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The **Economic Research Digest** monitors recently published research across a number of economic areas relevant to the work of the Department for the Economy such as competitiveness, innovation, enterprise, trade, FDI, tourism and infrastructure. The Skills Research Digest deals separately with recently published skills and labour market research.

In each case, we provide a short summary of the key points and web links to the full article or report*. A full list of sources can be found at the end of the publication.

Highlights this quarter include:

- The Inaugural Global Economic Openness Index, which benchmarks trade, competition and productivity for economies.
- Analysis of trends in technology and industrial manufacturing in 2019.
- New research into the gender pay gap in the United Kingdom.
- Exploring why FDI inflows to the UK have been declining recently.
- Visitor Attitude Survey 2018 for Northern Ireland.

** Links are correct at the time of publication, however it is likely that some will break over time. The list of sources has more general links, which should help the reader to track down the original report.*

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The research summarised here presents the views of various researchers and organisations and does not represent the views or policy of the Northern Ireland Executive or those of the authors.

COMPETITIVENESS

Global Economic Openness Index, published by the Legatum Institute, measures the extent to which economic systems around the world enable trade, competition and productivity.

- This report measures the extent to which the economic systems of 157 countries enable trade, competition and productivity, by measuring four pillars that describe the policy choices for countries: Market Access and Infrastructure, Investment Environment, Enterprise Conditions and Governance.
- This year there are four key findings:
 - Economic Openness is at its highest ever level, with some of even the lowest-ranked countries improving, and lifting millions of people out of poverty.
 - Countries with greater levels of Economic Openness are more productive.
 - Economic Openness, and therefore economic growth, can be improved by policy choices.
 - Governance is key, yet the quality of Governance is stagnating, acting as a brake on Economic Openness.
- Globally, Economic Openness is at its highest-ever level, improving by 8% over the last 10 years. 130 countries, representing 90% of the world's population, have risen since 2009. Furthermore, the gap between the lowest and highest score has closed, albeit slowly. Over the last 10 years, the bottom fifth of countries have closed 5% of the gap with the top fifth of countries.
- The UK is a successful open economy, ranking seventh overall in the Index. The UK's strong and trusted institutions have created a stable investment environment that has allowed businesses, both established and nascent, to flourish. These strong foundations make the UK resilient (though not immune) to any economic uncertainty. Underpinning the UK's strength as a global financial centre are its strong institutions and the trust placed in them by the population and the international business community.

Prospects for the UK economy, published by the National Institute of Economic and Social Research, summarises forecasts relating to the UK economy.

- The UK's future relationship with the European Union (EU) remains undecided. Brexit-related uncertainty has led to investment plans being deferred, and increased stock building.
- Under the main-case forecast, based on a 'soft' Brexit and continuing uncertainty, GDP growth continues at around 1½ per cent in 2019 and 2020, broadly in line with potential output growth, and the unemployment rate stays at around 4 per cent.
- CPI inflation is forecast to remain at around 2 per cent per annum as faster unit labour cost growth is offset by slower import price inflation. With inflation stable at target, and only limited evidence of domestic inflationary pressure, Bank Rate remains at 0.75 per cent throughout this year before being raised to 1 per cent in the second half of 2020.
- The current account deficit is forecast to fall from 4.2 per cent of GDP in 2019 to around 3 per cent in 2020, as domestic saving picks up relative to investment.

Cost of Doing Business in Ireland 2019, published by the National Competitiveness Council (ROI), measures overall cost bases for the Irish Economy by analysing indicators relating to cost areas.

- Labour costs in Ireland are broadly in line with the euro area average. The total hourly labour cost in Ireland was €30.90, which was lower than the corresponding figures for Denmark (€43.50), Sweden (€36.60), France (€35.80) and Germany (€34.60). However, it was higher than the total hourly labour cost in the UK (€25.70). After remaining flat between 2012 and 2014, Irish labour costs have started to increase in line with the growth in labour costs in other jurisdictions. The last data shows that Irish labour costs increased by 2.9% in 2018 – which is concerning as it is four times higher than the inflation rate.
- The tax burden, as a percentage of labour costs for a single individual earning the average wage, stood at 27%, which is below the OECD average (36%) and the UK (31%). The tax burden, as a

percentage of labour costs, for Irish married couples (with two children) earning the average income was 11% of labour costs, while the corresponding figure in the UK was 26%.

- Over the last year, there has been a steady increase in commercial property prices and the cost of constructing office space. In the office rental market, in the last five years, prices are up 15.9% in Dublin (Suburbs) and up 16.5% in Galway.
 - The rental price of prime office space varies greatly across Europe. In Q4 2018, office rental in Dublin cost €646/m². This was lower than Paris (€810/m²) and London City (€804/m²), but considerably higher than Amsterdam (€450/m²), Berlin (€396/m²) and Brussels (€275/m²).
 - According to Turner and Townsend, Dublin is one of the most expensive cities in the world in which to construct prime office buildings. In 2018, the construction cost per square metre of a prime office building in Dublin was \$3,065/m², lower only than London (\$3,919/m²) among the major cities measured. Similarly, construction costs for a high-tech factory in Dublin (\$2,679/m²) is comparable to London (\$2,812/m²), and costs in Dublin have risen by 27% from 2013 to 2018.
- In recent years, aggregate transport sector prices in Ireland have increased moderately. Prices in all transport sectors (except sea and coastal transport) have steadily increased, with postal and courier services recording the highest price increase, followed by warehousing, storage and cargo services.
- In 2018, the average price per litre of petrol and diesel were €1.43 and €1.34 respectively. Prices of both petrol and diesel have fallen off since their peak. Petrol prices in December 2018 (€1.43/litre) were 4.6 % lower than the peak in November 2018 (€1.50/litre). Similarly, diesel prices were down by 2.8 % December (€1.36/litre) compared to the peak in October (€1.40/litre). Over the course of 2018, petrol prices increased by 2.8% and the price of diesel increased by 4.6%. After increases at the start of the year, bus and taxi fares remained stable, but fares on other purchased transport services have increased significantly (3.9%), since the start of 2017.
- Certain utility costs (including electricity and gas) tend to be higher in Ireland than other jurisdictions, while Ireland is more competitive regarding other utility costs (telecoms). Businesses in Ireland face higher interest rates than the average business in the EU, or the euro area. In Ireland, the overall price of services is rising much faster than the price of goods. In total, the price of services has increased by 7% since 2015, but this masks widely different changes in the price of certain services.

Ireland's Competitiveness Scorecard 2019, published by the National Competitiveness Council, assesses the relative performance of the ROI economy.

- Ireland's GDP will continue to grow quickly, while inflation remains subdued, though there are a number of downside risks for Ireland's economic growth. In 2019, domestic (and international) observers forecast that Irish GDP will grow by between 3.8% and 4.2% while inflation is forecast to be in the range of 0.7% to 1.3%.
- The Irish economy continues to be dependent on a small number of firms in a small number of sectors dominating economic performance. For goods, pharmaceuticals and chemicals accounted for 58% of Ireland's total goods exports, up from 45% in 2017. The services data suggest a similar concentration, with computer services dominating services exports in 2018 (43%), just below the 46% recorded in 2017.
- The latest productivity data shows that Ireland is a very productive economy. However, a small number of firms deliver most of Ireland's productivity performance, while there are many domestic firms where productivity is stagnating.
- In Ireland, public investment (at 1.9% of GDP) is still substantially below international peers (for example, the UK spends 2.4% of GDP on public investment). These below average investment figures may have contributed to the negative perceptions of Irish infrastructural quality exhibited in the World Economic Forum survey.
- The divergence in productivity growth between top performers and the rest is a concern given that Ireland is a high cost economy (albeit where prices are increasing slowly). Higher costs in general should not be an issue if productivity levels are higher, but if certain parts of the economy are not experiencing these higher productivity growth rates, they may be more affected by higher costs. Moreover, while average prices are increasing slowly, there are areas where Irish businesses face specific cost disadvantages relative to key competitor jurisdictions (including credit, business services, and commercial rents).

