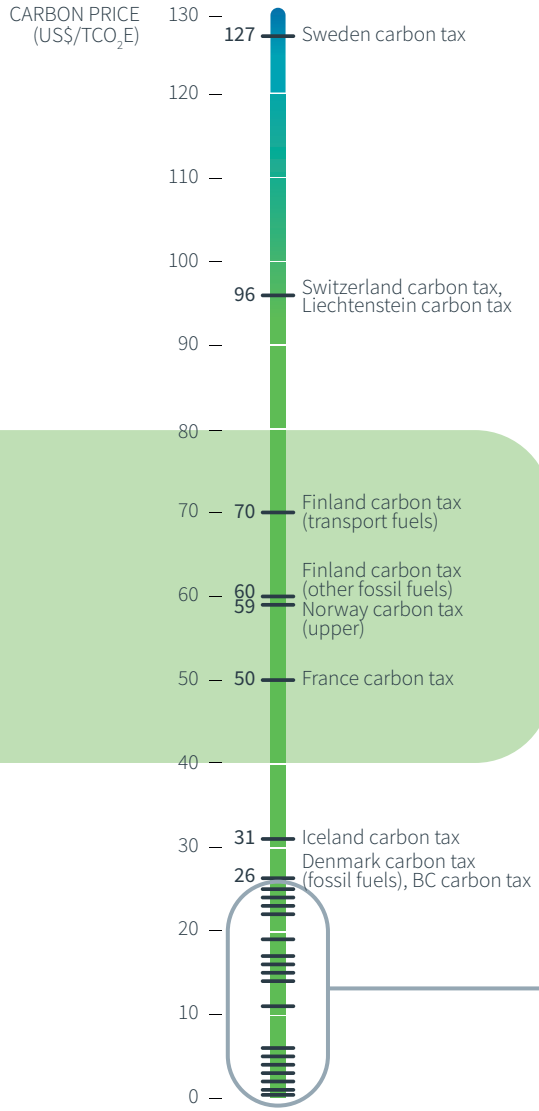


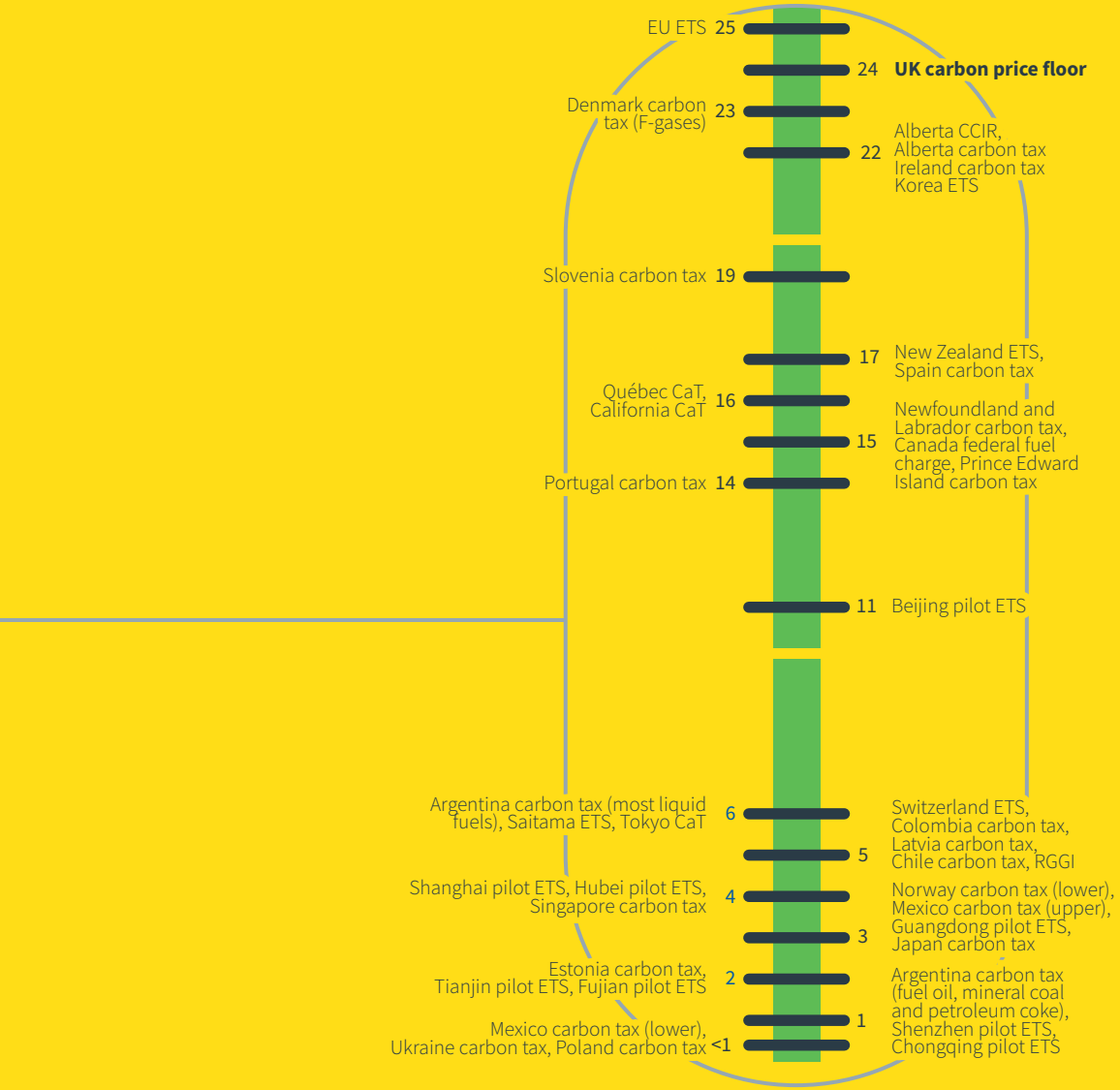
Carbon: A taxing issue

Most countries that have introduced carbon taxes have set them way below the "severe mitigation" scenario set out in the Paris Agreement, which intends to cap the increase in temperature below two degrees Celcius above the pre-industrial era.

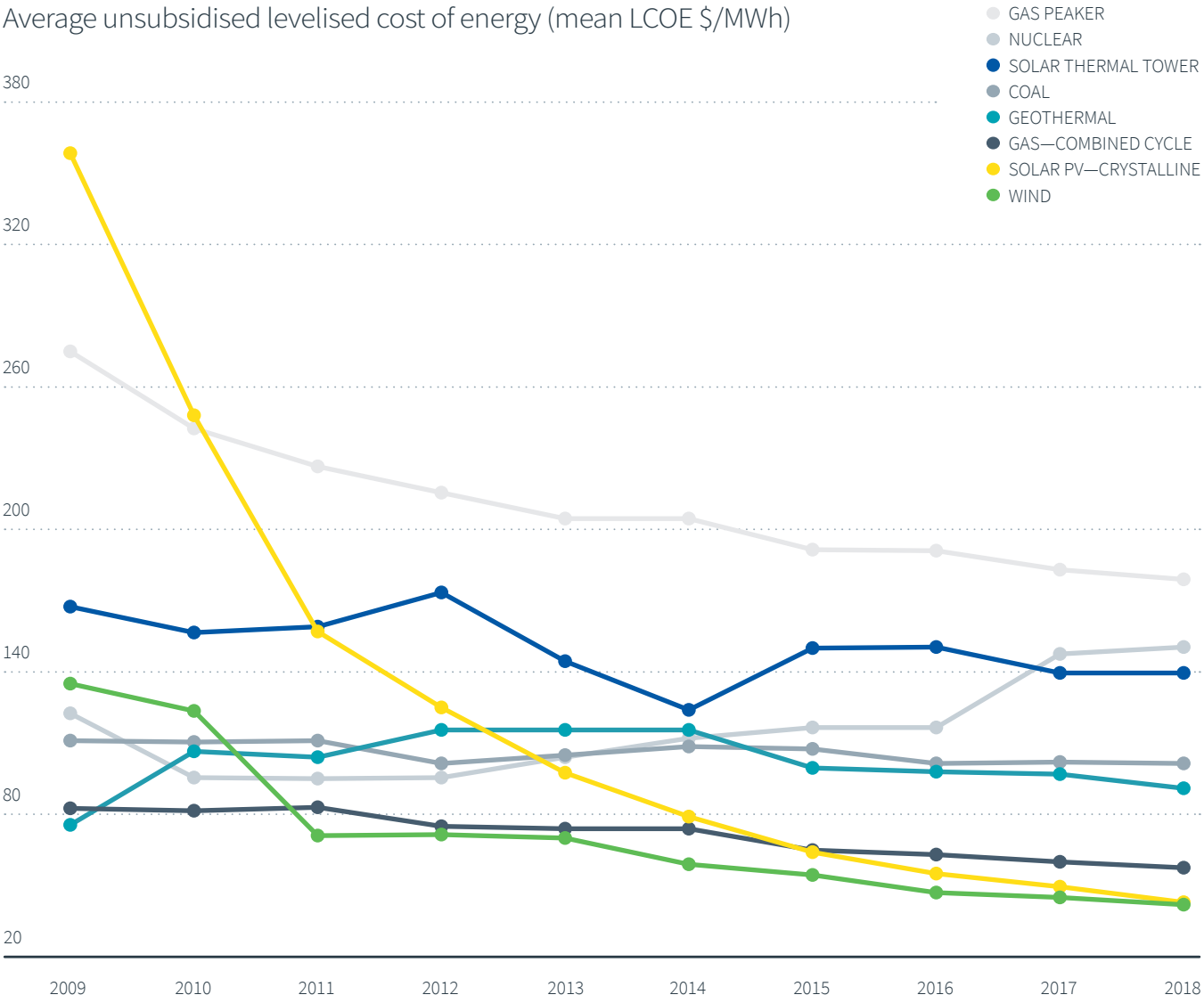
The "severe mitigation" scenario gives a 50 per cent chance of meeting that two-degree cap.

