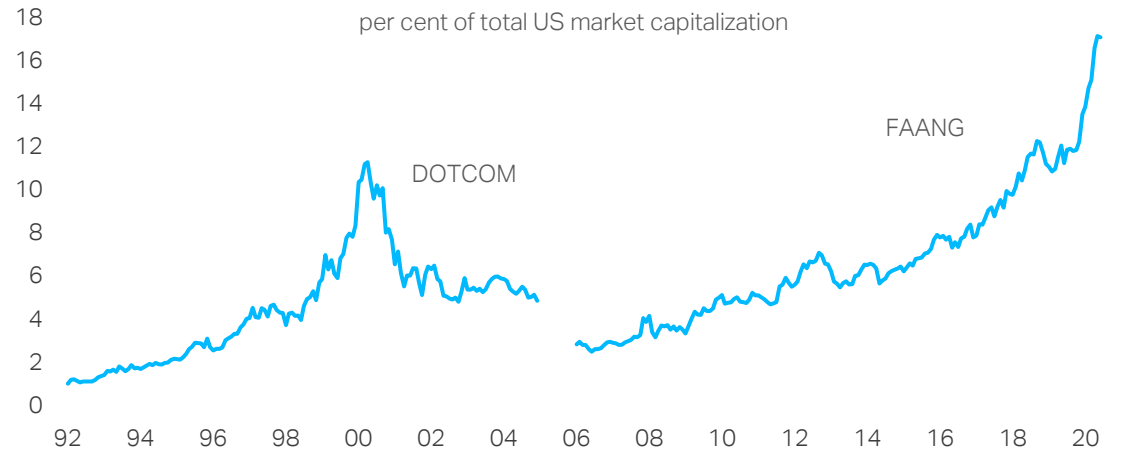
Macro Picture

DOTCOM 2.0

Dario Perkins

Arguments about a bubble in equities continue, with US tech at the center of the dispute. Some are drawing comparisons with Dotcom in the 1990s. Yet the economic risks are greater this time. Big tech companies provide the best exposure to a secular growth story, but watch macro vulnerabilities in labour markets and commercial property.

CHART 1: LOOKING A LITTLE BUBBLY



Source: Datastream, TS Lombard estimates

BUBBLE TROUBLE

The gap between asset prices and fundamentals continues to divide investors. US tech stocks, which have dominated the rally, are at the epicenter of this "bubble" dispute. Bulls argue these companies are immune to COVID-19 and benefit from lower interest rates. Bears believe this is liquidity-driven euphoria, similar to what happened in the late-1990s ahead of the Dotcom crash.

NEWER ECONOMY

The bubble debate comes down to two issues: (i) can new technologies live up to their hype? And (ii) will the current "superstars" capture the efficiency gains? Dotcom ushered in a New Economy, the gains were distributed widely and productivity/incomes improved. The latest wave of innovation has been different – technological diffusion has slowed, causing acute polarization.

WINNER TAKES ALL

While COVID-19 is accelerating digital disruption, the current superstars remain in a dominant position, thanks to years of complementary capex and propriety R&D. These companies are still the best way to get exposure to a secular growth story. Digital disruption also threatens existing macro vulnerabilities, especially via labour markets, commercial property and social inequality.

DOTCOM 2.0

The US stock market continues to defy the sceptics, resilient despite the ongoing health and economic crisis. While in April it was possible to believe investors were 'looking through' the impact of government lockdowns, this narrative seems less compelling with infection rates in many parts of the world continuing to rise. For the bears, this is a liquidity-driven bubble that has nothing to do with fundamentals. The bulls, meanwhile, highlight the importance of permanently low interest rates, which they claim justifies a market rerating. After all, what is the alternative investment? US tech stocks are at the centre of this debate, with their dominance growing in 2020. If the tech superstars are less vulnerable to the COVID-19 recession, because consumer and business activity is moving online, surely investors should pay a premium to own these companies (especially in an era of zero bond yields). Yet the euphoria in US tech is starting to stretch beyond its potential resilience to COVID-19. A longer-term bull narrative is also enticing investors, based on the idea rapid technological advancement will allow the big tech companies (including the likes of Tesla) to escape secular stagnation. Can new digital technologies live up to this hype? And if they can, will today's "superstars" provide the best exposure to this theme?

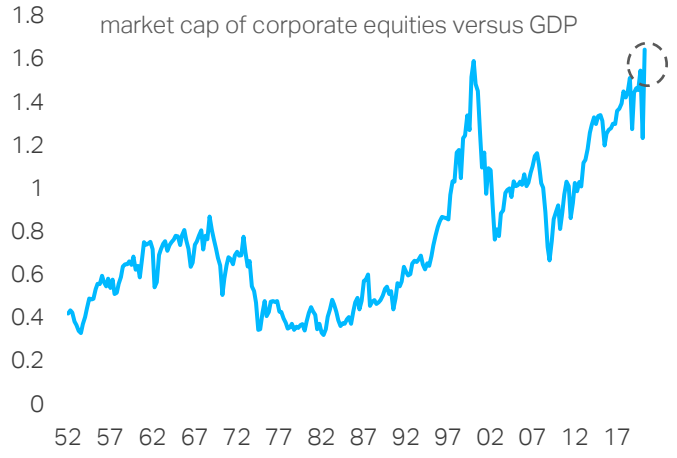
Historically, new inventions have often been associated with asset-price bubbles. So it is not surprising that people are making comparisons with the Dotcom era in the late 1990s. Back then, rapid developments in computer power, communications, and the creation of the Internet produced a powerful bull market in stocks, ending in a spectacular crash. Yet, while most of the companies that were part of Dotcom failed to live up to expectations, there was a fundamental basis for investor optimism – the economy was changing. This New Economy delivered a period of rapid productivity growth, halting a 30-year deterioration, which combined with globalization to raise the equilibrium profit share and reduce inflation. Today, while industry-insiders again see a bright technological future (even a "Second Machine Age"), the macroeconomic benefits are less obvious. Yes, the official data understate the influence of digital technologies – another parallel with the 1990s – but this is not the whole story. Technological diffusion has also slowed, with the superstars capturing most of the efficiency gains. So far, these companies have been able to break free of the secular stagnation that has gripped the rest of the economy, particularly a fail-tail of corporate laggards that became dependent on cheap labour and low interest rates.

There is no clear consensus on why technological diffusion has slowed since the 2010s. Tech enthusiasts blame implementation lags, as it takes time to reach critical mass for new technologies, restructure existing businesses and make complementary investments in e.g. human capital. Others blame lax anti-trust regulations, patent abuse and proprietary investment. COVID-19 is unlikely to break these barriers in the short term, which means the tech superstars will remain the main beneficiaries of any secular 'disruption' theme. While the pandemic has certainly accelerated the adoption of digital technologies, it is impossible to know whether this is the 'quantum leap' industry-insiders have been anticipating. The macroeconomic implications could be extreme. While history offers reasons for optimism – the technophobes are usually too pessimistic – the transition doesn't look easy. In the short term, digital disruption is likely to amplify important macroeconomic vulnerabilities, especially in labour markets, the traditional retail sector and commercial property (including "Mallmageddon"). New technologies will also widen social inequalities and create further polarization, which could trigger populism and a regulatory backlash. Pundits warn of a "Dotcom II" bubble but the current situation is scarier. Dotcom crashed the stock market – the fallout from the current crisis could be more profound.

1. BUBBLE TROUBLE

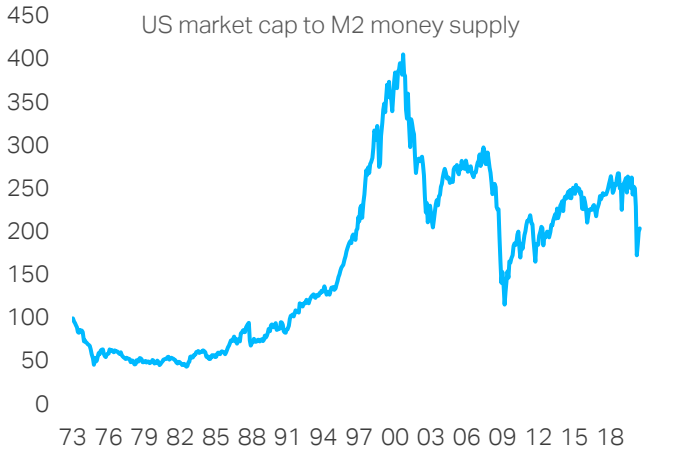
Since the start of the rally in March, many financial pundits have been alarmed by the 'disconnect' between markets and the real economy. Even as GDP declined at a pace rarely seen in history, global equities have staged one of their strongest recoveries in history. The most optimistic explanations have credited this to radical policy measures, both public health and macroeconomic, which allowed investors to look through the short-tern destruction associated with COVID-19. Governments locked down their economies, which would naturally cause activity to collapse, but the global economy would rebound once the pandemic was under control. After all, nothing 'fundamental' had changed. Four months on, these explanations seem increasingly tenuous. COVID-19 isn't under control, which means governments that have tried to reopen their economies have seen infection rates re-accelerate. The current economic slump looks set to continue well into 2021, whether economies are locked-down or not.

Chart 2: Evidence of a "disconnect" with macro?



Source: Datastream, BEA, TS Lombard

Chart 3: "Liquidity" driven stock prices?