- All major indicators suggest that the Irish economy is performing well in aggregate. However, there are still overarching areas that should be addressed. Productivity growth is concentrated in too small a number of firms, and more needs to be done to ensure that the right framework is in place to allow broad based productivity improvements across regions and sectors.

[Economic Inactivity in Northern Ireland: A focus on why male economic inactivity has been rising](#), published by Nevin Economic Research Institute provides potential reasons for rising inactivity.

- In Q1 2009 the rate of economic inactivity for females was 37.1% and 23% for males - a gap of 14 percentage points. By Q1 2019 the gap between male and female economic inactivity had declined to 7%.
- Not all of the closing of the gap between male and female economic inactivity has been driven by the decline in female economic inactivity, but rather by a concurrent increase in the rate of male economic inactivity.
- The author's suggest that the reason for the increase in the rate of male economic inactivity is related to changes in the nature and quality of male employment.
- Within the labour market there has been quite a substantial increase in the proportion of male workers who are employed on a part-time basis. In Q1 2009 11.4% of males were employed on a part-time basis. By Q1 2019 this had increased to 15.7%.
- Male part-time employment has some of the lowest earnings of all work. In 2018 median hourly earnings of part-time male workers was £8.50. This compares to £9.03 for part-time female workers and £11.40 for all workers.
- The fact that the labour market is increasingly skewed toward the worst paying jobs for males leads to the conclusion that for these workers - work just might not pay.

PRODUCTIVITY AND GROWTH

[Skills, management practices and productivity in SMEs](#), published by the Enterprise Research Centre, uses longitudinal data on productivity to examine causal links between skills and management practices.

- For small firms Strategic Management Practices have a greater impact on productivity than HR practices, although these effects are inconsistent with only weak levels of significance. In particular, Strategy Formalisation proves the most important driver of productivity among small firms with fewer than 50 employees.
- Not all types of practices yield productivity benefits. For example, Strategy Centralization has little productivity benefit. Strategy Centralization describes a process where strategic decisions are made by the individual CEO and is strongly associated with the presence of the founder in the business. Paradoxically, this type of Practice also seems to restrict the impact of the individual's Entrepreneurial, Leadership and Organizational skills.
- In policy terms the mediating role of practices in the link between skills and productivity is also potentially important. The implication is that improving skills in isolation will not transfer directly to improvements in productivity. It is only where upgraded skills enable or inform and influence practice that productivity benefits will be realised. This suggests the need for a dual focus in business support which aims to drive productivity growth: training to develop skills alongside mentoring/advisory support to help firms' embed and implement practices. The combination of the two may be mutually reinforcing.
- CEO skills matter for the adoption of management practices and in turn these have an impact on productivity over a three-year period; adding one additional HR practice adds around 2 per cent to productivity over three years. This relationship is strongest in larger firms (with more than 50 employees) where HR practices show a strong link to productivity. For smaller firms, productivity benefits are associated with less centralised decision-making even in firms led by a single business leader such as those considered here. The research suggests a symbiotic link between management skills and management practices, where managers use their skills to develop and adopt management practices. Understanding why entrepreneurial firms adopt management practices necessitates an understanding of the manager as well as the practice.

Testing the resilience of Europe's inclusive growth model, published by McKinsey & Company, focuses on prospects for inclusive growth in the period to 2020.

- European countries have different flavours of welfare model, yet they share a history of solid social protection and a focus on inclusive growth, which has been under stress since the recent financial crisis. Although inequality across Europe has grown only moderately since the early 2000s, social divergence between and within some European countries has increased.
- Investment rates have not recovered to pre-crisis levels, trust in national governments is still falling in one-third of European countries, and populist parties have won greater shares of the vote.
- Market income inequality in Europe rose only moderately compared with other regions, and redistribution almost stabilised disposable income distribution in recent years. However, the cross-country picture is mixed. Nordic countries have achieved the largest income growth, but in Southern Europe, all income quintiles have lost between 1 and 3 percent a year of disposable household income, with the lowest-income households experiencing the largest losses.
- There could be cracks in the sustainability of the EU social contract in the next decade caused by six megatrends: ageing demographics; digital technology, automation, and artificial intelligence (AI); increased global competition; migration; climate change and pollution; and shifting geopolitics. Based on these trends, inequality may rise again, and divergence within Europe may increase.
- Improved innovation and upgrades in human skills should be key priorities for Europe given that both can support inclusive growth. In all scenarios, the EU is likely to need to adapt the parameters of the social contract to cope with the megatrends, for instance embedding lifelong learning in the workplace and enforcing behaviour with respect to limiting pollution and overuse of natural resources.
- Europe will also need to increase, and better communicate, efforts to rebuild citizens' trust in order to gain their support for the required changes ahead.

Central and Eastern Europe needs a new engine for growth, published by McKinsey & Company, suggests creating a digital economy could be the growth engine that the region needs.

- The current growth engine of Central and Eastern Europe (CEE) is losing momentum. Growth in CEE has been driven by a number of factors, including traditional industries, dynamic exports, investments from abroad, labour-cost advantages and funding from the European Union. But now these drivers are beginning to weaken.
- Digitization can be the next driver of sustained growth for the region, with €200 billion of additional GDP by 2025 at stake. The analysis shows that developing the region's digital economy across all sectors would bring significant economic benefits, primarily due to the resulting productivity gains. By closing the digital gap to Western and Northern Europe, CEE could earn up to €200 billion in additional GDP by 2025 – a gain almost the size of Portugal's entire economy in 2017.
- In 2016, the digital economy of "Digital Challengers" (the ten countries of CEE that form the core of the study - Bulgaria, Croatia, the Czech Republic, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia) accounted for 6.5 percent of their GDP. This is almost on a par with the EU Big 5 (6.9 percent) but well behind Digital Frontrunners such as Sweden (9.0 percent).
- Notably, Digital Challengers are enjoying great momentum in their digital economies. Between 2012 and 2016, the region's combined digital economy grew by 6.2 percent a year, twice as fast as in the EU Big 5.
- The business world, governments, and individuals all need to act in order for the transition to be successful. Collaboration between CEE countries as Digital Challengers is key. The countries of CEE will only be able to capture the full potential of the digital transformation by cooperating closely with each other, due to at least four factors:
 - Scale effects: Together, Digital Challengers represent €1.4 trillion in GDP, making them the equivalent of the twelfth-largest economy in the world.
 - Similar starting points: The countries of CEE have high levels of market openness and similar levels of digitization, besides their cultural and historic commonalities.
 - Common challenges: The region's countries face many similar challenges, such as the "brain drain" and need to reskill the workforce.

- Best practices: Each CEE country has developed different areas of digital specialization, each with their own advantages. Sharing best practices can accelerate the process of transformation.

LIVING STANDARDS, WELLBEING AND PROSPERITY

The gender pay gap: women work for lower-paying firms than men, published by the Institute for Fiscal Studies (IFS), publishes new information relating to the gender pay gap.

- Across the UK economy, women are on average paid nearly 20 percent less per hour than men. This gap is the fourth largest in Europe and it has changed little in the last decade.
- The reporting requirements have brought greater scrutiny to this important issue. But by focusing on pay differences within firms, they miss a potentially important driver of the gender pay gap: the tendency of women to work in less productive, lower-paying firms. Even if no organisation had any gender pay gap, an over-representation of men in higher-paying firms would still lead to a gender pay gap in the UK as a whole.
- Compared to men, women are more likely to work in firms at the bottom end of the productivity distribution, and less likely to work for the most productive firms. This is partly because women are overrepresented in the retail and hospitality sectors, which tend to have low productivity.
- Average gross value added per worker among the firms that women work for is 22 percent lower than among the firms that men work for. Women are about a third less likely to work for one of the top fifth most productive firms (21 percent versus 33 percent). Because more productive firms pay their workers more on average, the gender pay gap in firm productivity is likely to contribute to the overall gender pay gap.
- The gender gap in firm productivity begins to widen for people in their mid-30s. Women aged 18-34 are around 5 percentage points less likely to work for the top fifth most productive firms than men of the same age. This difference grows rapidly over the next decade, before levelling off at around 15-20 percentage points for those aged 44 and over. This partly reflects differences in sector – older women are more likely (and older men less likely) to work in retail – but even within sectors the productivity of firms women and men work in starts to diverge in the mid-30s. The same pattern holds if other proxies for firm productivity are used, such as the share of workers employed in R&D activities or average R&D spend per worker.
- The data does not follow the same individuals over their lifetimes, as other data sources have allowed the IFS to do when looking at the gender pay gap. It is possible that some of the differences by age reflect differences between generations: older people in the sample entered the workforce in earlier decades, when gender differences in the labour market were more pronounced. However, the widening of the gap around childbearing age is striking and mirrors the evolution of the gender pay gap.

