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Economic Research Digest

Quarter 4 2019

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:

- Examination of the UK's productivity performance.
- Assessments of life-satisfaction and well-being in Northern Ireland.
- The Legatum Prosperity Index, which evaluates and ranks long-term changes in global prosperity.
- The benefits of digitisation across a range of sectors.
- The impact of poor broadband and mobile connection for small businesses and the benefits an improved broadband network can offer society.

** 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.*

Contents

The Economic Research Digest is issued by:
Analytical Services, Department for the Economy ✉ analyticalservices@economy-ni.gov.uk

Economic Outcomes

COMPETITIVENESS

***Doing Business 2020*, published by The World Bank, compares the ease of setting up a business across 190 economies by investigating the regulations that enhance business activity and those that constrain it.**

Following on from 2017, remaining in first place as the economy where the ease of doing business is the greatest is New Zealand. However, Singapore have marginally reduced this gap over the period.

The United Kingdom, positioned in the top ten, at 8th, has performed better in comparison to last year's rankings (9th). In regards to European economies, the UK has been ranked 2nd, with Denmark placed at the top.

The study shows that developing economies are catching up with developed economies in ease of doing business.

Still, the gap remains wide. An entrepreneur in a low-income economy typically spends around 50% of the country's per-capita income to launch a company, compared with just 4.2% for an entrepreneur in a high-income economy. It takes nearly six times as long on average to start a business in the economies ranked in the bottom 50 as in the top 20.

Worldwide, 115 economies made it easier to do business. Whereas, 26 economies became less business-friendly, introducing 31 regulatory changes that stifle efficiency and quality of regulation.

***National Competitiveness Council Bulletin 2019 (Ireland)*, published by the National Competitiveness Council, is a summary of an annual assessment of the factors driving productivity and prosperity in selected countries developed by the World Economic Forum.**

- Ireland is ranked 24th out of 141 countries in the Global Competitiveness Index 2019 Rankings, a fall of 1 place from 2018.
- It is the 9th most competitive economy in the euro area and 12th most competitive in the EU28 and performs well in relation to labour market (6th), business dynamism (10th), and institutions (16th).
- Ireland is ranked in the top 15 in relation to cost of starting a business (3rd), insolvency recovery rate (11th), attitudes towards entrepreneurial risk (11th), workers' rights (11th), and growth of innovative companies (13th). Furthermore, Ireland scores 99.99 out of 100 for macroeconomic stability.
- Areas requiring improved performance are highlighted in relation to infrastructure (40th), financial system (42nd), and ICT adoption (49th).

***Ireland's Competitiveness Challenge 2019*, published by the National Competitiveness Council, uses information from a Competitiveness Scorecard along with the latest research to outline the main challenges facing Ireland's competitiveness.**

- As a small, highly open economy, Ireland is particularly exposed to external factors. The global economy may be entering a new phase of slower growth, exacerbated by heightened trade tensions and wider geopolitical developments. The challenging international environment continues to provide many hurdles for the Irish economy to overcome.
- This report recognises the importance of progressing the digital economy, developing economic infrastructure, enhancing SME productivity and skills, and reducing the costs of doing business.
- Specific focus has been given to three issues in relation to productivity, namely, digital engagement, infrastructural investment and skills and training. Whilst note is also made of the impact of costs on business, especially on SMEs, namely, the cost of credit, legal costs and insurance costs.
- The most immediate concern from an Irish perspective is the United Kingdom's planned exit from the European Union. Regardless of the form of Brexit that eventually takes place, the departure of one of Ireland's nearest trading partners will constitute a shock to the Irish economy, especially for small and medium-sized enterprises, the agri-food sector and border communities.

- There are also vulnerabilities that risk eroding Ireland's competitive advantage. As the economy approaches full employment, infrastructure bottlenecks and capacity constraints have led to rising costs for households and businesses. Ireland currently performs well internationally in terms of productivity and competitiveness, but as seen in the past this comparative advantage can be quickly whittled away.
- It is pertinent that Ireland reacts and adapts now in order to stand ready to respond to emerging challenges such as the rise of automation and artificial intelligence and the need to move to a low carbon economy.

PRODUCTIVITY AND GROWTH

***Productivity Statement 2019*, published by the National Competitiveness Council, tracks the productivity drivers and performance of the Irish economy.**

- Productivity growth is a key component of national competitiveness as it enables firms to compete successfully in domestic and international markets by facilitating output to be produced in a more efficient and effective manner.
- Aggregate labour productivity figures for Ireland continue to show a strong performance relative to other advanced economies.
- Much of the strong performance can be attributed to the operations of large firms in specific sectors (e.g. ICT, Pharma-Chemicals, and Food & Beverages) which continue to show productivity levels well above the Euro Area average.
- However, the productivity performance of the Domestic and Other sector is likely to be influenced by a number of traditionally domestic industries (e.g. Machinery & Equipment) which over time have shown an increasing share of foreign value added or turnover.
- While there is clear evidence about the direct contribution made by a highly productive and concentrated group of multinational corporations to the Irish economy, there is less clarity about the productivity performance of an increasingly diverse domestic sector, where both high performing and low-performing sectors and SMEs seem to co-exist.