Source: Datastream, Federal Reserve, TS Lombard

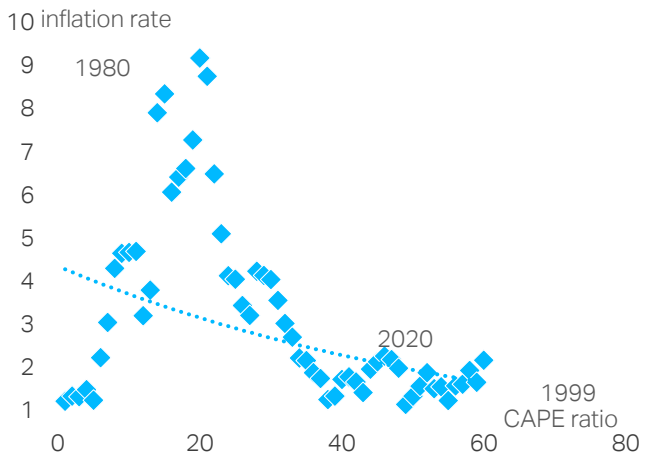
For the bears, the resilience of risk assets – especially equities, but to a lesser degree corporate credit – is a liquidity driven-bubble that does not reflect the macroeconomic reality. They point out central banks and governments have pumped huge amounts of cash into their economies, which has inflated asset prices but can't prevent a deep recession. Equity bears like to draw attention to Charts 2 and 3, which show US stock prices look alarmingly high compared to GDP, but are less outlandish when you allow for an explosion in the money supply. To be fair, the monetary authorities are partly to blame for this narrative. Back in 2009, when the Fed and other central banks first introduced QE, they said powerful 'portfolio balance' effects would encourage investors to sell bonds and replace them with riskier assets such as equities and credit. This would drive asset prices higher, becoming a critical part of the "monetary transmission" mechanism. Ultimately, however, real asset prices would return to their fundamental levels.

Not just a liquidity story

While central bankers eventually changed their minds about portfolio balance effects, the idea has stuck with pundits who have spent the last decade complaining about "QE bubbles". Yet the liquidity story doesn't add up, even as an explanation for the latest rally. While central banks expanded their balance sheets at a historic pace, removing duration from bond markets, the fiscal authorities have offset this move by ramping up their new issuance. The supply of bonds, net of central bank purchases, has actually increased. Perhaps long-term yields would be higher without these interventions, but this seems unlikely in an environment where global activity has

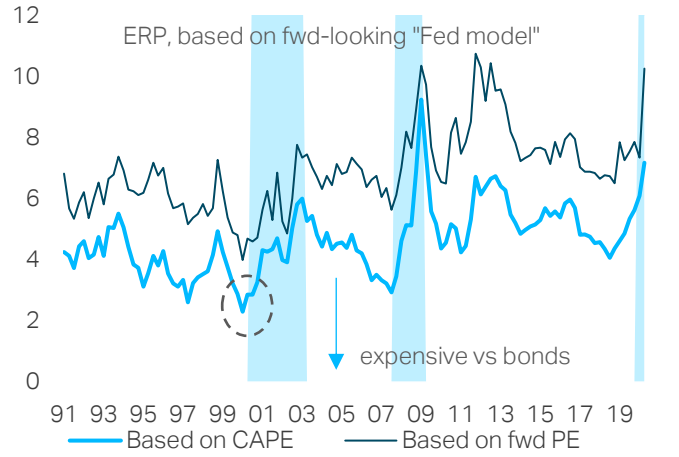
collapsed, the monetary authorities are committed to keeping their policy rates at zero, and bond investors see an unprecedented deflation skew. Fiscal stimulus, of course, has added cash to the economy, but this has facilitated massive precautionary saving, not a direct equity bid.

Chart 4: Lower inflation justifies "rerating"



Source: Robert Shiller website, TS Lombard

Chart 5: Equities contain decent risk premium

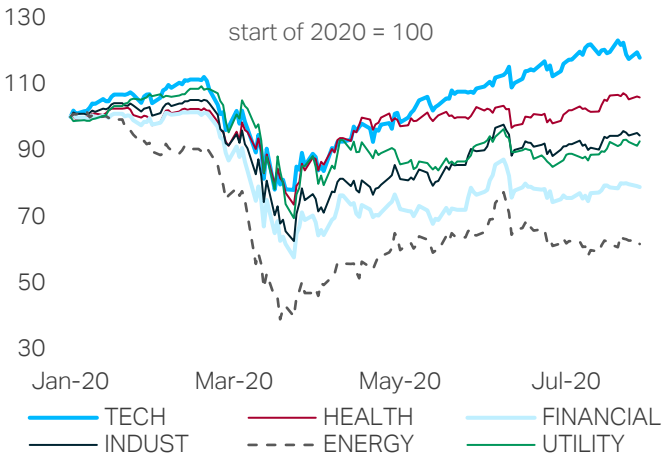


Source: Datastream, TS Lombard estimates, shaded area: bear mkts

A discounting story

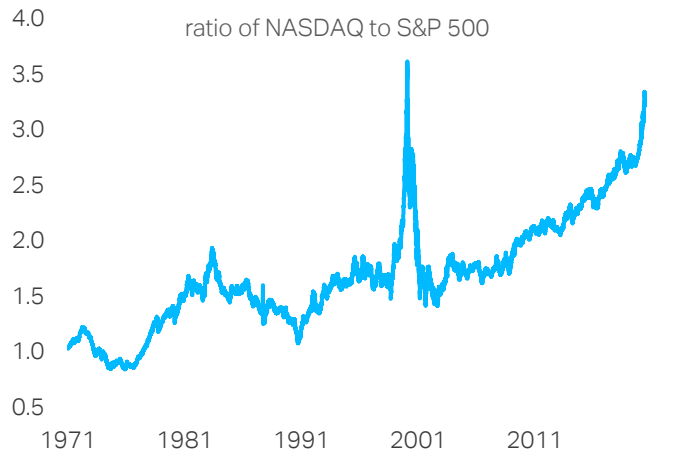
The better explanation for the stock-market rally is that it reflects a collapse in interest-rate expectations, which has made future dividends more valuable. Certainly, this is the explanation we hear most often from clients, who say they have no alternative to equities in a zero/negative yielding world. Yet COVID-19 will also reduce future corporate profits, not just the discount rate. As we explained in a previous Macro Picture, aggregate (bottom-up) earnings estimates for the next 12-18 months looks wildly optimistic. But remember, the equity rally has been heavily skewed towards the US tech sector. Large tech companies such as the FAANGs are less vulnerable to the pandemic than most other parts of the market, such as industrials, banks or traditional retailers. In fact, they might even benefit from COVID-19 "disruption" if a larger proportion of business and consumer spending stays online. This raises an important question – how do you price companies such as the FAANGs in a permanently zero-yield world? With resilient nominal earnings, the PV of future dividends theoretically rises to infinity!