The generation of poverty, published by the Resolution Foundation, examines how poverty has changed over the course of people's lives over the last six decades.

- The general life-course pattern of relative poverty is greatly influenced by the costs and incomes associated with certain life stages. The additional income required to meet the costs faced by larger families as children arrive (accounted for in income data by 'equivalising' for household size) means that child poverty rates are generally higher than rates at other life stages.
 - In contrast, it is low incomes in retirement that have historically driven exceptionally high pensioner poverty rates.
- The relative poverty rate (after housing costs) for pensioners in their late 70s rose sharply in the 1980s and early 1990s, reaching almost 45 per cent at its height for the "greatest generation" who were born between 1911 and 1925.
- Pensioner poverty has since fallen rapidly, with relative poverty rates at age 70 more than halving to below 20 per cent for the next generation of pensioners – the "silent generation" born between 1926 and 1945.
- The poverty rate for the post-war "baby boomer" generation who are now entering retirement has fallen to 15 per cent – the lowest on record.
- Relative child poverty has been rising for those born over the last decade compared to their predecessors. Children born between 2016 and 2020 are facing the joint-highest rates of early

year's poverty in 60 years, with more than 35 per cent expected to be living in poverty at age two.

- The "millennial generation" born between 1981 and 2000 are on course to face record rates of working-age poverty.
- Child poverty declined from the mid-1990s onwards, falling by 10 percentage points from 35 per cent to 25 per cent at the age of eight for the eldest cohort of the latest generation (born in the first decade of this century) when compared to those born 10 years earlier. This was due in part to increases in the cash benefits offered to families with children. But cuts to the working-age benefit system have started to reverse some of these declines, leading to the divergence in child and pensioner poverty rates.
- Relative poverty rates are also expected to rise for working-age adults, who historically have escaped from high poverty rates. Millennial and generation X cohorts are likely to face the highest working-age poverty rates to date, with almost a quarter of the 1991-95 cohort expected to be in relative poverty in their late 20s. A key feature of these trends – relative poverty falling for pensioners while rising for children and working-age adults – is that the majority of people in poverty now live in a household in which someone works. This is a big shift in understanding who experiences poverty and how policy can best seek to tackle it.

Innovation and Enterprise

INNOVATION

***[Innovating into trouble: When innovation leads to customer complaints](#)*, published by the Enterprise Research Centre, examines the unintended consequences of innovation.**

- Analysis reveals that higher levels of innovation activity increases the probability of customer complaints in the short term, although this disruptive effect dissipates over time. The analysis is focused on legal services in England and Wales and is based on a 2015 survey of innovation by legal services providers matched with data on customer complaints between 2013 and 2017.
- The authors also identify how firms can reduce the potential for customer complaints by adopting collaborative innovation strategies with clients and engaging in multifunctional team-working. Prior empirical studies have shown that engaging consumers and employees across various functions in the innovation process can enhance creativity and innovation quality and help overcome customer resistance.
- Higher levels of innovative activity may generate additional value for consumers but the evidence suggests that more innovation will also lead to an increase in consumer resistance and complaints in the short-term. This emphasises the importance of organisations such as the Legal Ombudsman which can help to resolve any issues which arise between legal service providers and their customers. For legal service providers, the results suggest that engaging with customers and team working as part of their innovation activity can help to mitigate the risk of complaints and any potential reputational and commercial damage.
- The investigation of the risk of customer complaints for innovating firms is conducted in a single jurisdiction. Other jurisdictions have similar regulatory bodies which investigate consumers' complaints about legal services. Matching such complaint data with innovation survey data would enable replication studies to be undertaken; building on the paper's findings. It is also important to acknowledge that the complaints data used here may be a result of direct 'use' of a new service innovation or may be indirectly linked to other innovation activity within the firm.
- In addition, it must be considered that the findings may be unique to legal services and not necessarily generalizable across other sectors. Traditionally considered a conservative sector, customers may be less appreciative of innovative activity within legal services. Notwithstanding the legal services context of the study, legal services shares many of the standard attributes - the intangible nature, inseparability, and extensive interactivity between client and provider - of other professional services. Therefore, similar studies on customer complaining behaviour across different sectors are needed.

Micro-Businesses in Ireland: From Ambition to Innovation, published by the Enterprise Research Centre, presents new information on the ambitions, growth aspirations and innovation levels of Irish micro-businesses.

- In Ireland, most micro-businesses are mature, and many are home-based. They are closely related to the families which own and run them.
- There is a story of ambition – for the business, for the individual:
 - An ambitious 27 per cent of micro-business in Ireland want to build a national or international business, while 71 per cent of micro-businesses emphasise the importance of keeping their business similar to how it operates now.
 - Over 80 per cent of micro-business owners report 'freedom to adapt my own approach to work' and 'greater flexibility for personal and family life' as key personal motivators.
 - Micro-businesses in the West (Galway & Galway City, Mayo & Roscommon) are amongst the most ambitious in the country.
 - Micro-businesses in the Border region (Cavan, Donegal, Leitrim, Monaghan, Sligo) reveal a low ambition profile.
 - One-third of micro-businesses in Dublin consider growth to be an important ambition. However, micro-businesses based in Dublin are not markedly more ambitious than micro-businesses across the country.
 - In the South-East (Carlow, Kilkenny, Wexford, Waterford & Waterford City), microbusiness owners are more likely to emphasise personal rather than business ambitions.
- Innovation leads to new products, new services, new ways of doing things:
 - Levels of innovation in Irish micro-businesses in Ireland are higher than those in the UK and USA.
 - 40 per cent of micro-businesses introduced a new or improved product or service in the three years prior to the survey.
 - One in four micro-businesses introduced new business models or forms of organisation in the three years prior to the survey.
 - The percentage of sales derived from innovative products and/or services is approximately 11 per cent.
- Uptake of Digital Technology: Trends & Patterns
 - From a relatively low base in 2012, diffusion of digital technologies by microbusinesses in Ireland is strong and growing.
 - Uptake of digital technologies by micro-businesses in Ireland compares well with those in the UK and is considerably higher than those in the USA.
 - The most popular digital technologies among micro-businesses in Ireland are Cloud Computing and Web-based Accounting Software, with 40 per cent of micro-firms using these technologies.
 - 34 per cent of micro-businesses in Ireland are using E-Commerce, while 26 per cent and 17 per cent are using Computer-Aided Design (CAD) and Customer Relationship Management (CRM) respectively.
 - There is little variation in the average number of technologies adopted by microbusinesses across the regions of Ireland.
 - However, approximately one in four micro-businesses have not adopted any digital technology.

RESEARCH AND DEVELOPMENT

[No relevant material sourced for this quarter's release.]

SECTORS AND TECHNOLOGIES

[OK Computer: The Creation and Integration of AI in Europe](#), published by University College Dublin, investigates the creation and integration of Artificial Intelligence (AI) patents in Europe.