Minimum price range needed by 2020 to be consistent with achieving the Paris Agreement temperature target.




EU ETS 25
24 UK carbon price floor
Denmark carbon tax (F-gases) 23
22 Alberta CCIR, Alberta carbon tax Ireland carbon tax Korea ETS
Slovenia carbon tax 19
17 New Zealand ETS, Spain carbon tax
Québec CaT, California CaT 16
15 Newfoundland and Labrador carbon tax, Canada federal fuel charge, Prince Edward Island carbon tax
Portugal carbon tax 14
11 Beijing pilot ETS
Argentina carbon tax (most liquid fuels), Saitama ETS, Tokyo CaT 6
5 Switzerland ETS, Colombia carbon tax, Latvia carbon tax, Chile carbon tax, RGGI
Shanghai pilot ETS, Hubei pilot ETS, Singapore carbon tax 4
3 Norway carbon tax (lower), Mexico carbon tax (upper), Guangdong pilot ETS, Japan carbon tax
Estonia carbon tax, Tianjin pilot ETS, Fujian pilot ETS 2
1 Argentina carbon tax (fuel oil, mineral coal and petroleum coke), Shenzhen pilot ETS, Chongqing pilot ETS
Mexico carbon tax (lower), Ukraine carbon tax, Poland carbon tax <1

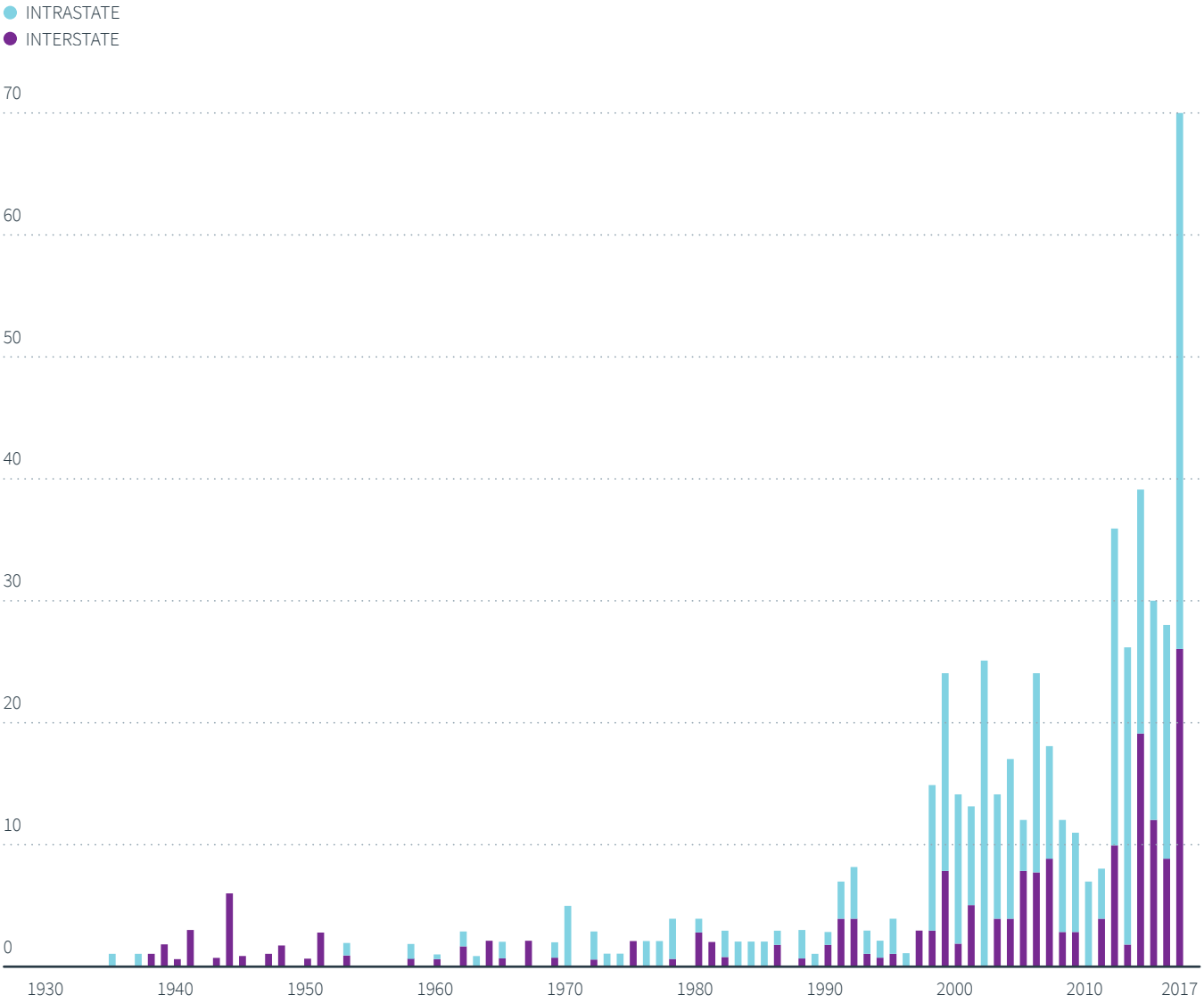
Costing the earth: Renewable costs plummet




We have reached a turning point, where in some cases it is more cost effective to build and operate renewable energy projects than it is to maintain conventional generation facilities. Spot the steep decline in costs for large-scale solar and wind – although progress is still needed in energy-storage technologies.

Fighting thirst

Number of water-related conflicts



A drop in the ocean

With water-related conflicts on the rise, universal access to H2O demands our attention. After all, it should be considered a basic human right.