Chart 6: The uneven US equity rally



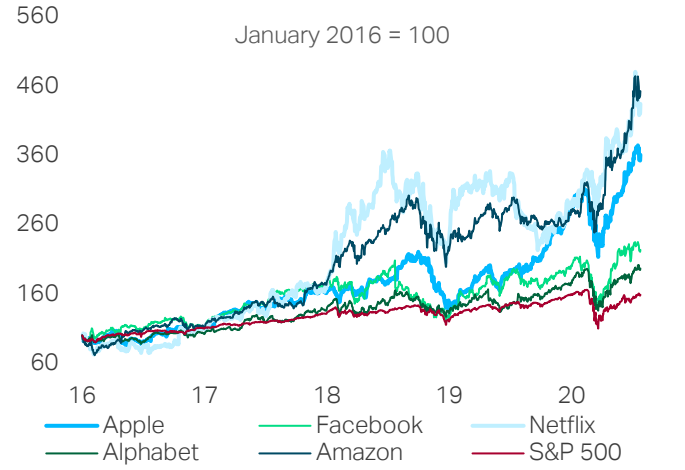
Source: Datastream, TS Lombard

Chart 7: Sounds of the 90s



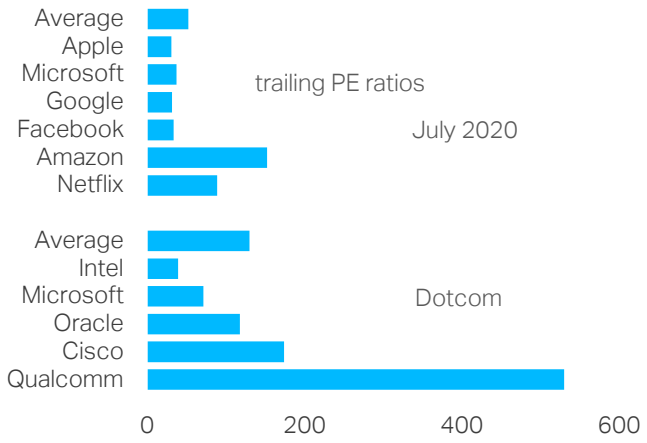
Source: Datastream, TS Lombard

Chart 8: FAANGs for the massive rally



Source: Datastream, TS Lombard

Chart 9: Not as pricey as Dotcom

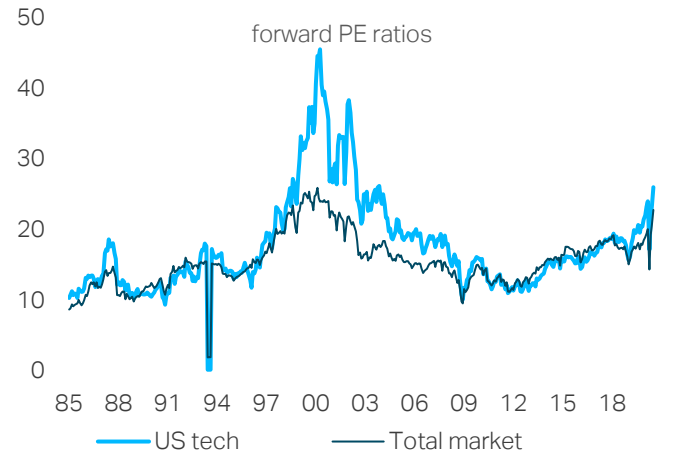


Source: Datastream, TS Lombard

Bubble debate centred on US tech

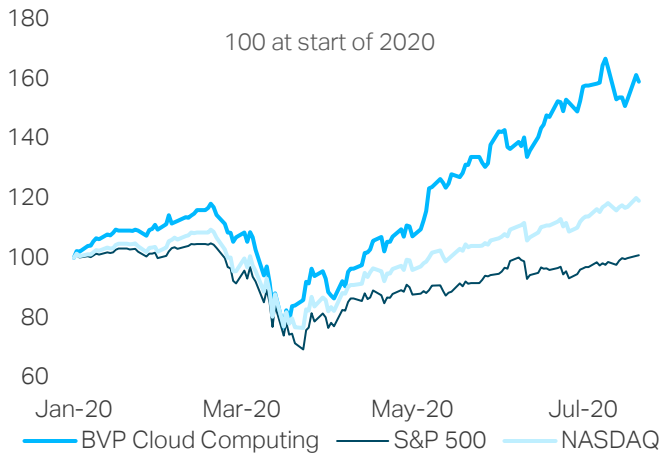
The dominance of US tech, compared to other domestic sectors, and as a driver for US outperformance versus the rest of the world (especially Europe), means the debate about "bubbles" is now firmly centred on this specific part of the stock market. The last few weeks has produced a flurry of sellside comparisons with the Dotcom bubble. Looking at Charts 7 and 8, it is easy to see why. The powerful rally in the NASDAQ has opened up an impressive divergence with the S&P 500, reminiscent of the situation in the late 1990s. Meanwhile, the stock market has become increasingly dominated by the FAANGs, another obvious throwback to the Dotcom era. While not all the FAANGS are officially counted as "tech" stocks – e.g. Amazon is part of consumer discretionary – new digital technologies are essential to their business models.

Chart 10: Earnings prospects support tech



Source: Datastream, TS Lombard

Chart 11: The post-COVID economy



Source: Datastream, TS Lombard

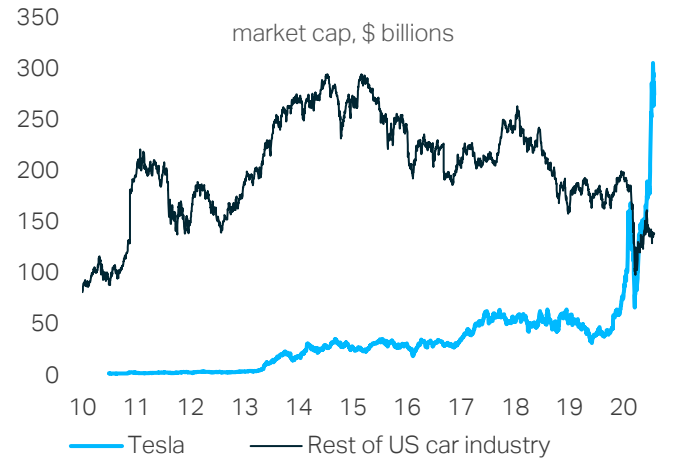
There is a crucial difference between today's tech dominance and the Dotcom era. Whereas expectations drove the 1990s market euphoria, today these companies are actually generating large cash flows. We see this in relative PE ratios, which are much less extreme than they were 20 years ago. Back in the nineties, investors could see the world was changing – rapid advancements in computing, communication and the creation of the Internet would reshape the global economy (the "New Economy") but they had unrealistic expectations about what many of

these tech start-ups could achieve. As an influential article in Barron's highlighted in March 2000, at the peak of the mania, 74% of internet companies had negative cash flow. The 10 largest market-cap tech stocks in the US, representing 25% of the S&P500 – Microsoft, Cisco, Intel, IBM, AOL, Oracle, Qualcomm, Dell, Sun and HP— could not live up to expectations. Over the next 18 years, not a single one beat the market: five produced positive returns, averaging 3.2% a year, far lower than the market return, and two failed outright. Of the five that produced negative returns, the average was a loss of 7.2% a year, or 12.6% a year less than the S&P 500.

Chart 12: Maybe this makes sense post-COVID

Source: Datastream, TS Lombard

Chart 13: But what about this?



Source: Datastream, TS Lombard

Conditions for a bubble

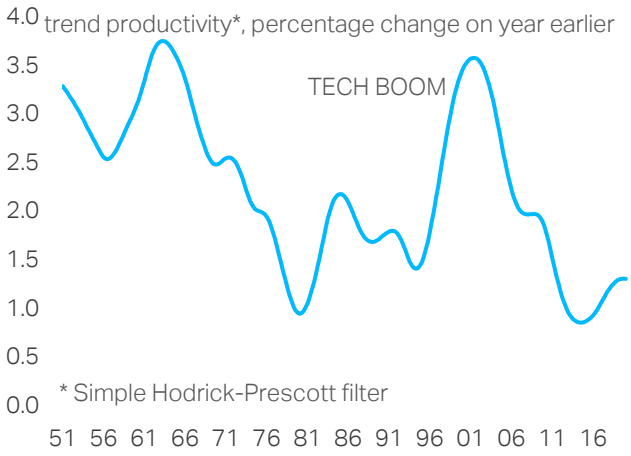
Proven revenues means today's tech story is not like Dotcom. The pace of price appreciation has also been less "bubbly". Whereas the NASDAQ jumped from 1.5x SPX to 3.5x in 18 months between 1998 and 2000, the same move has taken 10 years this time. Yet, this doesn't mean current optimism about the sector has been grounded in "fundamentals". After all, as our strategy team pointed out, Tesla's value – which is totally detached from earnings and is not a direct beneficiary of COVID-19 consumption patterns – has seen a similar rerating to Amazon. A recent Bloomberg article made a similar point, suggesting that investors' attitude to US tech is shifting. Companies such as Apple, which were priced on the basis of existing product lines (IPhones etc.) are now priced according to their potential to develop new technologies through radical innovation, breaking free of the secular stagnation that has undermined the rest of the economy. This shift in investor psychology would be consistent with past asset bubbles, including Dotcom, where new technologies created radical uncertainty about future returns[1].

Ultimately, we the bubble debate comes down to two questions: (i) Can new digital technologies live up to increasingly bullish expectations? And, if they can, (ii) will todays tech 'superstars' continues to capture most of the benefits. In the nineties, the "New Economy" was genuine, but investors failed to identify the winners. Today, the evidence for a "Newer Economy" is rather

[1] The link between bubbles and technology is usually blamed on bouts of optimism and pessimism. Yet explanations that rely purely on investor psychology are not particularly helpful. An influential paper by Satjajit Chatteriee shows it is possible to come up with models linking innovation to boom-bust periods in asset prices even without the psychological element of 'irrational exuberance'. Asset price booms and crashes are most likely to occur when the value of the asset in question depends on an innovation whose full profit potential is initially unknown (or investors disagree). As they learn over time about what that earnings potential is, the price of the asset can rise strongly for a while and then crash.

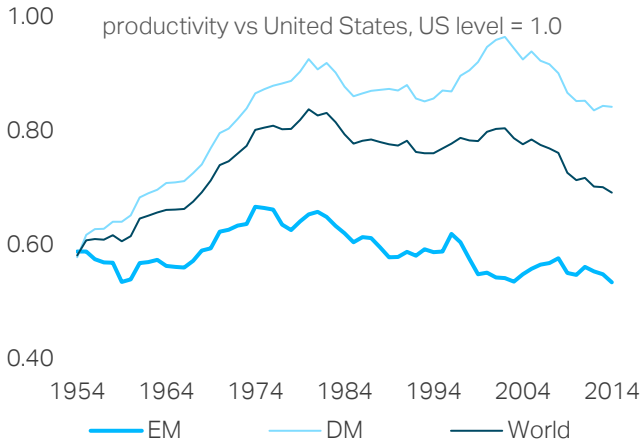
underwhelming, in part because technological diffusion has slowed. But this also means it might be easier to pick winners – FAANGs would continue to provide the best exposure to this theme.

Chart 14: The New Economy was true



Source: BLS, TS Lombard estimates

Chart 15: US outperformance



Source: Penn World Table, TS Lombard

2. NEWER ECONOMY

Many young investors look back at the late-1990s with bewilderment. The Dotcom bubble was one of the largest in history, giving way to a spectacular multi-year crash. People lost their life savings, especially those with no background in finance (see American Sucker, recounting the mid-life crisis of a film critic who got caught up in the mania). Yet the underlying basis for the bull market was sound – there actually was a "New Economy". The United States, which was at the forefront of the internet revolution, experienced a substantial acceleration in productivity, partially reversing a multi-decade slowdown. Most studies show IT was an essential part of the story, keeping the US at the global efficiency frontier and widening the gap with nations that were slower to embrace computerization, especially parts of Europe. Over time, these new technologies boosted living standards, curbed inflation and raised the equilibrium profit share.