- AI is clearly one of the buzzwords in contemporary innovation and the rush to develop and market it is palpable. As governments scramble to implement policies to support “Industry 4.0”, it becomes increasingly necessary to develop an understanding of how, where, and why AI development is taking place.
 - To overcome the lack of Cooperative Patent Classification codes capturing AI, the authors use a text matching algorithm to identify AI patents, finding just over 5,300 of them in Europe from 1980-2013.
 - The report also describe the regions that are most successful in generating AI patents finding that success in computing-related innovation activities likely feeds into success in AI.
 - Finally, the authors position the AI patents into each region’s knowledge space and develop a methodology for describing how embedded AI is in the region’s inventive network. When doing so, they find that the AI superstar regions also tend to be those for which AI is most central in its knowledge space. In addition, this contributes methodologically by developing the first approach to measuring how embedded a particular technology is in a local knowledge space.
- The results show that those regions where AI is most embedded into the innovation landscape are also those where the number of AI patents is largest. This suggests that to increase AI innovation it may be necessary to integrate it with industrial development, a feature central to many recent AI-promoting policies.
- From a policy perspective, the results suggest two things. First, if AI is best developed by linking it to other technological innovations, the findings support the application-driven AI promotion policies currently in use by many governments. Second, it suggests that those policies alone are unlikely to be successful since a large part of AI-development capabilities build from the historic strengths of a region. Thus, even if “smart specialization” targets AI, only some regions may be able to achieve their policy goals.
 - In addition, if AI has the economic returns predicted by its supporters, this suggests that as the technology grows it is likely to add to the unequal distribution of income growth across regions. Since the data indicates that the development of AI entered a new, rapid phase of development starting in 2010, such shifts may well already be underway.

[Tackling Europe’s gap in digital and AI](#), published by McKinsey & Company, gauges how firms anticipate the way AI might unfold in Europe and how AI has been developed into start-ups ecosystems.

- Europe’s digital gap with the world’s leaders is now being compounded by an emerging gap with the world’s leaders in its development and adoption of artificial intelligence (AI) technologies. Without faster and more comprehensive engagement in AI, that gap could widen.
- Digitisation is an important technical and organisational precondition for the spread of AI, yet Europe’s digital gap—at about 35 percent with the United States—has not narrowed in recent years. Early digital companies have been the first to develop strong positions in AI, yet only two European companies are in the worldwide digital top 30, and Europe is home to only 10 percent of the world’s digital unicorns (a technology start-up company that has reached a \$1 billion market value).
- Europe has about 25 percent of AI start-ups, but its early-stage investment in AI lags behind that of the United States and China. Further, with the exception of smart robotics, Europe is not ahead of the United States in AI diffusion, and less than half of European firms have adopted one AI technology, with a majority of those still in the pilot stage.
- If Europe develops and diffuses AI according to its current assets and digital position relative to the world, it could add some €2.7 trillion, or 19 percent, to output by 2030. Such an impact would be roughly double that of other general-purpose technologies adopted by developed countries in the past.

- With the exception of some Scandinavian countries and the United Kingdom, Europe lags behind the United States in readiness for AI. If laggard European countries were to close the current readiness gap with the United States, Europe's GDP growth could accelerate by another 0.5 percentage point a year, or an extra €900 billion, by 2030.
- To scale up and close the gap with the world's AI leaders, Europe will need to focus on five priorities:
 - Continued development of a Europe-wide, vibrant ecosystem of deep tech and AI start-ups.
 - Acceleration of digital transformation and AI innovation among incumbent firms.
 - Progress on the digital single market.
 - Fundamental development of research, education, and practical skills.
 - Bold thinking about how to guide societies through the potential disruption.

Industrial manufacturing trends 2019, published by PWC, highlights a series of external challenges of which technology could be the answer.

- For the industrial manufacturing (IM) sector, a series of external challenges ultimately may be catalysts for action that the industry has avoided for many years. Global trade disputes, tariffs and trade barriers, political instability and even the potential onset of a recession are topping a long list of threats that could have repercussions for companies that make complex engineered products and equipment.
- Protectionist trade policies have a particularly strong effect on this industry, which often does business across national borders. In the US, steel and aluminium tariffs and levies placed on more than US\$200bn worth of Chinese goods—which, in turn, led to retaliatory actions from China—have increased IM materials costs and squeezed margins.
- The depth of these challenges has not been lost on the sector's CEOs. According to the results of PwC's [22nd Annual Global CEO Survey](#), government policy worries were top of mind for IM leaders (40%), with trade conflicts a close second at 39%. The trade tensions between China and the US, in particular, were viewed as a notable threat, with 87% of IM CEOs who were extremely concerned about trade conflicts.
- To mitigate these challenges, businesses should execute a digital plan that covers three primary aspects of the industrial manufacturing landscape: Customer-facing activities; Core operations; and Supporting operations, such as customer service, sales, HR and accounting.
- IM businesses should digitise wherever and whenever possible. Until now, few IM companies have scaled beyond the pilot or exploratory phase of advanced plant digitisation, in part because it requires a level of investment that they are reluctant to make in technologies and digital innovations they don't always fully understand.
- Strengthen the supply chain. Creating a digital twin of the supply chain—a digitised replica of the interactions between a company and its suppliers—would be a valuable way to analyse and monitor supply chain performance. Using this window into the supply chain, real-time assessments can be made about the most cost-effective and reliable sources of supply at any given moment, as well as the most optimal global footprint design.
- IM businesses need to recognise that their customers are increasingly expecting more reliable, transparent and efficient B2B relationships. Digital tools and innovations can enable an improved customer experience, such as through blockchain-based traceability solutions, more deeply integrated and configurable price quote portals or even product-as-a-service (PaaS) offerings in which smart products are monitored and maintained by the producer.

Technology trends 2019, published by PWC, reports on key dilemmas facing tech businesses.

- According to PwC's [22nd Annual Global CEO Survey](#), just 40% of technology leaders said they were 'very confident' in their organisation's revenue growth potential over the next 12 months.
- Confidence was at the lowest level recorded in the past five years. The challenges that tech companies face arguably are greater, and more complex, than any the industry has come up against recently, in part because some of them go to the heart of their relationships with their customers—indeed, to the question of how seriously they take their consumer and business customers' concerns about privacy and data safeguards.

- Concerns about technologies such as artificial intelligence, the Internet of Things and autonomous vehicles are growing, and the companies developing these technologies cannot afford to take the 'beg for forgiveness' approach to ensuring their acceptance. Resistance among consumers and government regulators against several big tech companies that are taking this path only highlights the risks involved.
- What's required is a change in the strategies used to bring new technologies to market. The key element to focus on is trust. Tech companies should take three key factors; transparency, governance and public policy into account as they develop and implement new technologies.
- As the concept of trust gains importance throughout the technology industry, two other issues will also bedevil the tech sector's ability to maintain its high pace of growth and innovation: trade and the war for talent. Trade and geopolitics. Trade talks with China and the spectre of additional tariffs on all kinds of goods are already affecting where tech companies do business, and disrupting their supply chains. Equally crucial to the future of the tech industry is the increasing attention paid to the protection of intellectual property—including company and trade secrets, and technological information of military value.
 - Concerns about firewalls, intellectual property theft and vulnerability, most visibly in China but also in other countries, will shape the deals tech companies make and their relationships with governments around the world. Indeed, more than 80% of technology heads who responded to the CEO Survey as 'extremely concerned' about trade conflicts cited US–China conflicts as their primary trade-related concern. Meanwhile, the EU's new data rules are changing how tech companies do business there, adding considerable friction to their operations and connections with customers, particularly when it comes to maintaining and commercialising data. And regulatory issues remain a concern in just about every market.
- The war for talent: Tech companies are already facing considerable difficulties in finding the talent they need to innovate in areas such as AI, data analytics and (autonomous vehicles) AVs. It is no surprise that 50% of tech company leaders were 'extremely concerned' about finding the talent and skills they needed, and 55% of these CEOs said lack of talent was adversely affecting their company's ability to innovate. And the competition is getting fiercer, as companies outside the tech sector have joined the hunt for workers with the skills needed to enable their own digital transformation.

ENTREPRENEURSHIP

[Are Social Enterprises Different?](#), published by the Enterprise Research Centre, discusses the growth in social entrepreneurship.