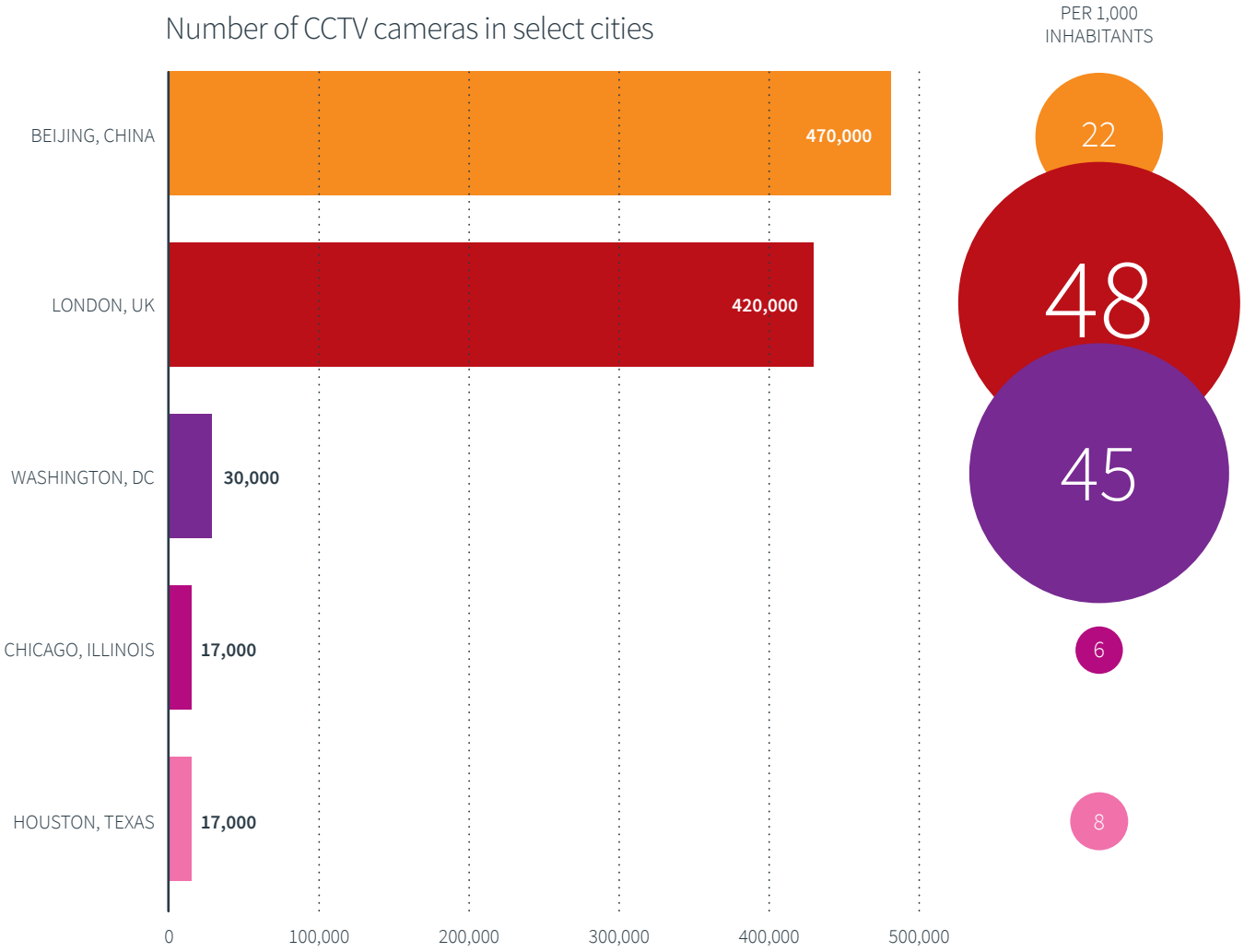
Estimates from the World Bank claim that to "*achieve universal and equitable access to safe and affordable drinking water for all*" and "*achieve access to adequate and equitable sanitation for all and end open defecation*" would cost $114bn a year, with 69 per cent of it focused on sanitation.

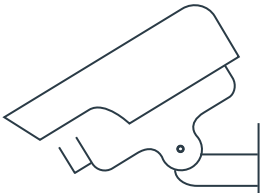
The $114bn figure would amount to just 0.39 per cent of the GDPs of the 140 countries the World Bank studied.

In other words, to provide access to drinking water for everyone would cost around $30bn a year.

However, *The Economist* points out this still amounts to a huge reallocation of resources, and that "*for it to be realised three issues need to be tackled: ownership; price; and political priorities*".

All eyes on you...





For facial-recognition technology to work in the public sphere, you need two things: good software and lots of cameras. Much has been made of China's use – and export – of facial-recognition technology for security and policing purposes, but when it comes to Big Brother-style surveillance of public spaces, plenty of European and American cities have a huge number of eyes in the sky too.

As these cities deploy facial-recognition software with increasing frequency, the ethical and legal battles are only just beginning.

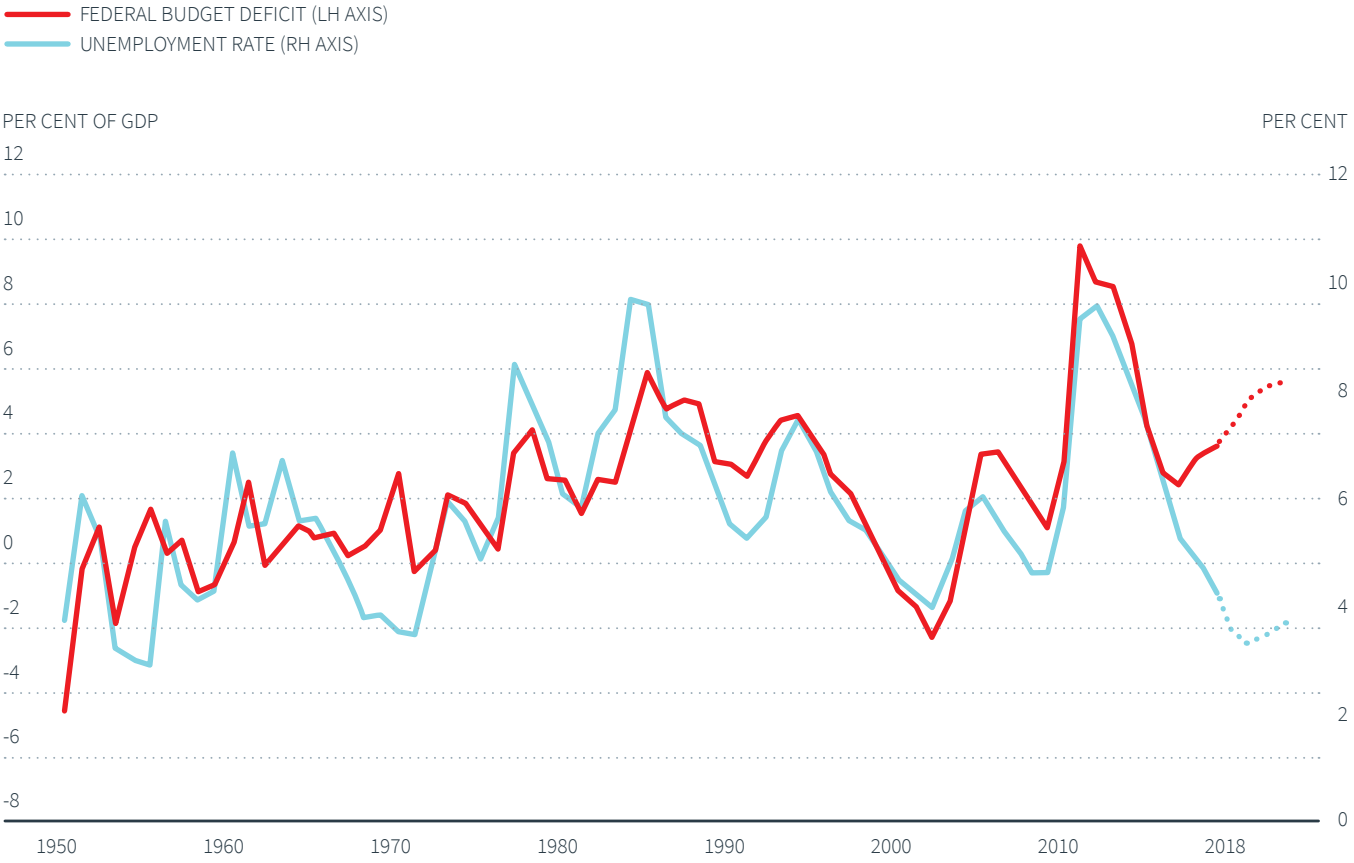
Markets

Visualisations of data to highlight the opportunities and risks associated with equities, bonds and alternative assets.