Second Machine Age

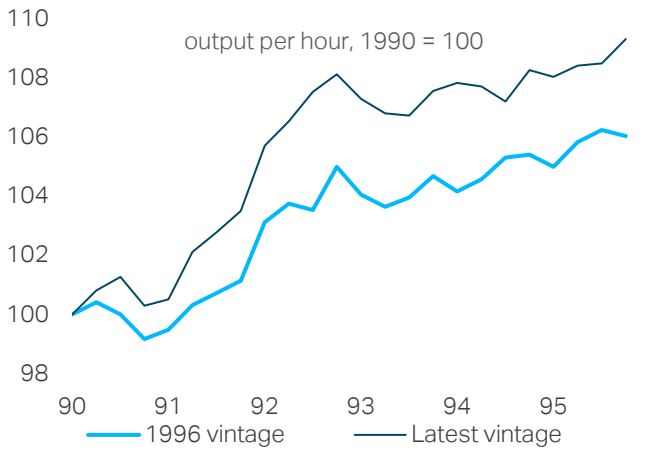
For years, there has been a fascinating debate about whether the world is on the brink of another technological revolution, perhaps even a "Second Machine Age". Tech enthusiasts believe COVID-19 will accelerate this transformation, providing a quantum leap for digital technologies such as Virtual Reality, Artificial Intelligence, Machine Learning and Robotics. Yet the macroeconomic impact of these technologies remains controversial. Sceptics, such a Robert Gordon, argue these innovations are inconsequential compared to past inventions, which means the world will continue on its "megatrend' slowdown in efficiency. Part of the problem is that we see few obvious benefits of digital technologies in official statistics. Productivity remains chronically depressed, with the 2010s the weakest in centuries.

Still, just because digitization hasn't yet shown up in official data doesn't mean we won't see improvements over time. The Dotcom era created similar data puzzles, especially in the early years[2]. Alan Greenspan was one of the first to spot this problem. He spent three years between

[2] In 1987, Robert Solow remarked "you can see the computer age everywhere, except in the productivity statistics".

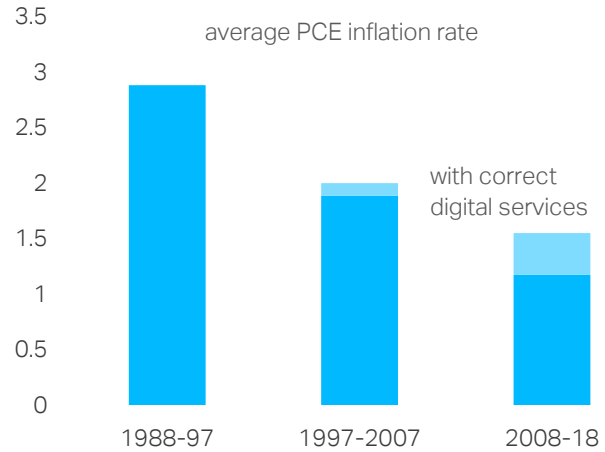
1993 and 1996 trying to convince his FOMC colleagues that the statistics they were using to guide policy were wrong. While Greenspan's view was initially based on a hunch – the economy seemed to be changing in ways that were not apparent in the national accounts – it soon became clear that the Fed's models for forecasting the US economy had also broken down. The traditional Phillips curve wasn't functioning, while unemployment had fallen below the Fed's NAIRU estimates without triggering wage inflation. Greenspan also spotted inconsistencies in the data. For example, while firms' wage costs were relatively subdued and their prices were stable, they were also reporting extremely large increases in earnings. This could only happen if they were becoming more efficient – which the Fed chair linked to a massive ICT boom.

Chart 16: Productivity under-reported in 90s



Source: ALFRED, TS Lombard

Chart 17: Finding similar distortions today



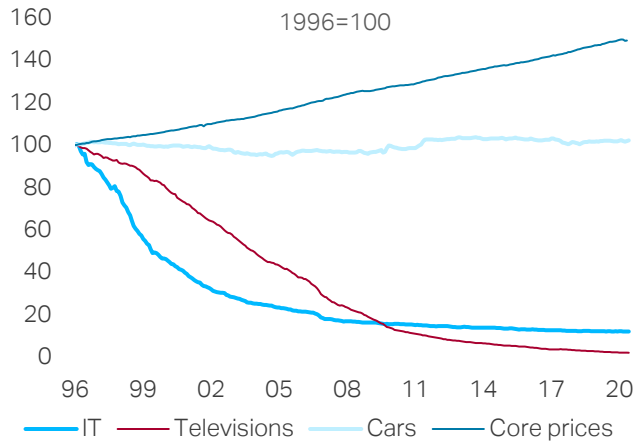
Source: Byrne and Corrado (2020)

Measurement error?

There are similar data issues today. National accounts data for the US and the UK suggest the digital share of the economy has been roughly stable over the last decade, which doesn't make sense. Yet current mismeasurement problems are more subtle than the issues Greenspan identified in the 1990s. Today, there is no obvious disconnect between the national accounts data on corporate profits and reported EPS. And both series have been consistent with real unit labour costs over the past decade, which suggests there is no hidden margins expansion. If we apply Greenspan's method to today's data, we wouldn't reach the conclusions he reached in 1996. But perhaps that's because there is something more profound going on.

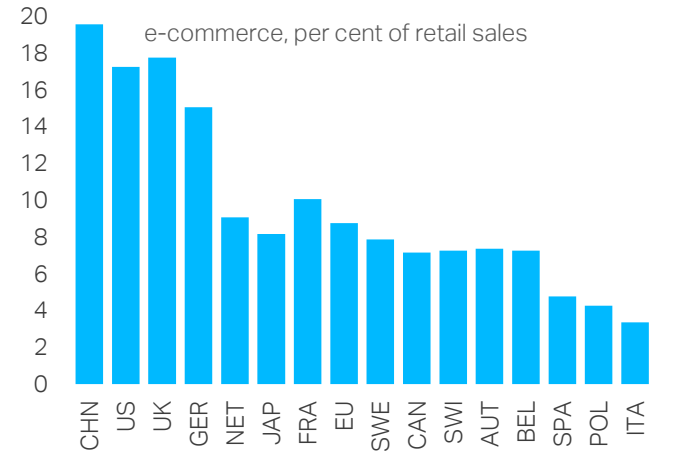
Measuring productivity has always been difficult but the digital economy has introduced a new set of challenges that could mean existing statistical techniques need updating. This is why several high-profile economists, including Ken Rogoff, Martin Feldstein and Hal Varian believe the recent slowdown in productivity is an illusion, reflecting the authorities' inability to keep pace with rapidly changing technologies and new ways of conducting business. Incorporating the digital economy into macro data is obviously tricky. Consumption of digital products often does not involve a monetary transaction that corresponds to its value to consumers. Moreover, digital products are usually 'non-rival' and can be replicated at negligible cost. This means the authorities are missing some digital activities, while including the disruption these technologies are causing to traditional industries (causing a negative bias). Research in these areas has flourished over the past decade, with economists identifying a number of main problem areas:

Chart 18: IT prices stopped falling in the 2000s



Source: Datastream, TS Lombard

Chart 19: E-commerce is taking over



Source: Statista, national sources, TS Lombard

i) Quality improvements in IT equipment: After strong declines until the early 2000s, IT-related prices have stopped falling in recent years (Chart 18). Some researchers believe this stability doesn't capture the latest improvements in quality or the introduction of new products. Official statistics are supposed to be quality-adjusted, but economists are increasingly finding new ways to improve these measures. Allowing for quality enhancements would reduce average prices, lifting the volume of output. Real GDP and productivity would be higher.

ii) Free digital content: In the past, consumers paid for goods and services with money. The authorities could observe both the price of the transaction and the quantity of items sold, making it easy to calculate real production. But in the Newer Economy, digital products are often delivered at zero price, so tend to be excluded from GDP. Meanwhile internet companies such as Facebook, Google and YouTube, which operate by selling advertising space and exchanging data, are under-represented in the national accounts.

iii) Time savings: The digital economy has surely lead to various efficiencies that are not included in official productivity statistics. For example, Hal Varian calculates massive time savings from Google search, which benefit both businesses and consumers. Other advances, such as GPS tracking, have strengthened and streamlined global supply chains.

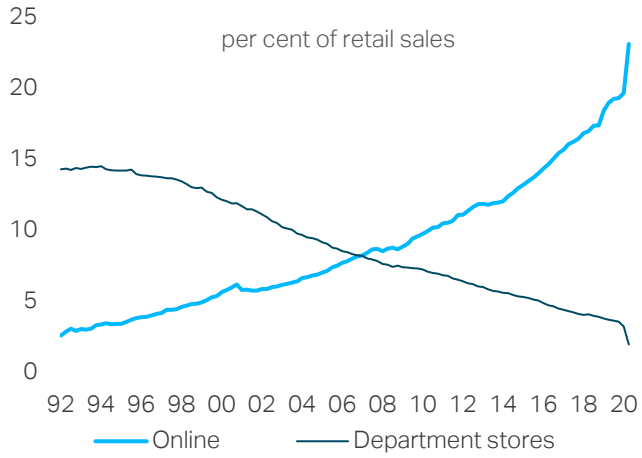
iv) Non-tangible investments: Intangible investment has become increasingly important in the knowledge-based economy. The national accounts include some intangible investments, namely software, R&D, and artistic originals. But businesses undertaking other forms of investment, such as training, reorganizations and brand-building, are excluded. There are also questions about whether 'data' should be included as a separate factor of production. Some recent studies have looked at investments in cloud computing and ICT services, suggesting these could now be having a substantial (unrecorded) impact on output per hour.

v) Global value chains: An important portion of the global supply chain which takes place in the e.g. United States is not well measured. The R&D and management activities conducted in the US add substantial value to final products that are assembled overseas. It isn't clear this value added is properly captured in the national accounts as exports.

vi) The sharing economy: The sharing economy is the use of digital technologies to unlock online marketplaces and social networks to facilitate the purchase, hire, and sharing of skills and assets. It has shifted ownership to rental demand and blurred the link between work and leisure time. Many of these activities are excluded in national accounts.