- The growth in social entrepreneurship over the past decade is not in dispute and it is evident that this has been a global phenomenon that spans many industrial sectors. Social enterprises offer an alternative model to the for-profit organisations; one which will allow for environment and societal market failures to be addressed while offering a more sustainable and potentially efficient allocation of resources.
- Recent developments in economically-focused literature offer a way forward for additional microeconomic analysis of organisational performance but data on social enterprises tends to be patchy, as it is often self-declared. Moreover, reliance on 'organisational type' classification (such as Community Interest Company) may not provide a solution, given overlaps between different organisational statuses and the complexities of modern organisations.
- What appears to be clear is that a decade on from the global financial crisis, social enterprises seem to be holding firm, experiencing a growth in numbers, diversification of purpose and extending their influence. The extent to which these organisations behave fundamentally differently to purely-for-profit organisations, as defined by traditional economic metrics, has still not been comprehensively established.

BUSINESS GROWTH

[High-Growth Firms: Facts, Fiction, and Policy Options for Emerging Economies](#), published by the World Bank, presents new evidence on the incidence, characteristics, and drivers of high-growth firms.

- The report's insights are based on detailed analysis of high-quality longitudinal data sets in Brazil, Côte d'Ivoire, Ethiopia, Hungary, India, Indonesia, Mexico, South Africa, Thailand, Tunisia, and Turkey.

- HGFs are powerful engines of job and output growth. In the countries studied in the report, HGFs make up about 20 percent or less of firms in manufacturing and services, yet they create as much as 80 percent of all new sales and jobs in these sectors taken together.
- A common view of a typical HGF is a small start-up in a high-tech sector that grows quickly over a sustained period through some favourable quality inherent to the firm. Thus, the policy challenge is framed as determining which firms have the potential for high growth and providing these firms with access to financial and technical resources to realize this potential. However, the new analysis in this book, as well as the economic literature it surveys, shows that this view is a misconception.
 - Although HGFs tend to be younger than the average firm, most will have been in business for at least a couple of years before embarking on a high-growth trajectory. HGFs are not necessarily small either; many already are larger than the average firm at the beginning of a high-growth episode and, depending on the definition, the average HGF is anywhere from 4 percent larger to six times as large as an average firm after three years of high growth.
 - The achievement of high growth in one period does not mean that firms are more likely to grow rapidly in subsequent periods—evidence shows that HGFs mostly turn out to be “one-hit wonders.” As many as 50 percent of firms that experienced a high-growth event in the previous three years are likely to exit the market altogether in the following three to six years, whereas fewer than 15 percent are likely to repeat a high-growth episode.
 - This evidence suggests that a “high-growth episode” is something that select few firms experience at some point in their life cycles. Because all of the benefits of HGFs take place only within these narrow windows, the fragile and elusive nature of high-growth events means that targeting them may be neither feasible nor advisable.
- Policies that seek out potential HGFs based on outward characteristics or target some desired share of HGFs are likely to be misguided. This is because the link between productivity and high growth is often weak since firms may grow for a variety of reasons, with the growth driven by high efficiency but also demand shocks, uncompetitive markets, or political connections.
- The findings in the report call policy makers’ attention to factors such as innovation, agglomeration and network economies, managerial capabilities and worker skills, global linkages, and financial development, which contribute significantly to increasing the probability of a high-growth episode.
- Evidence also shows that it is difficult to consistently identify high-potential firms before or at early stages of a high growth episode: the strike rate of predicting success for any set of methodologies, including scoring by judges, predictive models, and machine learning approaches, is between 2 and 12 percent. And the few characteristics that have some explanatory power in predicting high growth, for example, age, gender, and IQ scores, can lead to investment strategies that select the already better-off beneficiaries and may widen rather than reduce existing inequities.
- The report suggests that improving allocative efficiency, facilitating B2B spill overs, strengthening firm capabilities and offering financial incentives should be of priority to policymakers.

GROWTH FINANCE

[Small Business Finance Markets 2018/19](#), published by the British Business Bank, provides a timely, comprehensive and impartial assessment of finance markets for smaller businesses.

- Flows of finance to SMEs remain strong despite uncertainty about the economic environment: 2018 saw flows of finance to SMEs match or exceed those in 2017, continuing the progress over the last 5 years. Other forms of finance continued to advance, albeit more slowly than in 2017. Notably, equity finance, asset finance and market-based lending have grown by 4%, 3% and 18% respectively.
- There remains a significant number of businesses that expect to grow in 2019, but the economic environment is challenging, with many business surveys showing a decline in confidence during the second half of 2018. In addition, the impact of Brexit on small business finance may be unclear for some time, so it is important that the finance market developments are carefully monitored.
- Many smaller businesses remain reluctant to use finance. There is increasing evidence that SMEs’ continued reluctance to use finance is, in significant part, driven by attitudes towards finance rather than circumstances. Most SMEs are willing to forgo some growth in order to avoid finance,

and even those that already use external finance have often not thought about using more. To encourage more SMEs to use finance, several hurdles need to be overcome.

- Greater understanding of the potential benefits of using finance is required, combined with more awareness of the increasingly diverse range of products and providers that exist in the small business finance market.
 - Encouraging more smaller businesses to seek advice, and to actively consider using a wider range of finance products and providers, will help them access the most appropriate finance for their needs from this more diverse market. High quality, trusted advice will help increase their confidence in assessing the finance offered to them.
 - Smaller businesses tend to be overly pessimistic about their likelihood of success when applying for finance. Fear of rejection discourages some from applying, however unjustified. This fear must be overcome for attitudes towards, and use of, finance to improve.
- Many high growth potential firms need access to appropriate equity finance. Ensuring that those businesses that have growth potential and aspiration can access the finance they need is important for long-term UK productivity and competitiveness. The evidence suggests that smaller businesses with growth aspirations are more likely to achieve those growth plans if they make use of external finance.
 - The UK wide picture on small business finance markets masks examples of notable success in some local areas, but also considerable challenges in many parts of the UK. On the debt side, bank lending volumes broadly match the regional distribution of the small business population. However, local level data demonstrates greater variation in lending. Furthermore, evidence on the extent to which alternative providers and products reach across all parts of the UK is limited.
 - On the equity side, the evidence continues to suggest that high growth firms are spread across the nations and regions of the UK. However, awareness of equity finance is less common outside London and the South East and there is much resistance to using equity in many parts of the UK, even amongst those looking to grow.
 - In addition, the clustering of angel and venture capital finance in a relatively small number of cities, suggests there is more to be done to increase the reach of early stage equity finance, to support business with growth potential in many parts of the UK.

BUSINESS REGULATION

[No relevant material sourced for this quarter's release.]

Succeeding Globally

TRADE

[Asian exports to China are down by up to 15%, but economic stimulus could yet delay a more severe slowdown](#), published by the Centre of Economic and Business Research, analyses China's performance of some of its most important trading partners.

- While the Chinese economy has embarked on a path of transformation, for the time being, it is still an economy that imports large amounts of natural resources and semi-manufactures to fuel its manufacturing hubs scattered around the country. China is a central trading hub in Asia and due to its sheer size, it is the most important trading partner for a large number of countries in the region.
- When data was analysed at the beginning of 2019, the picture was extremely bleak. Exports by Australia, South Korea, Singapore and Japan to China had fallen, in the case of Singapore and Japan by as much as 30% compared to the previous month, leaving them significantly below the levels seen in the same month of 2018. Even Australia, whose raw material exports to China performed relatively well over 2018, saw a monthly decline of 15%. This data coincided with other news coming out of China showing that growth slowed as the country struggled with the twin effects of the trade war with the US and its efforts to deleverage its financial system.
- More recent months have shown that luckily, worst fears have not come to pass. This recent uptick in Chinese economic activity is largely thanks to a number of stimulus measures implemented by the Chinese government, which have made themselves felt over the first quarter of 2019. According to the latest trade statistics, Australian and Japanese exports currently stand

above the January 2018 levels, and the annual deficits for Singaporean and Korean exports are shrinking.

- China's government has used a number of levers to try and avoid a deeper slump for the economy, including a fiscal stimulus of US\$300 bn consisting of infrastructure spending and cuts to income and corporation tax. Moreover, the sharp increase in total social financing at the beginning of the year, which is a broad measure of credit and liquidity in the economy and includes lending activity in the shadow banking sector, also showed that China is still able to control credit flows within the economy.
- While the risk of a Chinese slowdown is still very much a threat to global growth in 2019, the most recent export statistics from its main trading partners as well as the efforts by the Chinese government to prop up the economy are encouraging news. The stimulus, however, also implies that the country will further increase its already precariously high debt levels, abandoning its path of deleveraging.