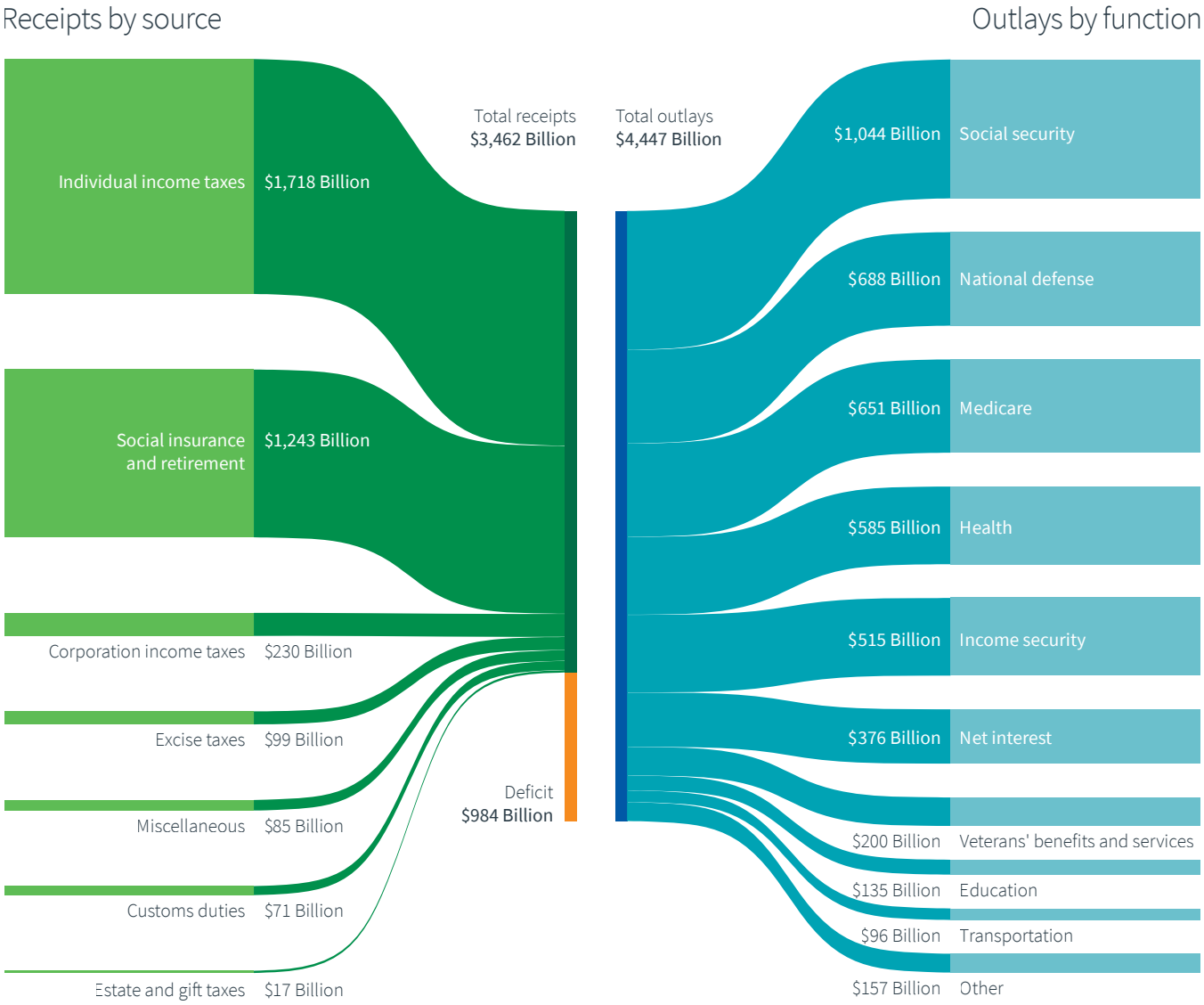
The future of the US economy

There has been fevered discussion about the 'inverted yield curve' and what it tells us about the likelihood of a US recession. But this chart may be a better indicator of the long-term direction of travel for the US economy.

The breakdown of the correlation between unemployment and the fiscal deficit points to a political willingness to sustain spending even when the economy is purring. This dynamic could lead to mounting pressure on US public finances over the coming years.



US bookkeeping: fiscal year 2019



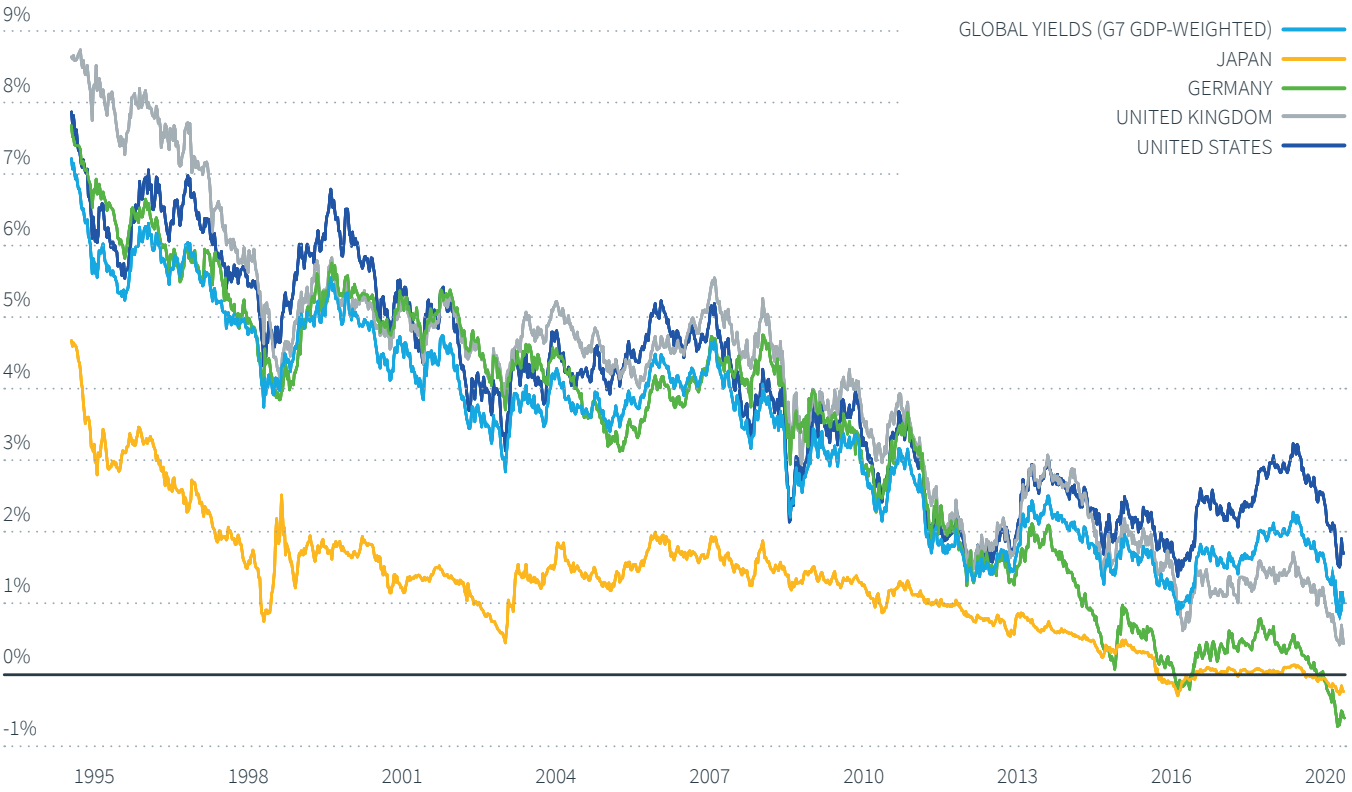
Yields: Travelling towards zero

In 2019, renewed monetary support saw global risk-free rates fall sharply, with many 10-year sovereign-bond yields reaching new lows.