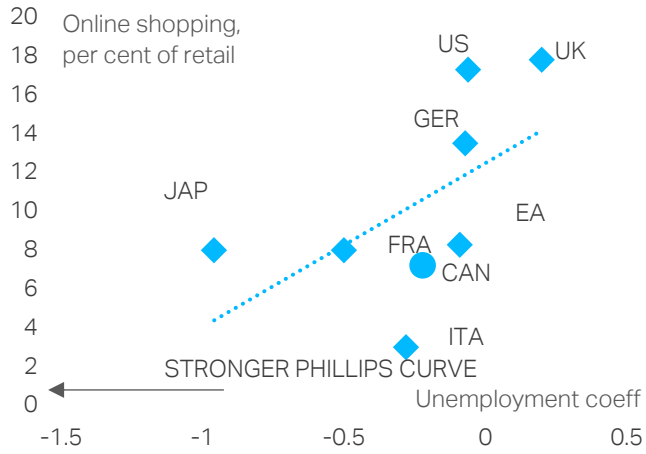
Taking account of these measurement problems, we start to understand why the inventions of the last decade haven't shown up in productivity data. A recent study by the Fed's David Byrne, one of the leading experts in this field, shows that better measurement of digital consumer services, such as Netflix, would add up half a percentage point to US real GDP over the past decade – not bad, when growth has averaged just 2%. Still, it is also true that not all activities should be included in the national accounts, even if we could measure them correctly. If, for example, social media and Google are affecting the efficiency of our leisure time more than our work, this is not something that should show up in GDP, a measure of market-based activity. In this case, digital technologies raise "consumer surplus", not output and productivity.

Chart 20: COVID-19 accelerant



Source: National sources, TS Lombard

Chart 21: Indirect effects on inflation?



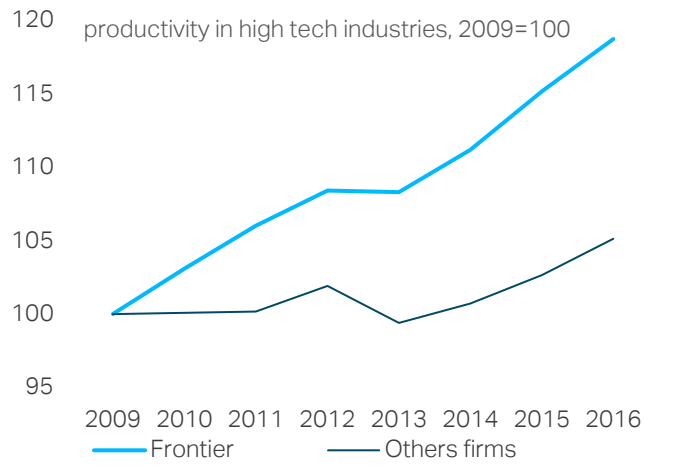
Source: TS Lombard estimates based on OECD data

The Amazon Effect

We suspect digital technologies have also had an 'indirect' effect on macro performance. Just as computerization flattened the Phillips curve in the 1990s, the spectacular growth in online retail has surely continued this dynamic. To illustrate, we estimated Phillips curves for the major economies by running simple regressions of inflation on unemployment. The size of the coefficient, typically a negative number, measures the strength of the relationship and the 'slope' of the curve. We then compared this coefficient to the share of online retail, as shown in Chart 21. It is interesting that the economies where the Phillips curve is most clearly broken – the US, the UK and Germany – are also the countries where online shopping has grown most rapidly. In contrast, countries where online shopping has failed to gain traction – particularly Italy, where e-commerce is less than 3% of retail spending – still have a functioning Phillips curve.

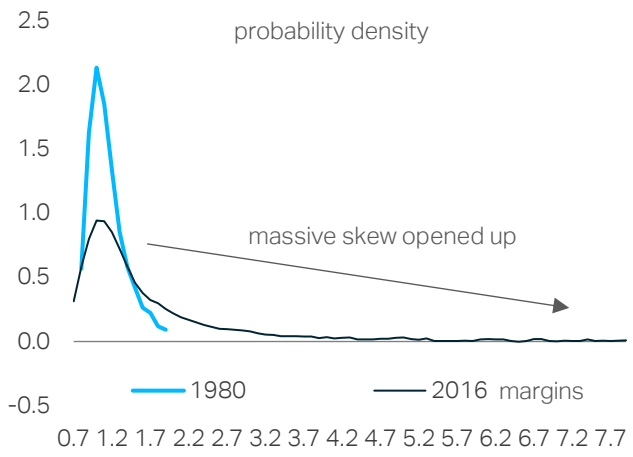
This so-called "Amazon effect" makes intuitive sense. Online retail has enhanced price transparency and strengthened competition, eroding the pricing power of traditional retailers. Meanwhile, new digital technologies have facilitated complex international supply chains, which has created additional deflationary pressures, eroding worker power and reducing average wages. Even if these effects are not obvious at the aggregate level, they are clear at the sectoral/firm level. For example, there has been a widening gap in efficiency between the traded and non-traded sectors, with big exporters continuing to make large productivity gains. But it's not just the gap between exporters and non-exporters that has widened. There is also clear evidence that technological diffusion has slowed even within domestic industries.

Chart 22: Divergence at the tech frontier



Source: OECD (2019)

Chart 23: Emergence of the Superstars

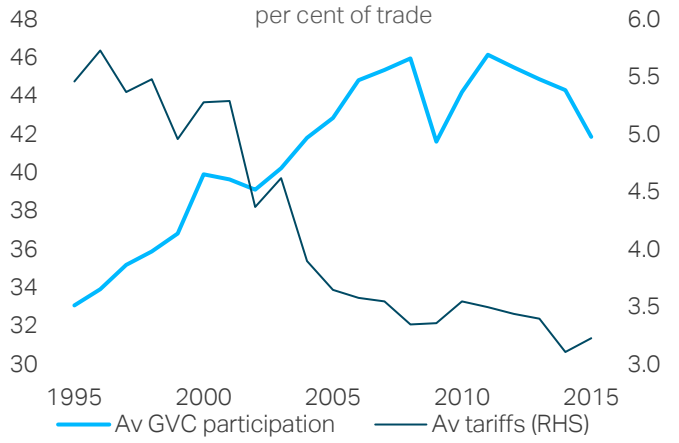


Source: IMF study (2018)

Slow diffusion is the critical issue

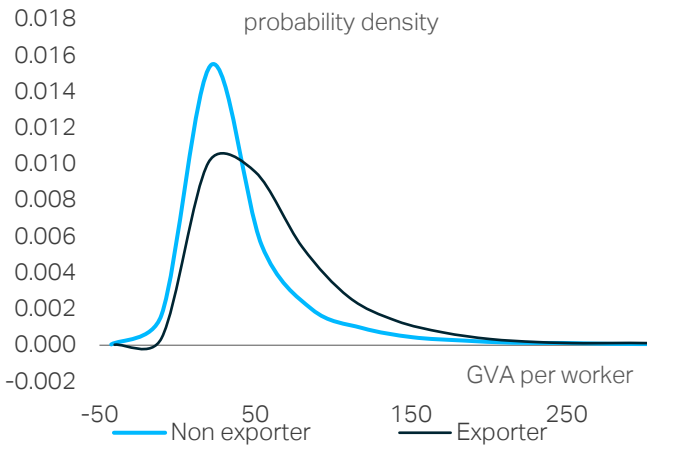
Computers were General Purpose Technologies (GPT), which means they influenced the entire economy. Like previous GPTs, such as steam power and electricity, they could drastically alter society through their impact on multiple sectors/industries. Yet the digital innovations of the last decade have not been so meaningful. Technological diffusion has slowed, which is why – even allowing for mismeasurement – their macro impact has not been as material as the tech enthusiasts expected. Some companies have harnessed these innovations, allowing them to secure large efficiency gains and outsized profits, but most have not. This has polarized the corporate sector, creating a gap between the "superstars" and a fat tail of laggards, dependent on cheap labour and low borrowing costs. As the BoE's chief economist puts it "the forces of secular innovation and secular stagnation are both been operating powerfully, with the two [corporate] productivity poles acting like magnets pulling the economy in opposite directions". How will this conflict be resolved? And will technological diffusion eventually increase?