INWARD INVESTMENT

***The disappointing picture of business investment*, published by the National Institute of Economic and Social Research, reviews the latest data and discusses what has made the United Kingdom a less attractive place to invest.**

- Relative to the past four recessions and recoveries, this expansion phase has been prolonged. It is only in the past 2½ years that the level of investment has clearly disappointed relative to previous expansions, corresponding to about the same date as the EU Referendum.
 - The level of business investment in the last quarter of 2018 was about 13% less than an extrapolation of the 2010–16 trend would have predicted. The UK picture also compares unfavourably to other advanced economies as the UK is the only G7 country where business investment is estimated to be declining.
- The slowdown in business investment since 2016 has been apparent in both manufacturing and non-manufacturing sectors. Manufacturing investment has been growing strongly ahead of the referendum before contracting in 2016, recovering slightly in 2017, and contracting again in 2018. There was a brief rebound in business investment in 2017, but this rebound proved short-lived, in both manufacturing and non-manufacturing sectors. Brexit affects business investment in two ways:
 - The uncertainty related to the future trading arrangement between the UK and the EU-27 causes business leaders to delay or forego investments until they feel more confident about how the new arrangement will affect the profitability of their investments.
 - Even when businesses know for sure what the new trading arrangements will be once the UK is out of the EU, they may still wish to reduce their investment because the additional trade frictions could warrant a lower equilibrium level of investment. The Bank of England Decision Maker Panel Survey confirms that more businesses expect to reduce their investment than to increase it directly as a result of Brexit.
- In a survey between November 2017 and January 2018, about 30% of business leaders expected changes in customs and tariffs and in the freedom of movement of people to lead to lower investment, and only 10% expect Brexit to lead to higher investment. NIESR estimates that in the case of a no-deal exit from the EU, business investment would be reduced by 3.5% in the long run compared to continued membership in the EU because of reduced international competition and lower foreign direct investment.
- The loss in attractiveness of the UK economy as an environment for investment has been reflected in lower than expected foreign direct investment (FDI). Since the EU referendum, UK inflows of FDI have been reduced by between 16 and 20 per cent. Conversely, the number of new investments made by UK firms in EU countries since the EU referendum was 12% higher than it would otherwise have been expected to be.
- These two effects suggest that there may have been some diversion of investment from the UK to other European countries as a result of the loss of attractiveness of the UK as a base for international business. However, the UK is still one of the largest recipients of FDI in the World, and FDI flows are very volatile from one year to the next.
- While the Brexit vote is widely cited as a primary factor behind relatively low investment, other long-term factors like the labour market and productivity may also help explain the disappointing investment figures.

- An expanding labour market (unemployment at record low and employment at record high) along with unit labour costs growing very moderately has meant that businesses have invested relatively more in labour than in fixed capital. But this argument does not explain the relative weakness of UK business investment compared to other advanced economies that are broadly in the same business cycle position and with similar employment situations.
- Another argument is that weak investment growth may be related to the productivity puzzle. UK productivity growth in the past ten years has lagged behind all other advanced economies except Italy. If businesses doubt that additional investment can lift their productivity, then it could explain why they have limited their investments. The combination of Brexit uncertainty and lagging productivity performance appears to have made investing in the UK less appealing. The more worrying feature would be that, if the low business investment trend were to continue, it could impair future economic growth prospects.

FDI and local productivity, published by the Enterprise Research Centre, investigates the relationship between foreign direct investment and local productivity.

- The academic literature on the productivity effects of inward investment has been hampered by imperfect models and imperfect data.
 - The literature does suggest that the impact of inward investment on host country productivity is positive, but that the reasons for this are as much concerned with re-allocation of resources to more productive activities, and the competition that inward investment engenders, as they are with “pure spill over” effects.
- Taken together, the academic studies illustrate that the mechanisms by which inward investment can generate productivity growth in the host location are by no means straightforward. Perhaps the three most important factors are:
 - The motivation for firms to undertake FDI. Characterising for simplicity firms who are motivated to bring activity to a location in order to sell there, are internationalising through technological and other forms of firm specific advantage, and they bring some of that with them.
 - Connectivity between inward investors and local firms. Whether this is through buyer-supplier relationships or other less formal mechanisms, inward investment can generate significant learning effects in the host country. A key role for local policy is to foster these, particularly in terms of addressing blockages such as skill shortages, or access to capital in the local SME sector that may hinder their ability to for example become suppliers.
 - Absorptive capacity. The better able host country firms are to assimilate new technology, the better able they are to assimilate spill overs.
- Investment promotion agencies should pay more attention to the first, why their region may be attractive to inward investors, and what sort of investment they may attract.
- They should then consider how they can help the inward investment become more embedded in the local economy. Here, there is often a trade-off between for example employment and productivity – inward investors that generate large numbers of jobs may be in lower value added activity, compared with investments in for example biotech that create fewer jobs. Local policy then needs to emphasise linkages and connectivity, encouraging local sourcing, and focussing for example on local labour or capital markets that may hinder this.
- Finally, working with universities and other R&D facilities locally to encourage collaboration between higher education, inward investors and local companies on innovation should also take place.

TOURISM

Visitor Attitude Survey 2018, published by Tourism NI, publishes statistics and analysis relating to inbound visitors to Northern Ireland.

- The Northern Ireland (NI) leisure market is principally comprised of Out Of State (OOS) visitors, most of whom are on their first ever visit to NI. Visiting attractions, taking in the scenery and landscapes and uncovering the history/culture are key reasons for visiting NI. The friendliness of the people at each stage of the visitor journey enhanced the overall visitor experience.

- The majority of leisure visitors (39%) travelled as a family group, whilst one third of visitors travelled as a couple. 12% of visitors travelled as a group of adults, 6% travelled alone and 5% were on a tour.
- Northern Ireland attracts a largely mature visitor, with less than 1 in 5 visitors aged under 35. 59% of Out Of State visitors were visiting NI for the first time.
- The main reason for visiting Northern Ireland was “to visit a specific attraction” (30%). The second most important motivator was the scenery and landscapes of NI. Not surprisingly, this varies greatly by area, with scenery being less important to those visiting urban areas, but more important to those visiting rural/coastal areas. Exploring the history & culture of NI was the third most important motivation.
- Almost two thirds of visitors had an experience that was beyond their expectations. 9 in 10 OOS visitors would be likely to recommend NI to others, with an NPS (Net Promoter Score) of 67 for NI as a whole. Enhancing the Sunday tourism offer across NI and the evening tourism offer outside the two main urban areas requires attention. Further development around some key aspects of transport and digital connectivity would also enhance the visitor experience.

Inbound visitor statistics for March 2019, published by VisitBritain, reports the volume and value of visits to the UK by overseas residents.