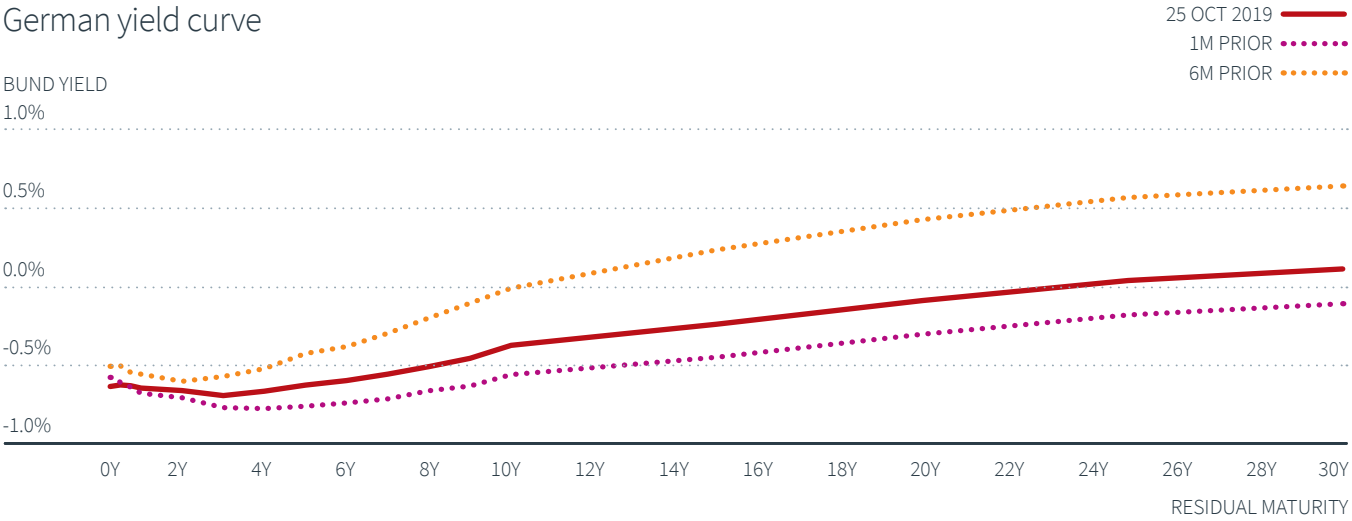
Negative-yielding bonds – sovereign and corporate – have flooded the market since 2016, reaching unprecedented volumes.

We are about to find out that travelling towards zero is a markedly different experience than living in a zero-yield world indefinitely.

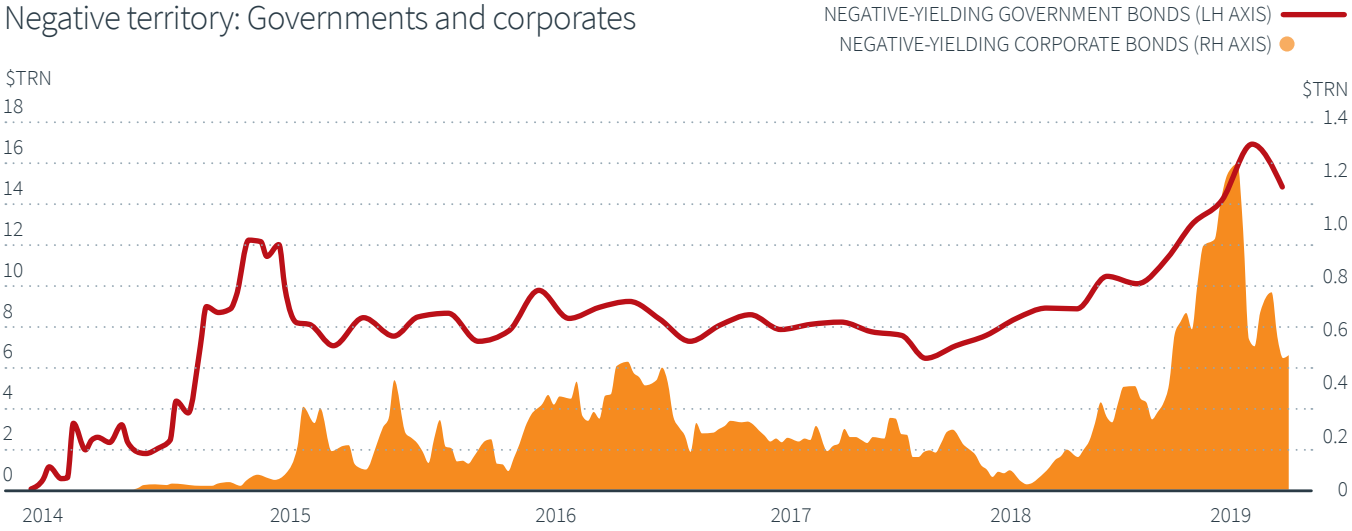
Sovereign bond yields



German yield curve



Negative territory: Governments and corporates



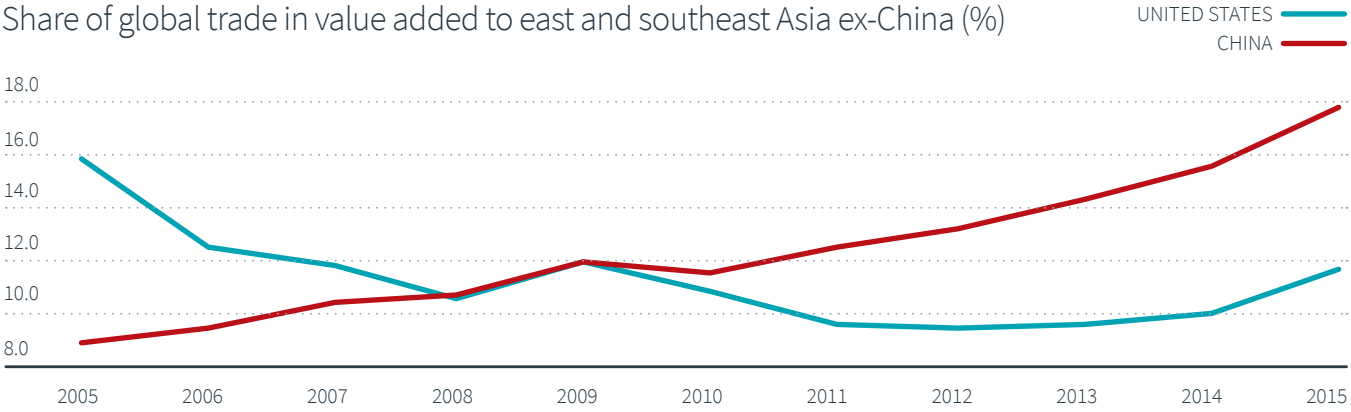
Renminbi: Value vs. influence

In August 2019, the renminbi (RMB) crossed the psychological threshold of US$7, rattling markets. This shows the renmimbi's increasing global significance, a goal China has long been working towards.

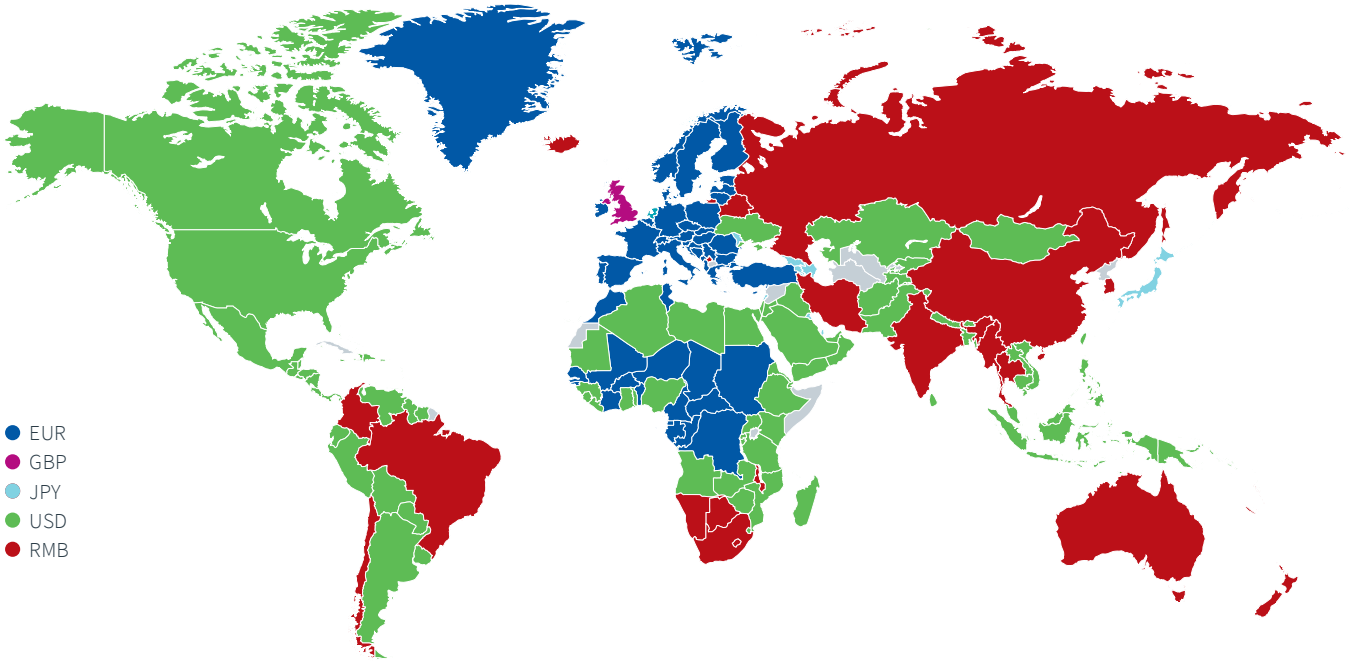
It is a larger trading partner than the US in east and southeast Asia, and could use its influence to supplant the dollar where it has not yet done so. With Hong Kong a ready-made financial hub, this could happen in a flash.