Chart 24: Globalization raised efficiency



Source: IMF, TS Lombard

Chart 25: Exporters are more productive

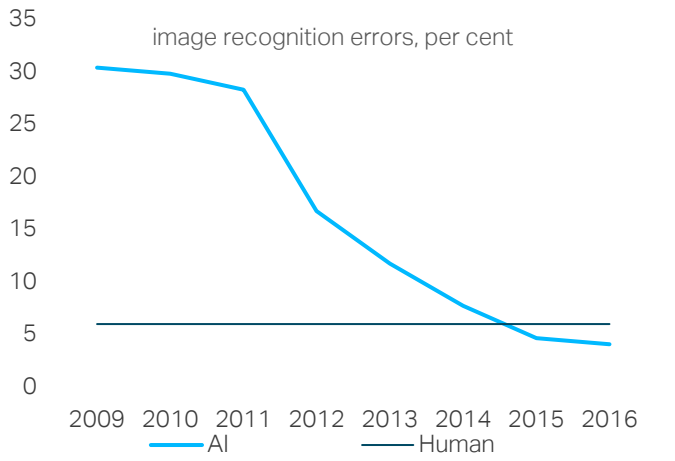


Source: Haldane speech ("The UK's productivity problem")

3. WINNER TAKES ALL

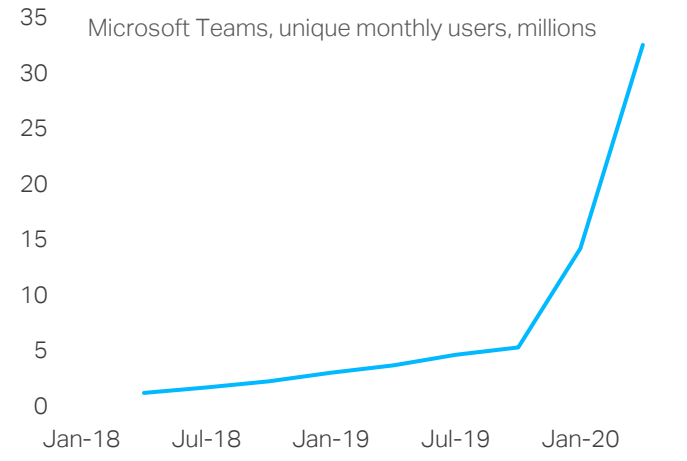
New technologies transformed the economy in the 1990s because the benefits were widely diffused across multiple sectors and industries. Yet, most of the companies investors were buying in order to gain exposure to this New Economy couldn't live up to their wild expectations. Today, we have a different sort of tech story – diffusion has slowed, so the macroeconomic impact of digital technologies is less evident. But a small group of superstars have become hyper efficient and profitable. What happens next is hard to figure out, especially in a post-pandemic world. Will COVID-19 provide a 'quantum leap for the digital economy, which will transform the macro economy and challenge the dominance of the FAANGs? Or will the current superstars maintain their advantage? Looking at the reasons why diffusion has slowed suggests the FAANGS are the best way to gain tech exposure, with or without a Second Machine Age.

Chart 26: Artificial Intelligence catches up



Source: Erik Brynjolfsson (2017)

Chart 27: The online office



Source: SimilarWeb

Why technological diffusion has slowed

Diego Comin and Marti Mestieri (2013) provide a useful framework for thinking about diffusion. Drawing on evidence from a wide range of countries and technologies over many centuries, they highlight four structural factors that have been crucial for technological trickle-down:

(i) External openness – companies that export typically make better use of tech;

(ii) Technology transfer – Comin and Mestieri identify two distinct forces at work when technology is transferred across countries or companies. First, there is technological adoption – the time it takes a new technology to first reach a country or company. Second, there is technological penetration – the extent to which these technologies then reshape processes and products in a company or country;

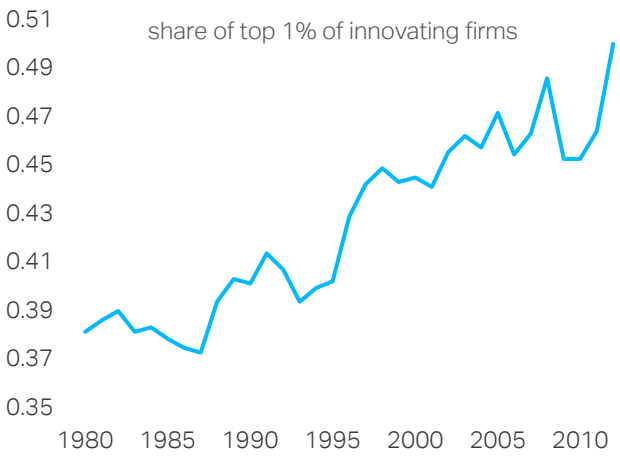
(iii) Human capital - One of the key mechanisms through which ideas and innovations are diffused across countries and companies is, unsurprisingly, through people. As workers transition between companies, their expertise and experience is transferred within them. Yet turnover rates have declined over the past decade, both within the most efficient companies and between the frontier and the laggards (see here);

(iv) Institutional differences - Countries with high-quality institutions typically grow more rapidly and have higher levels of productivity and living standards. One of the

channels through which institutions support growth is by nurturing capex and innovation. For example, upholding the rule of law and enforcing property rights is typically found to be crucial in supporting business investment and innovation.

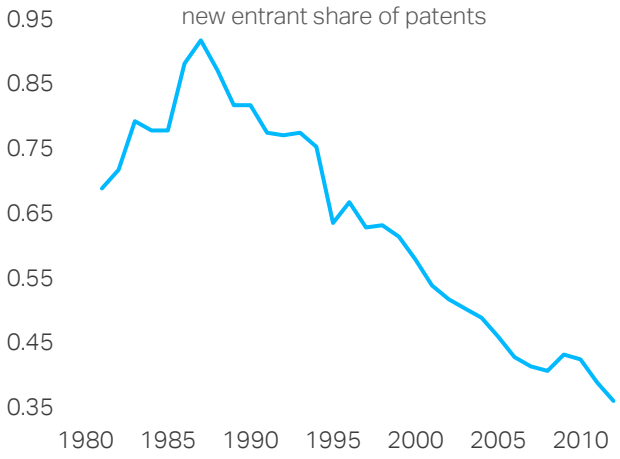
Tech enthusiasts, such as Erik Bryniolfsson, focus on technological transfer, specifically time lags that have opened up over the last decade. They argue it takes a while – longer than most commentators realize – to reap the full benefits. There are two main sources of the delay. First, it is necessary to build the stock of the new technology to a size sufficient to have an aggregate effect. Second, complementary investments are necessary to unlock the full potential of any invention. Paul David (1990) used similar arguments to explain Solow's original "productivity paradox", drawing a historical parallel between the diffusion of the computer and the electrical dynamo in the late 19th century. It turned out he was right. For both technologies there were significant time lags between the first major inventions and their macroeconomic impact. At first, old methods and capital remained more efficient, so few firms had an incentive to switch to the new systems. Eventually, as these technologies improved, the cost-benefit analysis shifted and a critical mass of firms made the switch, transforming the macro economy.

Chart 28: Fed evidence of "patent abuse"



Source: Federal Reserve study

Chart 29: Dynamism is slowing?



Source: Federal Reserve study

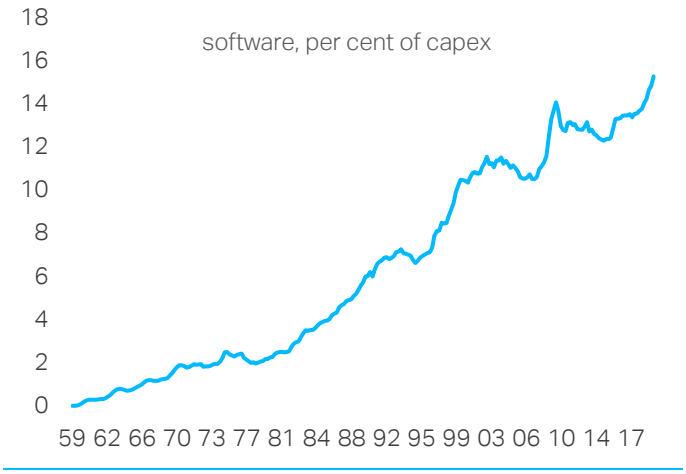
Barriers to diffusion

COVID-19 could shorten these time lags, especially now existing parts of the capital stock are already obsolete in a new era of 'social distancing'. Yet there are still important barriers to diffusion, which means it won't be easy to break the dominance of the superstars. Some economists believe these companies benefit from "monopoly power", blaming the dilution of any-trust laws since the 1980s. Jason Furman, for example, claims the authorities adopted the Chicago School view, wrongly believing (i) existing levels of competition were more intensive than previously thought, (ii) the dangers of consolidation were smaller than previously thought, and (iii) remedies that promoted competition would bring greater costs than benefits. Furman thinks this changed the behaviour of enforcement agencies and the courts, leading to more horizontal and vertical integration, curbing the dynamism of the US economy. Others make the comparison with Europe, claiming the Single Market has improved relative EU competitiveness.

Even staff at the Federal Reserve have expressed concern about the dynamism of the US economy, blaming the dominance of the superstars on their abuse of corporate power – especially through their use of technological patenting. They show there has been a dramatic increase in the share of patents registered by the top 1 percent of innovating firms (those who

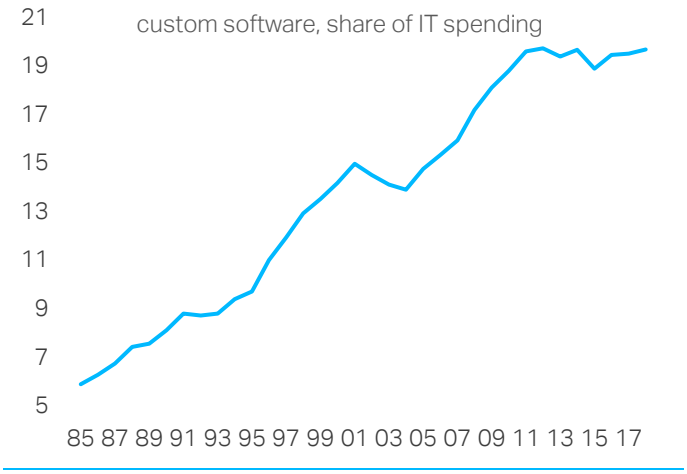
already have the largest stock of patents). Conversely, the share of patents among new entrants (firms that are issuing a patent for the first time) has trended lower. The reassignment of patents from large to small firms has also plunged, with large companies retaining their intellectual property. Given that patents are exclusively used to prevent competitors from using the patent holders' technology, these trends show market leaders are inhibiting the spread of ideas.