- The UK received 2.9 million overseas visits in March 2019, down 2% year-on-year. There were 7.8 million inbound visits to the UK between January and March 2019, just 1% below the inbound visits in the same period in 2018 (although that was itself down on 2017’s record). Overseas visits to the UK in the twelve months to March 2019 were 3% behind April 2017 – March 2018 with 37.8 million visits.
- In March 2019 inbound visitors spent £1.65 billion, 8% behind the record breaking March in 2018. With inbound spending down year-on-year in the first three months of 2019, visitors spent 5% less in January-March 2019 than the record set in Q1 2018. Overall, overseas visitors to the UK spent £22.7 billion in the twelve months to March 2019, down 8% compared to the previous twelve-month period.
- Holiday visits decreased for the first time in 2019, with March 2019 inbound visits down 1% on March 2018, to 1.1 million. With more positive results in January and February 2019, overseas holiday visits to the UK in the first three months of 2019 were up 7% on January-March 2018, hitting 2.7 million visits. Overall, there were 15.3 million holiday visits in the last twelve months to March 2019, up 2% on the previous twelve-month period.
- Visits to friends and relatives (VFR) were down 5% year-on-year to 860,000 visits in March 2019. With sluggish results reported in 8 out of the last 12 months to March 2019, VFR visits to the UK in the last twelve months were 3% below the previous rolling twelve months in 2017-2018 with 11.6 million visits.
- Business visits reached a new record for March, with 840,000 in March 2019 from inbound markets, up 2% year-on-year. However, with fewer inbound business visits in 9 out of the last 12 months, numbers in the latest rolling 12 months were 5% down on those seen between April 2017 and March 2018.
- In March 2019 there were 2.1 million visits to the UK from all EU markets, down 3% on the record-holding March 2018. With 5.4 million visits, visits in January-March 2019 were just behind 2018 (-1%). However, there were sluggish results in 8 of the last 12 months to March 2019, so the rolling twelve months to date were 2% behind the previous twelve-month period.
- There were 320,000 visits from North America in March 2019, 9% more than in March 2018. Visits in January-March 2019 were up 5% on Q1 2018 and the highest seen since 2006. However, with five out of the twelve months to March 2019 down year-on-year, visits in this period were just on par with April 2017 – March 2018 visits.
- Rest of World markets saw a 15% decline in visits in March 2019 vs March 2018. At a rolling twelve-month view, 6.0 million visits were received from ‘Rest of World’ markets, a 5% drop on April 2017 – March 2018.

ENERGY

[Alternative heat solutions: converting a town to low carbon heating](#), published by the Department for Business, Energy and Industrial Strategy, analyses the costs and barriers associated with converting a UK town to low carbon heating.

- The purpose of the study is to compare four different alternative low carbon heating solutions for a typical small to medium sized town in the UK. The town selected for assessment is Cowdenbeath in Scotland from a shortlist of eight towns in Great Britain. The selection was based on a set of assessment criteria to determine which option was closest to the UK average.
- A key challenge for the decarbonisation of heat arises in the UK's many small and medium sized towns where (collectively) a large proportion of the UK population lives. The path to decarbonising the heat supply is arguably more challenging here than in larger, urban areas with higher heat density and associated economies of scale - e.g. for district energy schemes.
- The main scenarios (high temperature) are compared to an alternative scenario in which low temperature heat distribution in buildings and higher levels of thermal insulation are assumed. The comparison of the main scenarios with the low temperature scenarios indicates that the investment in fabric energy efficiency and low temperature systems results in lower lifecycle costs for all technology options.
- Increased efficiency of heat distribution systems in individual buildings requires a higher CAPEX but offers whole life carbon and cost benefit across the energy system with the potential to offer a reduced cost of energy supply to consumers.
- Technical risks identified include the lack of appropriate skills throughout the supply chain, and the required capacity to deliver a transition of this scale; as well as the compatibility of some technology options with the current UK building stock. The key risks associated with policy and regulation are stability of public policy and the timescales associated with delivering such a significant infrastructure programme, which is true of all options considered.
- The cost of utilising hydrogen from the nearby Moss Moran Ethylene plant was estimated for the purposes of a theoretical demonstration project. The lifecycle cost was estimated to be £42.9/MWh for the project. This assumes that hydrogen can be taken directly from the Ethylene plant without further investment in infrastructure.

[Funding a low-carbon energy system](#), published by the Economic and Social Research Council, explores public attitudes to paying for a transition to low-carbon energy.

- There is widespread public support for transition to a low-carbon, reliable and affordable energy system. The British public sees energy companies and government as primarily responsible for paying for energy transitions, because they are perceived to have the money and power to drive major change.
- Although the public feel they are paying over the odds already, people are willing to accept some personal cost on their bills (9- 13%) to fund the sustainable energy transition – but this depends on reciprocal commitment and transparency from energy companies and government.
- There is considerable public distrust in companies (seen as driven primarily by profit motives, interfering with commitments to energy transition goals) and government (seen as too closely connected to the energy industry, leading to inadequate and ineffective regulation).
- People's perceptions of public responsibility for energy transition costs are linked to concerns particularly about procedural justice (such as having a voice and being treated with respect in the process) and distributive justice (sharing costs fairly between the public and companies, and lower energy prices for low-income households). Personal financial circumstances are less likely to influence their perception of public responsibility.
- The publication also has policy recommendations:
 - To harness public support, government and the energy industry needs to demonstrate strong and clear commitment to low-carbon energy system change.
 - Greater transparency and accountability is needed – clearer information on energy costs (for example tariffs and energy bills), but also greater transparency of wider decision-making and practices to finance energy transitions.

- Greater clarity and justification for how public contributions are spent by government and energy companies (especially concerning profits).
- Innovative thinking on how to distribute current and future costs in a fair manner across society; for example, distributing costs according to the greatest ability to pay.

Cutting the climate impact of land use, published by the Green Alliance, analyses how the UK can develop a new system to support land management.

- The need for ambitious measures to reduce the UK's greenhouse gas emissions has never been more urgent. The Intergovernmental Panel on Climate Change has warned that we only have 12 years to design the right policies and take meaningful action to contain global warming to 1.5 degrees. To achieve the scale of change needed, action must be taken now to reduce emissions and lay the foundations for the longer term transformation required.
 - Rapid decarbonisation requires all sectors to act urgently and land use will play an essential role in supporting the UK's efforts. Leaving the European Union is an opportunity to introduce the policies, regulations and incentives to catalyse ambitious and sustainable land use change. It is a chance to enable farmers and land managers to cut their emissions, whilst supporting thriving businesses and delivering a range of other environmental benefits.
 - The UK is well placed to lead on this action, with its research and innovation capabilities and its global leadership of climate policy. By developing new solutions and a robust policy framework, the UK could support international efforts to limit temperature rise to 1.5°C.
- To bring about a rapid transition to low carbon land use, the government should:
 - Drive forward low carbon best practice by farmers and land managers: Land use policies lack coherence and urgency to provide farmers with consistent objectives to motivate low carbon investment and rapidly reduce emissions. To address this, decarbonisation should become a central objective of transitional support and the new Environmental Land Management (ELM) scheme, to direct immediate investment into low carbon farming.
 - Shape demand for low carbon food and biomass production: While regulation and incentives can directly encourage low carbon practices on farmland, there has to be a strong business case for changes at the scale needed for rapid decarbonisation. The government needs develop a cross departmental strategy for dietary change, to promote the consumption of less and better meat, and an increase in plant-based foods; and ensure the supply chain drives uptake of low carbon, sustainable food production in the field.
 - Invest in key enablers to guide action: A strategic and integrated approach to land use will require investment in a set of tools, including spatial mapping of the climate change mitigation potential of land, harmonised metrics for food production and a robust emissions accounting system. The government should take action immediately to put them in place and use them to guide policy development and delivery of low carbon solutions.

Acting on net zero now, published by the Green Alliance, suggests policies to reduce the UK's carbon emissions rate.

- The UK is on course to miss its 4th and 5th carbon budgets, set for the period 2023 to 2032. And, if the government introduces a target for net zero emissions by 2050, an even greater change in policy will be needed. Suggested policies in the report include:
 - Bring the 2040 ban on petrol and diesel vehicles forward to 2030. Transport has overtaken the power sector as the biggest emitter of carbon in the UK. At the same time, towns and cities are being blighted by dirty air. Bringing forward the ban on new petrol and diesel cars and vans to 2030 would reduce nitrogen and PM10 particulate pollution by 68 per cent in 2030, compared to 2016.
 - Introduce new incentives for better product design and reuse. Despite material costs in the UK rising nine times faster than labour costs over the past 15 years, little has been done to use resources more efficiently. The UK is suffering from a lack of productivity and an imbalanced economy. Manufacturing regions would benefit from the new jobs that a more circular economy would create. Developing this requires a transformative approach and a clearer policy steer from central government. Improvements in resource efficiency could be worth £10 billion in additional profits to manufacturers every year. This would particularly benefit those areas with below average productivity.