China's renminbi falls past key threshold

Share of global trade in value added to east and southeast Asia ex-China (%)



Reserve currency bloc



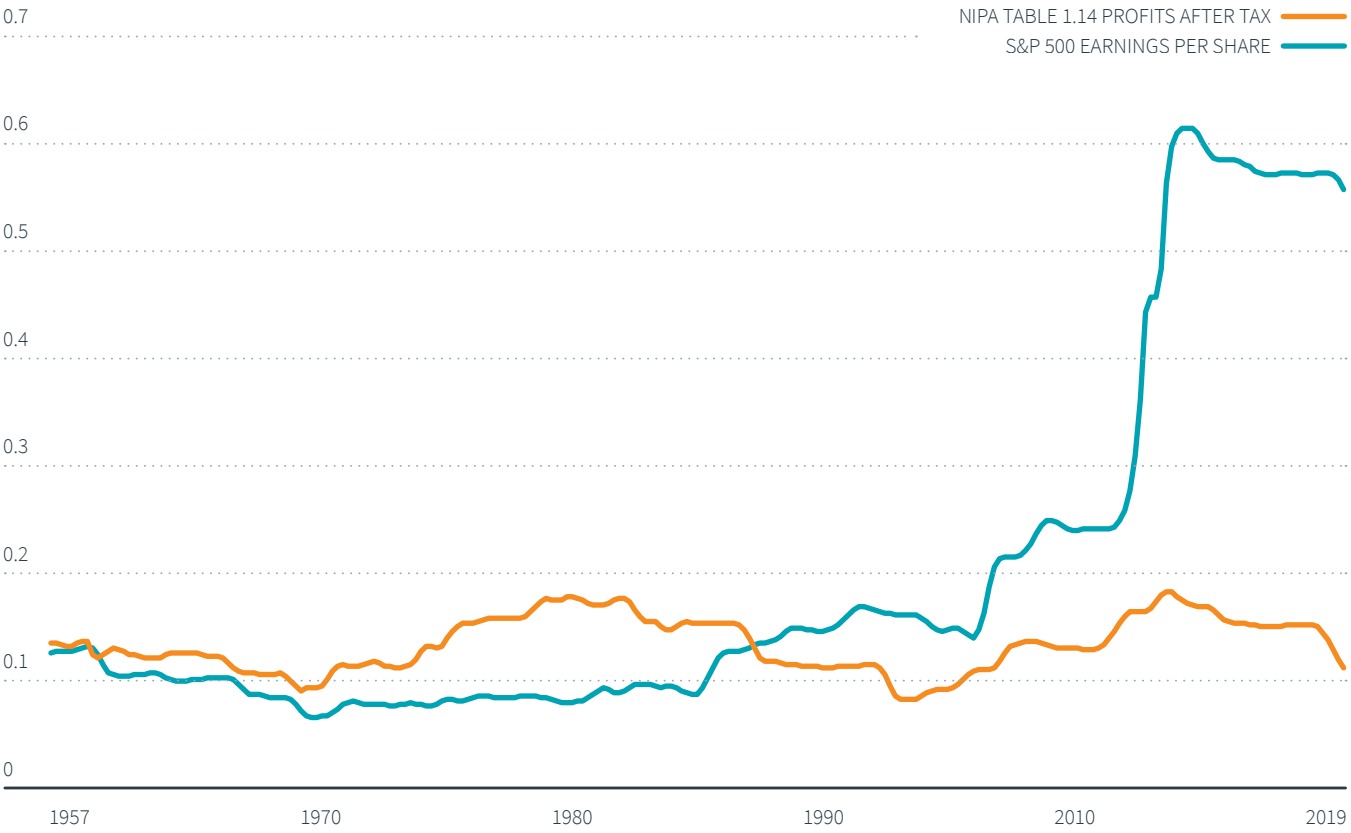
Equities: The trouble with styles

Volatility of US accounting

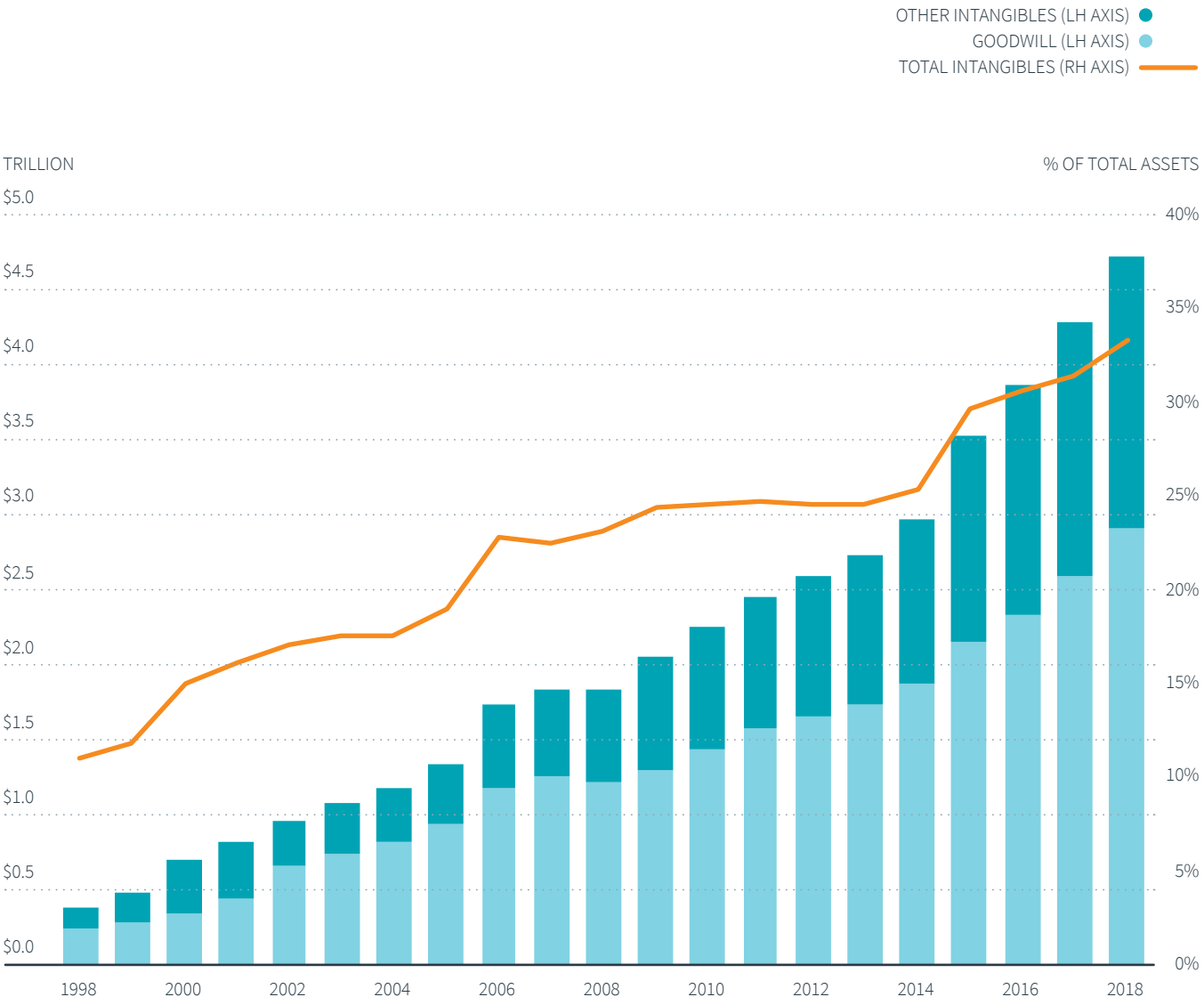
Corporate intangible investments are on the rise.