Chart 30: Software more important



Source: BEA, TS Lombard

Chart 31: Propriety capex supports superstars



Source: BEA, TS Lombard

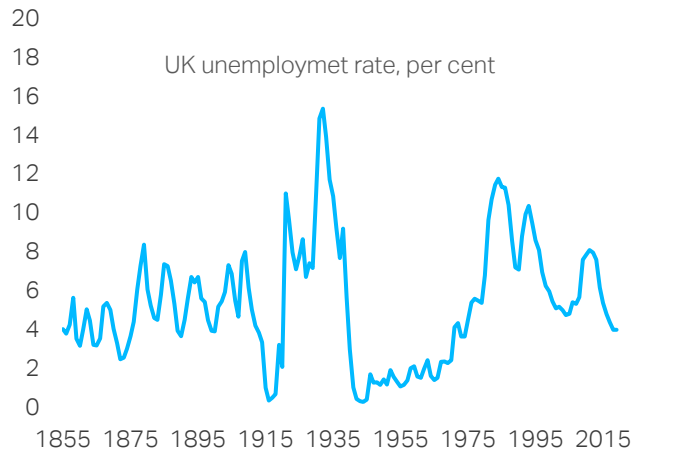
Dynamism or market abuse?

While it is popular to blame rising market concentration and slowing dynamism on the abuse of market power, it is questionable whether this applies to US tech. In areas such as retail, for example, there is no doubt competition has increased ("the Amazon effect", which has caused prices to plunge). An influential study by David Autor finds compelling evidence for this thesis, showing that corporate margins have increased not because market leaders are manipulating prices, but because new firms with lower labour costs have leapfrogged incumbents (consistent with the results of a recent OECD study on this same issue). Looking across industries, he shows market concentration and margins have increased most in those firms with the highest levels of technological innovation. This suggests it is the nature of digital technologies, not an abuse of market power, which has allowed the superstars to establish their dominance. Of course, this does not mean the superstars will not abuse their market power in the future.

Propriety investment

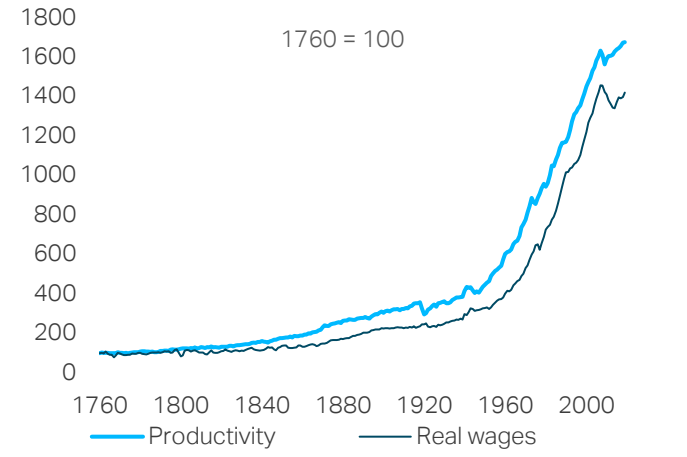
James Bessen at Boston University blames slow tech diffusion on a shift in the way the superstars invest in technology. During 1990s Dotcom boom, most companies would buy off-the-shelf hardware and software, technologies that were available to everyone. Today, the superstars are more likely to invest in their own propriety IT systems. IT spending that goes into hiring developers and creating software owned and used exclusively by a firm is now the key to competitive advantage. Today's big winners built their own software and even their own hardware, inventing and perfecting their own processes. Bessen shows that propriety IT investment can explain both the rise in market concentration and the gap in productivity between firms. These new systems are complex and since it has become impossible to obtain critical technologies, M&A is often the only solution. If true, this means the FAANGs could maintain their dominance, even in a post-COVID world, damping the potential spillovers from these investments to the wider economy, limiting their use as General Purpose Technologies.

Chart 32: No technological unemployment



Source: Bank of England

Chart 33: Income effects were dominant

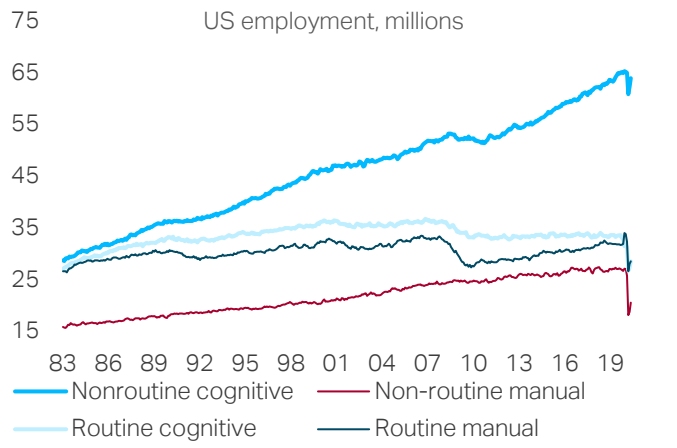


Source: Bank of England

Systemic risks from digital disruption

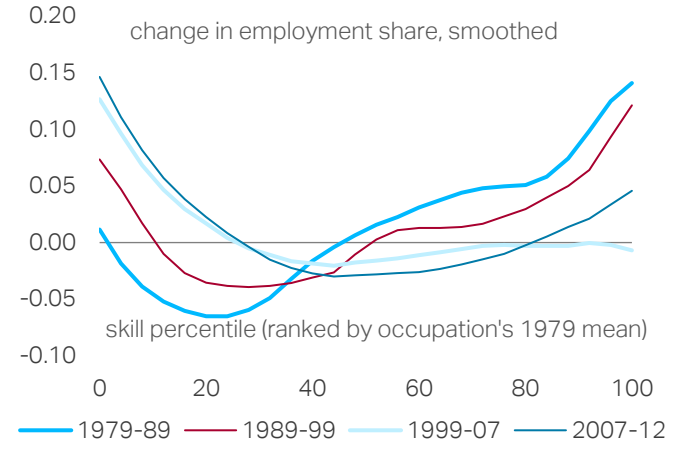
After years of debate, it is difficult to say how far away we are from the Second Machine Age. Tech enthusiasts believe COVID-19 will rapidly and permanently accelerate the use of digital technologies such as home working and Virtual Reality, but this is largely speculation. Adoption rates for these technologies increased massively during the first half of 2020 but we don't know if this will become a permanent shift in behaviour. New Industrial Revolution or not, existing barriers to diffusion suggest any short-term benefits could remain concentrated among the current group of superstars. So, if investors want exposure to this particular secular growth story, especially in an era of zero bond yields, the rally in the FAANGS etc. surely has further to run. It is important to remember, however, that the digital transformation also entails serious risks for the macro economy, especially in the context of a deep recession. We are particularly worried about the repercussions for employment and commercial property in 2021 and beyond.

Chart 34: Computerization hit routine jobs



Source: BLS, TS Lombard

Chart 35: And caused polarization in jobs

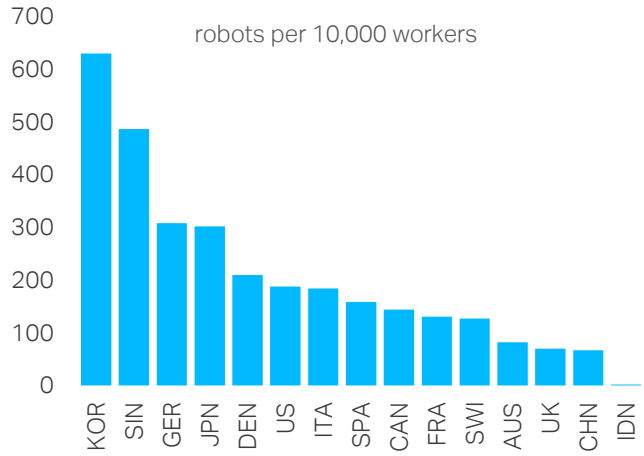


Source: David Autor (2015)

Risk 1: Technological unemployment

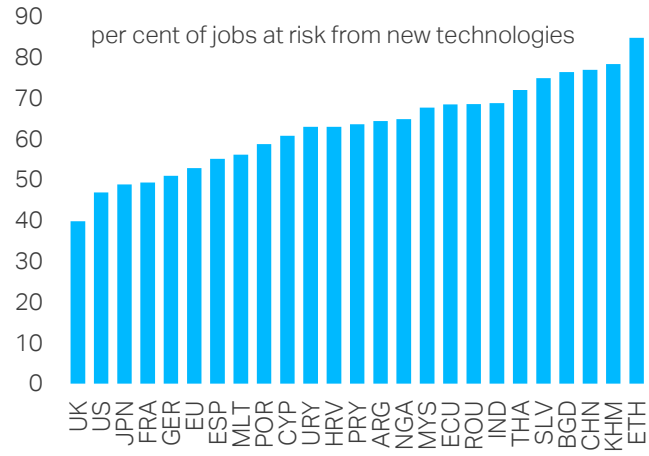
Fears of "technological unemployment" are not new, they date back centuries. Historically, the 'income effects' from technology (employment gains in new industries that come from higher living standards) have always dominated the 'substitution effects' (the replacement of workers with machines). This is why jobless rates have no discernible long-run trend (Chart 32). Yet, while computerization and the internet didn't damage aggregate employment, they caused large shifts within the labour market. The largest disruption was in 'routine' cognitive and manual tasks. Routine tasks are those following simple rules, readily expressed in computer code. Programmers set out procedures to direct the technology in every contingency. Companies automated many manufacturing jobs, plus other roles such as bookkeeping, clerical work, cashiers, telephone operators and copy-typists. Until now, non-routine tasks, both manual and cognitive, were less exposed to technology. These roles were not sufficiently well understood to be specified in code, or demanded human flexibility, judgement and common sense. This caused clear polarization in the labour market – people either 'skilled up' to roles that were complementary to computers, or they took lower skilled jobs in retail and services.