- Fund an ambitious new home energy efficiency programme. UK homes are some of the least efficient in Europe. Rising energy bills and fuel poverty are a major concern and it is estimated that nearly 10,000 people a year in the UK suffer premature death due to cold homes. In its Clean Growth Strategy, the UK has set a target to improve the energy efficiency of all existing homes to at least EPC band C by 2035 but it has no clear pathway to achieve it. This needs at least an additional £1 billion of public investment per year.
- Plant many more trees, restore more peatlands and wetlands, and manage soils better. UK greenhouse gas emissions from farming and land use have flat lined since 2008. Without concerted action, the sector could be one of the largest sources of emissions by 2050. The National Farmers' Union's commitment to net zero carbon by 2040 is recognition of the need to act. A transformative nationwide programme to plant more trees, restore habitats and manage soils will not only cut carbon emissions but go a long way to solving other problems like nature decline, poor air and water quality, and flood risk.
- Open up new routes to market for onshore wind and solar power. The UK has established itself as a global leader in offshore wind, which will be the dominant source of UK low carbon power in future. However, solar power and onshore wind farms are now the cheapest ways to generate electricity and are continuing to fall in price. But they currently only generate 40.1TWh a year between them. Allowed to grow, onshore wind and solar have the potential to generate an additional 62TWh of clean power a year, which would amount to 20 per cent of the UK's current power generation.

[Who Pays for Renewables? Increasing Renewable Subsidisation due to Increased Datacentre Demand in Ireland](#), published by the Economic and Social Research Institute, calculates the expected impact on consumers.

- Demand from datacentres makes up a rapidly growing portion of electricity demand in Ireland. Increased demand, in turn, gives rise to increased renewable generation, mandated by government targets, and a corresponding increase in subsidisation levels. The current method of apportioning renewable subsidy costs may lead to consumers other than datacentres bearing this excess cost of subsidisation. The study calculates the expected impact on these consumers.
- The article calculated the increased renewable subsidy costs that increased loads from datacentres may impose on consumers in Ireland. The extra cost arises from EU mandated government targets for renewable generation, which are calculated as a portion of total demand. Assuming the current method of apportioning Public Service Obligation (PSO) costs is applied as these new loads come on stream, residential and small commercial consumers will face increased PSO payments. The level of these costs increases considerably if the extra renewable requirement is met with solar generation.
 - Focusing on residential consumers, the increase in annual PSO costs they bear is 3% and 7% for the median and high demand scenarios, relative to the low demand scenario, when the increased renewable generation is provided by onshore wind generation. If the extra generation is provided by solar, the annual increase in the PSO costs is much higher, at 20% for the median demand scenario and 41% for the high demand scenario. Given that the analysis assumes the residential consumer does not change their demand at all, any increase in PSO costs for these consumers, however small, could be seen as an unfair imposition.
- Datacentre owners may prove unwilling to inflict higher costs on consumers, through PSO payments or otherwise. Therefore datacentre owners and/or energy regulators may wish to explore an alternative method of calculating and apportioning PSO costs to new loads of this type. The findings suggest that such an approach is prudent and may inform discussions on an alternative mechanism.

TELECOMS

[5G: A transformative technology](#), published by Barclays, examines how 5G could supercharge businesses and the UK economy.

- Despite the launch of 5G in the UK during June 2018, few companies were ready for the introduction of the technology. Barclays suggest that the benefits of 5G are clear and that businesses prepared to invest in the technology will gain an advantage.
- 5G will transform existing technologies and create a wealth of business advantages, but Barclays state that it will require UK telecoms providers, businesses and government to adapt and adopt the technology.

- 5G means high speeds, new technologies and more devices. Greater speed and ultra low latency will allow for rapid download times for things such as HD/UHD 4K movies. A 5G network will, at the very minimum, support one million devices for every square kilometre. This function will revolutionise the growing Internet of Things (IoT) – which can range from AI Home Speaker, Lights, Coffee Machine and Cars.
- 5G will accelerate the transition towards 'Industry 4.0' in the manufacturing sector. Logistics and distribution will change in line with the proliferation of connected devices. The IT, media, professional services, business services, healthcare, retail and entertainment industries are all expected to see changes too.
- The author says that revenues will increase and the UK economy will benefit. The UK will remain competitive on the world stage and workforce productivity and employment (both direct and indirect) will rise.
- All of these monetary benefits, innovation and intangible economic boost will only come if business, government and mobile infrastructure providers are ready for the change. Barclays' survey of over 500 medium-sized and larger UK businesses found that awareness of 5G was reasonably high, but only 9% of businesses were planning to allocate significant levels of resources to take advantage of the imminent roll-out of a national 5G network.

AIR ACCESS

[No relevant material sourced for this quarter's release.]

Government

NORTHERN IRELAND

[No relevant material sourced for this quarter's release.]

ENGLAND

[No relevant material sourced for this quarter's release.]

SCOTLAND

[No relevant material sourced for this quarter's release.]

WALES

[Skills and Employment Survey: Work in Wales, 2006 to 2017](#), published by the Welsh Government in 2019, provides specific analysis of the results of the 2006, 2012 and 2017 surveys.

- Jobs in Wales are in some respects better than jobs elsewhere, including relationships with managers, involvement in organisational decision-making and high levels of task discretion.
 - Jobs in Wales in 2017 are more skills demanding than jobs elsewhere in Britain based on a number of key measures from the surveys. They require on average more learning time to get to grips with the tasks the job involves and more training time is needed for the type of work undertaken. The level of generic skills regarded as being essential for the performance of jobs in Wales is also higher than in other parts of Britain. However, jobs in Wales are less skills demanding in terms of the level of qualifications needed on entry and the over-qualification rate in Wales has changed little over the last decade or so, hovering at around 40 per cent.
 - This is reflected in a fall in the 'real' over-qualification rate in Wales, which factors in use of skills, from 16 per cent in 2006 to 10 per cent in 2017.
- However, the relative weakness of the Welsh economy remains apparent, with perceptions regarding the cost of job loss being higher in Wales than elsewhere.
- Workers in Wales also now appear to exhibit the highest levels of stress in Britain in 2017, a clear shift compared to earlier years. Levels of enthusiasm and contentment among workers in Wales have similarly declined.

- Working long hours and at high levels of intensity can be associated with significant costs to those involved, such as an increase in the risk of workplace accidents or an increased incidence of work related ill-health. The Skills and Employment Surveys suggest that workers in Wales have not benefited from the decline in long hours working that has occurred in other parts of Britain over the last five years.
 - Since 2012 Wales has shifted position from being a relatively low stress economy to a situation in 2017 where workers in Wales exhibit the highest levels of worry (24 per cent), being unable to unwind (26 per cent) and feeling used up at the end of the day (32 per cent).
- However, the report findings with respect to organisational fairness, the helpfulness of managers and involvement in organisational decision making each resonate with previous evidence that suggests that the climate of employment relations is better in Wales.
 - One of the main messages of the 2017 results is that relatively poor productivity performance in Wales cannot be put down to a lack of engagement by managers in getting the ideas of workers. On the contrary, workers in Wales are more likely to think that they have had a more meaningful impact on productivity than workers across Britain as a whole. That said, employees in Wales report being more poorly equipped in terms of both the tools they have to work with and the organisation of the work process.

REPUBLIC OF IRELAND (ROI)

***Estimating Ireland's output gap: an analysis using selected statistical filters*, published by the Department of Finance (RoI), presents the statistical filter models used by the Department to estimate the cyclical position (i.e. output gap) of the Irish economy.**

- Estimates of the output gap serve as an important input into the fiscal policymaking process and the macroeconomic management of the economy. They enable the Department to better evaluate the appropriate fiscal stance and the sustainability of public finances over the medium term.
- There is no standard approach to estimating potential output or the output gap. From a statistical modelling perspective, many valid alternative technical assumptions can be made on how best to identify the level of potential output. However, alternative modelling procedures can produce quite different estimates. In that respect, it is prudent to develop a range of approaches.
- The GDP based output gap measure suggests a modest negative output gap in 2018, consistent with limited inflationary pressures in the economy and remaining slack in the labour market. However, the estimated output gap turns slightly positive next year and this widens thereafter, pointing to signs of overheating in the medium term.

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