Differences in the accounting treatment of tangible and intangible investments affects the size of companies' balance sheets, but can also have a meaningful impact on reported earnings. Efforts to compare companies merely on the basis of price-to-earnings ratios have therefore become more complicated.

Standard deviation in annual log changes over past ten years

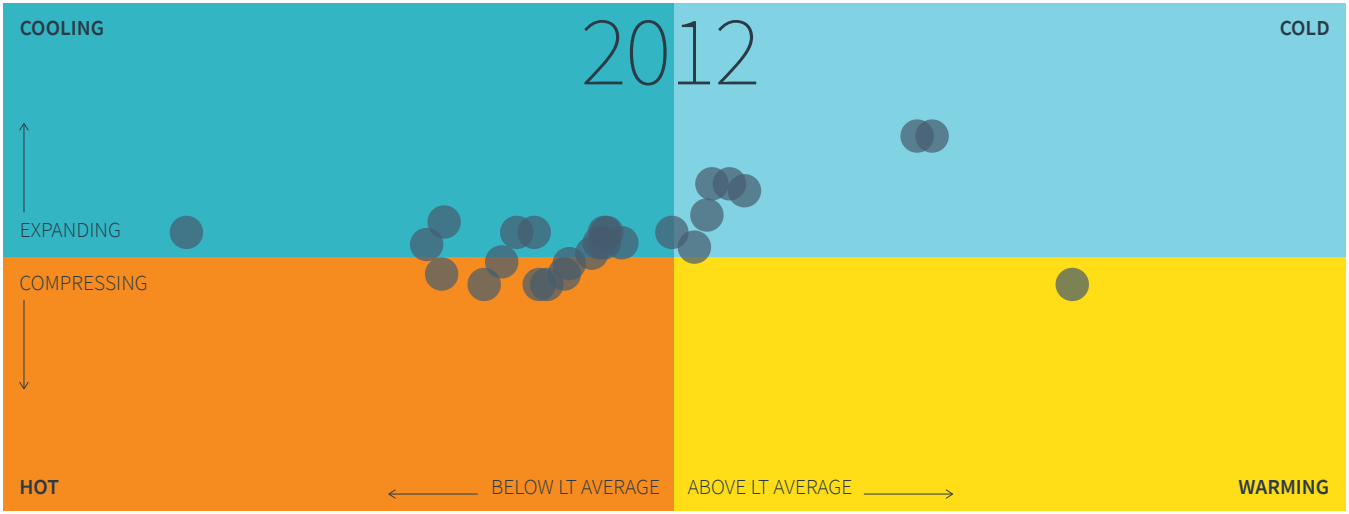


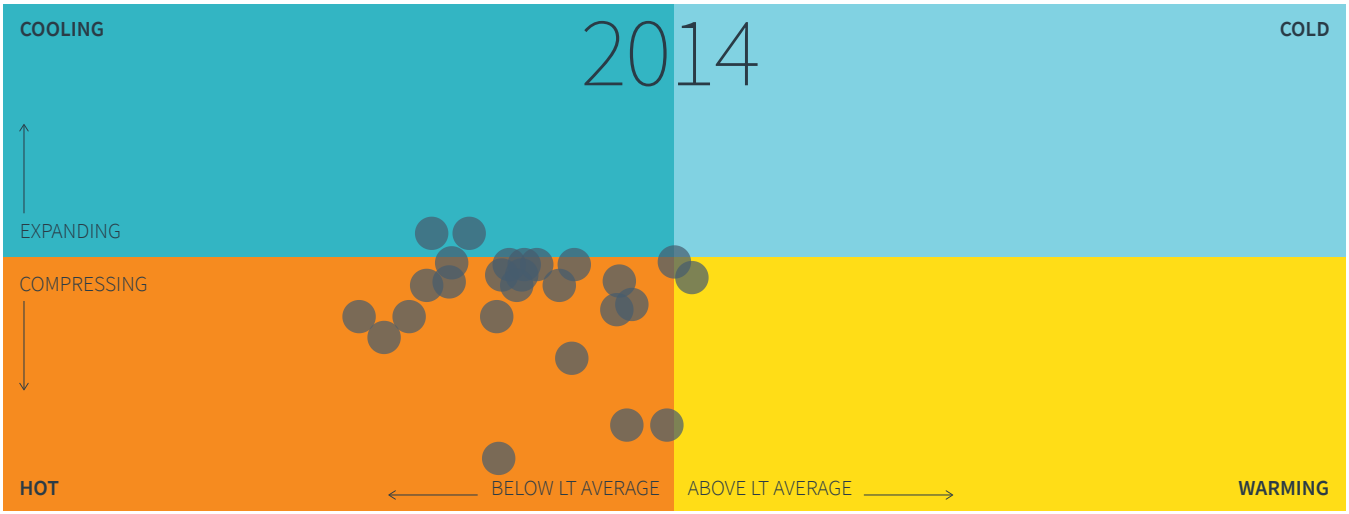
US Aggregate: Intangibles and goodwill on the balance sheet