Chart 36: Robots confined to industry (so far)



Source: Forbes

Chart 37: Is that about to change?



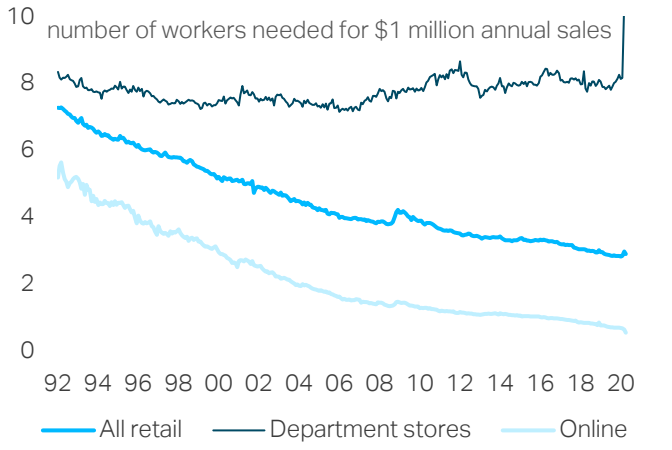
Source: Frey and Osborne

The next wave of automation could be different. Robots could replace jobs at the low end of the distribution, while AI and machine learning could take jobs from skilled occupations. The aggregate employment effects could be far more serious than previous industrial revolutions. An influential study by Frey and Osborne, for example, found that new technologies will make 50% of US jobs automatable. Developing countries are even more exposed (Chart 37). If this transition happened gradually, as in the past, it might be manageable. But sudden COVID-19 inspired disruption, prompted by e.g. social-distancing requirements, would be much harder to deal with. Unemployment has already skyrocketed and could stay high for many years.

Employment in retail and parts of the service sector is particularly vulnerable. Machines do not need to social distance and online retail is much less labour intensive than traditional outlets such as department stores. We can see this by comparing sales in the two sectors with the number of workers they employ. On average, traditional retailers have needed around 8 workers to achieve annual sales of $1 million. This is eight times more than online retailers. Recent research from the New York Fed shows that these sectoral shifts could also have an important impact on regional employment patterns in the United States. Department stores, for example,

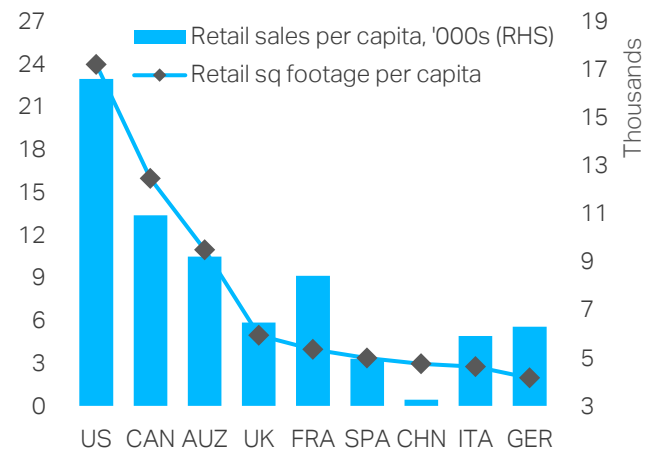
were typically spread out in line with the population because they relied on personal, face-to-face business. They employed people everywhere. But online retailers are more like wholesale distributors, concentrating staff in a few key locations.

Chart 38: Online retail needed fewer workers



Source: BEA,BLS, TS Lombard

Chart 39: US has retail over-capacity



Source: Brookfield Property

Risk 2: "Mallmageddon" and commercial property

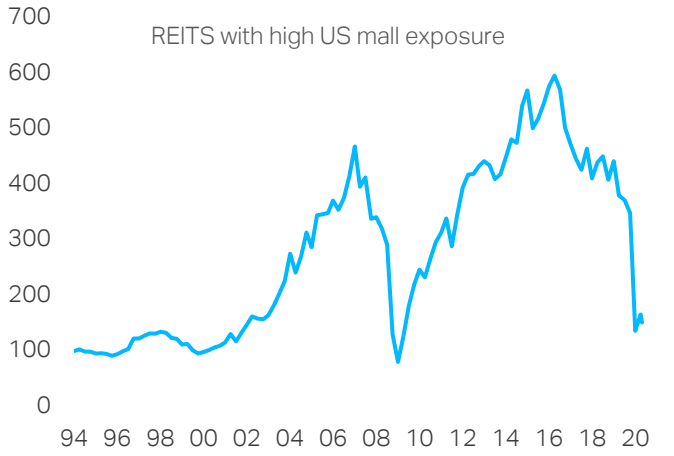
As COVID-19 encourages a shift to digital commerce, it threatens to amplify the destruction of traditional retail, an acceleration in the so-called "Mallmageddon" narrative. Recall, a few years back, some hedge funds were touting the anti-retail trade as the "the next Big Short", based on the idea that (i) digital technologies, particularly online shopping, would 'disrupt' existing business models, and; (ii) the multi-decade consumer boom had produced serious over-capacity in the retail industry. The US has four times the per-capita shop space of most other major economies. We are now seeing clear strains in the sector. Traditional retail stocks have crumbled, with the pain spilling over into commercial property, particularly REITS with large exposure to US shopping malls. REITS lease commercial real estate, making a rental return which they usually pay in dividends. These instruments have plunged in 2020. Bloomberg's BBREMALL index, which includes companies such as Simon Property Group, is down 75% from its peak.

The destruction in retail could have important financial stability risks, especially through the commercial property market – which will come under further pressure if "home working" becomes a permanent feature of the post-pandemic economy. Retail companies have also been taking on more debt in recent years. The total leverage for retailers in the Russell 2000, an index of small caps, has risen even as the outlook has deteriorated. With revenues collapsing, these debt levels could become unsustainable, forcing many companies to default. This would spread the damage to those banks etc. that have lent the funds. According to the IMF's Global Financial Stability Report, banks account for around 55% of commercial real-estate lending in the US and 70% in Europe. REITS are another source of vulnerability, owning considerable amounts of retail space. As retailers go out of business, rental incomes would deteriorate. This situation is made worse by the fact that many rental agreements include clauses that allow companies to renegotiate their rents if other large stores leave the area, magnifying the impact.

Corporate mortgages total around $3 trillion in the United States, which is smaller than the value of existing home loans – some $13 trillion outstanding – but still a large and potentially systemic vulnerability. Unfortunately, it's hard to estimate how much of this debt is related to the retail

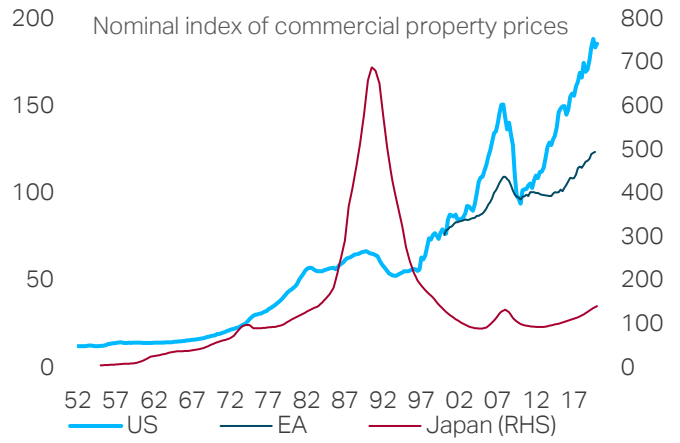
sector and how these liabilities are distributed across the system. But we do know: (i) the REITS own commercial retail estate assets of around $250bn (roughly half in retail); (ii) there is $500bn outstanding in Commercial Mortgage-backed Securities (CMBS), of which a third is retail-related, and (iii); the largest banks have significant holdings of commercial property debt. Overall, the Economist calculated total retail property debt at around $1 trillion, which seems reasonable given the size of the sector and the overall value of outstanding commercial borrowing. Clearly it will be important to monitor these strains if the current economic slump continues into 2021.

Chart 40: Mallmageddon strikes?



Source: Bloomberg

Chart 41: Risk to commercial property?



Source: BIS, TS Lombard

Bottom line

The debate about a "bubble" in stock markets continues, with the discussion now firmly centred on the US tech sector – the driver of the 2020 rebound. For the bears, this is a liquidity-driven market detached from fundamentals. For enthusiasts, US tech promises an escape from secular stagnation in an era of permazero interest rates. Certainly, the large US tech companies seem less vulnerable to the COVID-19 induced economic slump, with an increasing share of business and consumer spending moving online. Worries about a repeat of the Dotcom bubble also seem alarmist, especially as today's tech superstars are (for the most part) highly profitable. Whether COVID-19 triggers industrial reorganization on a scale that will accelerate the adoption of digital technologies and transform the global economy remains a more speculative issue. Diffusion has been slow over the past decade, with the superstars establishing a distinct competitive edge, especially thanks to years of propriety R&D. There are also dangerous macroeconomic risks associated with digital disruption, especially via labour markets and commercial property. Rapid diffusion could make the current economic slump worse, intensifying financial stability risks.