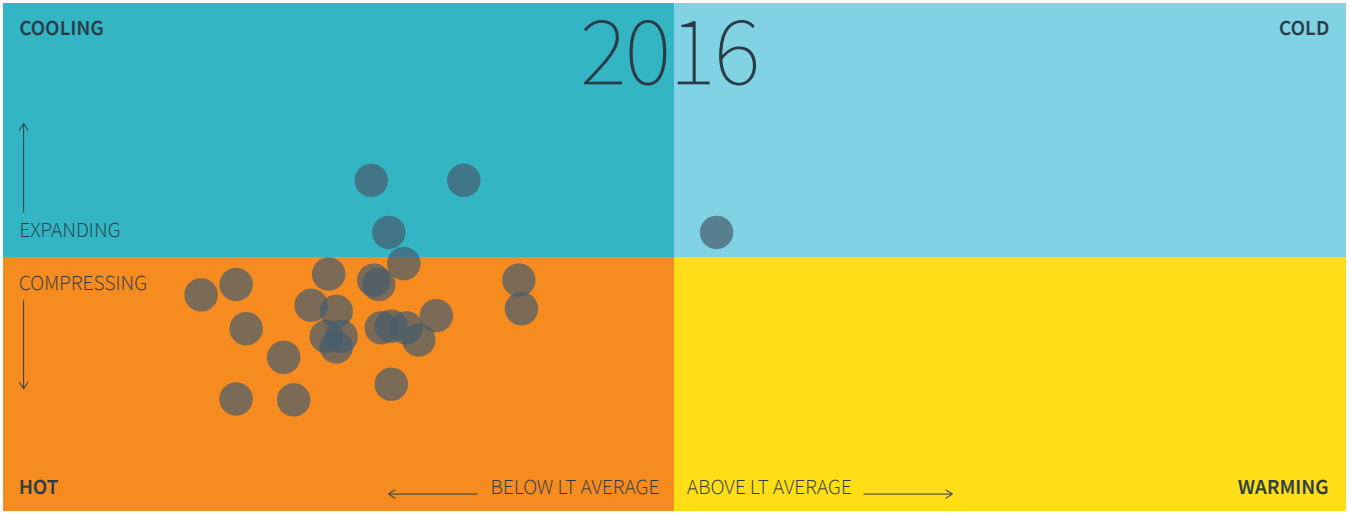


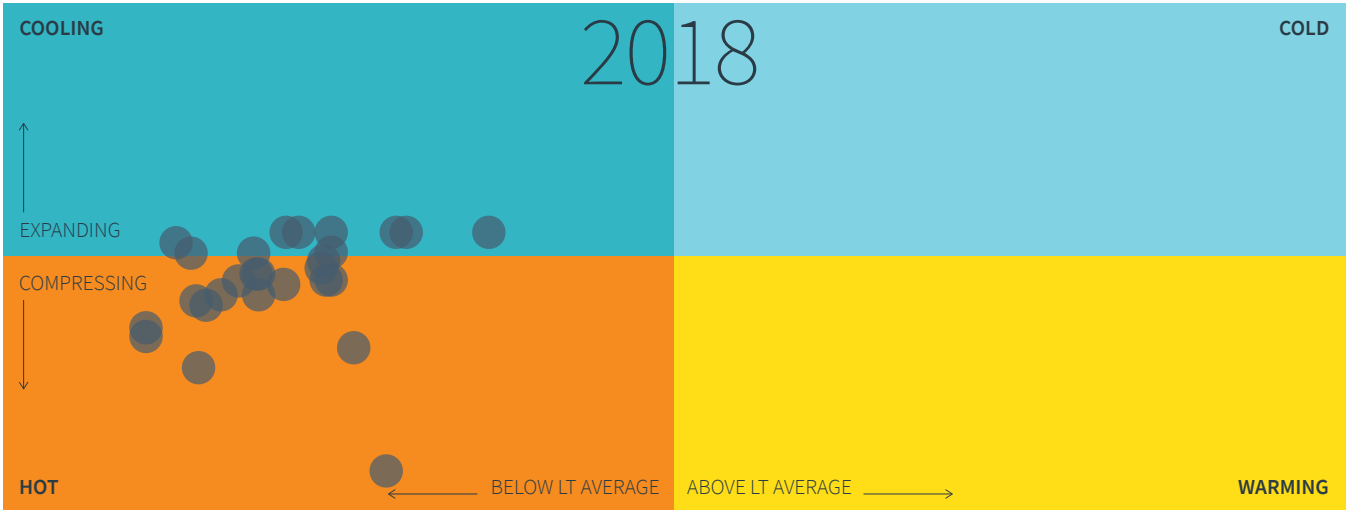
The European property cycle is hotting up

But lower-for-longer interest rates are likely to extend the cycle further



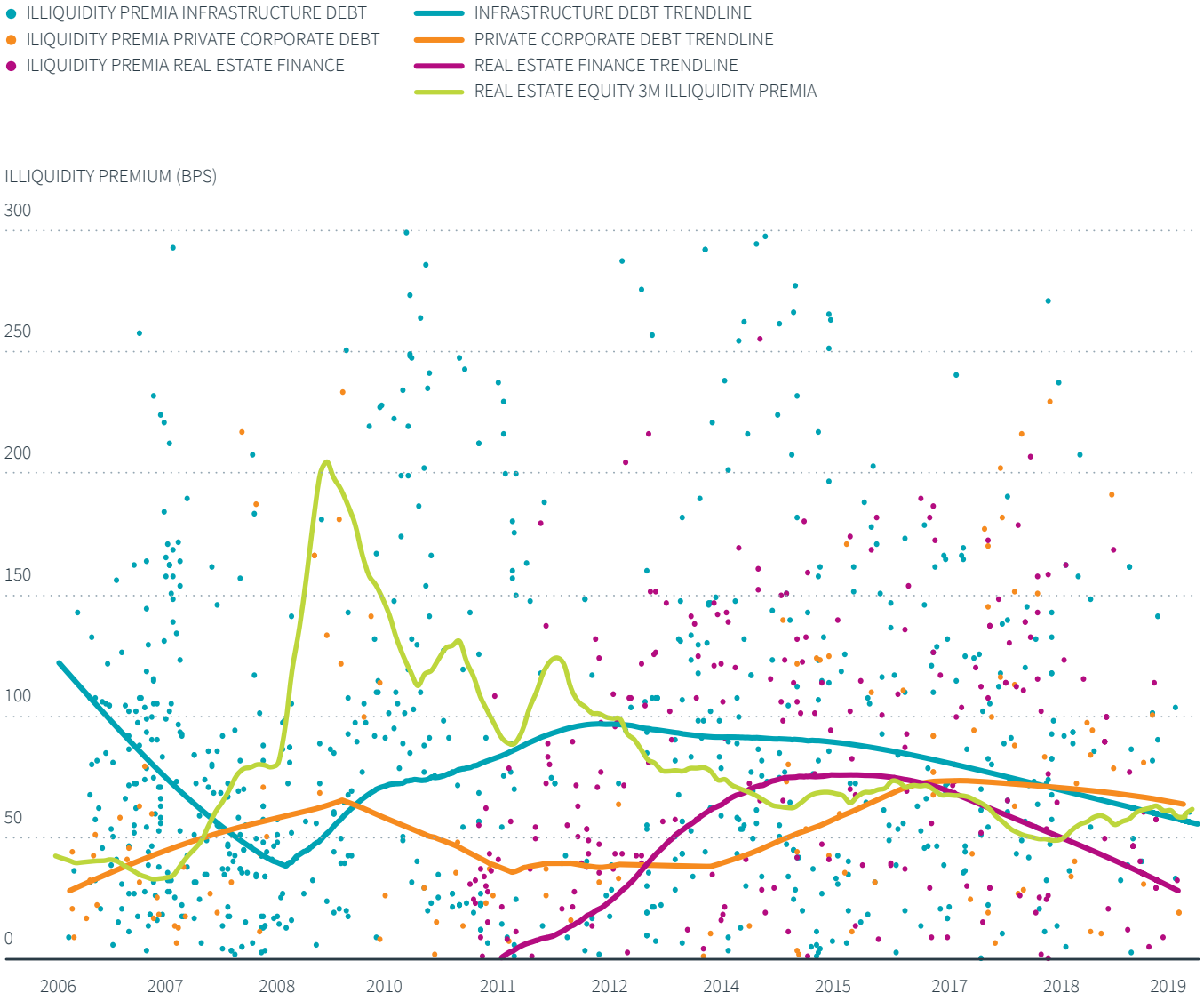



COOLING
2016
COLD
EXPANDING
COMPRESSING
HOT
BELOW LT AVERAGE
ABOVE LT AVERAGE
WARMING


COOLING
2018
COLD
EXPANDING
COMPRESSING
HOT
BELOW LT AVERAGE
ABOVE LT AVERAGE
WARMING

Illiquidity premium

Revealing premia in select private markets transactions



Investing in private assets has historically been capable of higher returns than from publicly traded ones of broadly similar credit quality and maturity. This is often called the illiquidity premium and reflects the fact that private assets are not available to trade on an exchange.

The data highlights the range and diversity of off-market assets. Premia have narrowed since the end of 2018 when public spreads widened, but opportunities still exist to add value through these specialist transactions.

One planet problem

1.7 Earths.
We are living well beyond our
resources. Ecosystems are being destroyed.
Biodiversity is collapsing. Wildfires raging. Glaciers melting.
Sea levels rising. Carbon dioxide and greenhouses gases stored
in our earth's core for millennia are flowing out at a rate of knots:
a key threshold – 415 parts per million – has been breached for the first
time in human history. Natural equilibria are being irreparably distorted:
tipping points, butterfly effects and feedback loops loom, with unpredictable
and non-linear effects. Extreme weather threatens to displace communities
and stoke social unrest. We *were* warned. Four decades ago, Nasa's James
Hansen spoke of these dangers – and the scientific evidence of human-driven
climate change dates back even further. Now we are belatedly starting to
recognise the scale of the problem. But global markets and institutions are
proving inadequate to the task, and are in desperate need of fixing. The
rallying cry from the generation most exposed to our failings cannot
fall on deaf ears. We are losing a zero-sum game with the highest
of stakes. It's a Greek tragedy of the commons: one where
free-riding bystanders leave their heads buried. As the
clock keeps ticking, life remains circular: after all,
what goes around WILL come
around.

Appendix

Sources

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