***The UK economy: Policies for Investment and Productivity Growth*, published by The London School of Economics and Political Science, identifies possible roots of the UK's recent poor productivity performance whilst further discussing proceeding implications.**

- The UK has suffered a 'lost decade' of near zero productivity growth. If productivity had grown on its pre-2010 trend (from the previous 30 years), it would be 17% higher today – around £5,000 per person.
- Woeful productivity is reflected in pitiful wage growth. Average earnings (after inflation) are about the same level as they were just before the financial crisis – the longest pay stagnation for centuries.
- The positive side of low wages is that there are plenty of jobs: the proportion of prime age adults with jobs is 76%. Higher than historical peaks of 73% after previous recoveries from recessions. But underlying the strong aggregate performance, there has been a considerable compositional change, with a significant rise in the share of poor quality jobs.
- One of the reasons for the UK's longstanding weak productivity is low investment in long-term assets in infrastructure, innovation and skills. Current investment is depressed by uncertainty over the form of Brexit, which will not be resolved until a comprehensive deal with the EU is reached, which will take many years.

***World Economic Outlook: Global Manufacturing Downturn, Rising Trade Barriers*, published by the International Monetary Fund, forecasts potential global economic prosperity, highlighting the factors and regions that are contributing favourably and adversely.**

- After slowing sharply in the last three quarters of 2018, the pace of global economic activity remains weak. Momentum in manufacturing activity, in particular, has weakened substantially, to levels not seen since the global financial crisis. Rising trade and geopolitical tensions have increased uncertainty about the future of the global trading system and international cooperation more generally, taking a toll on business confidence, investment decisions, and global trade.
- A notable shift toward increased monetary policy accommodation, through both action and communication has cushioned the impact of these tensions on financial market sentiment and

activity, while a generally resilient service sector has supported employment growth. That said, the outlook remains precarious.

- Global growth is forecast at 3.0% for 2019, its lowest level since 2008–09 and a 0.3 percentage point downgrade from the April 2019 World Economic Outlook. Growth is projected to pick up to 3.4% in 2020, reflecting primarily a projected improvement in economic performance in a number of emerging markets in Latin America, the Middle East, and emerging and developing Europe that are under macroeconomic strain.
- With uncertainty about prospects for several of these countries, a projected slowdown in China and the United States, and prominent downside risks, a much more subdued pace of global activity could well materialize.
- To forestall such an outcome, policies should decisively aim at defusing trade tensions, reinvigorating multilateral cooperation, and providing timely support to economic activity where needed. Making growth more inclusive, which is essential for securing better economic prospects for all, should remain an overarching goal.

***Understanding value added per employee in six UK sectors; the insiders' view*, published by the Enterprise Research Centre, draws on the experience and knowledge of 'industry insiders' in six sectors to better understand the UK's productivity puzzle.**

- Across each of the sectors productivity - or more accurately - efficiency was influenced by a mix of internal and external influences.
- In Oil and Gas, the oil price plays a dominant role in shaping both returns and value added per employee. Other factors included technology (innovation), management/leadership skills, regulation, geography and geology.
- In Beverages, the highly competitive nature of the sector has tailored a long-term focus on operational efficiency. The added complexity of premiumisation (the attempt to make a brand or product appeal to consumers by emphasising its superior quality and exclusivity) makes further efficiency gains difficult. Regulation and regulatory changes (e.g. sugar tax, reduction of plastic packaging, deposit return) are seen as raising costs and potentially impacting on margins and productivity as are changes to employment legislation (e.g. pension contributions).
- In Pharmaceuticals, notions of efficiency are seen as relevant only to the manufacturing and logistics element of the supply chain with little concern for value added.
- In Transport Equipment, ideas around productivity differ between sub-sectors although in none of the discussions was this understood in terms of value added per employee. Market structures and volatility, contract length and supply chain relationships limit efficiency gains.
- In Banking, insider interviews suggested little concern with value added. Competition and the innovation that accompanies it was seen as one of the most important drivers of operational efficiency. Competition is driving automation and digital adoption. Maintaining customer experience and satisfaction is also seen as important driving both cultural and technological change.
- In Insurance, competition from incumbents and new entrants was emphasised as a major spur to operational improvements in the sector. However, complacency and conservatism in the sector and firms' leadership were emphasised by respondents as a barrier to innovation and productivity improvement.

LIVING STANDARDS, WELLBEING AND PROSPERITY

***The Legatum Prosperity Index*, published by the Legatum Institute, evaluates long-term changes in global prosperity, pinpointing drivers of progress and highlighting those nations that have made the greatest strides forward.**

- World prosperity has grown globally during 2019 and is at its highest ever point in the history of the Index, with 148 countries improving since 2009. However, 19 countries have not improved, and their deterioration has resulted in the gap between the strongest and weakest performing countries widening since 2014.
- Small Advanced Economies (SAE) make up the majority of the 10 most prosperous countries: Denmark (1st), Norway (2nd), Switzerland (3rd), Sweden (4th), Finland (5th), Netherlands (6th), New Zealand (7th), Luxembourg (9th) and Iceland (10th). Germany, the only non-SAE completes the top 10, placed in 8th.

- The UK and Ireland both ranked strongly, standing at 11th and 12th respectively. However, this represents a fall for both economies, as the UK previously ranked 7th, and Ireland 10th.
- Continuing from the 2018 Index ranking, North America remains the most prosperous region, although, as a result of its prosperity stagnating, the gap with Western Europe has narrowed. Furthermore, this convergence has been catalysed by a significant improvement in Western Europe's prosperity score improvements. Placing either first or second in all pillars, North America and Western Europe have retained their dominance over the rest of the world in Prosperity scores.

***Personal Wellbeing in Northern Ireland*, published by the Northern Ireland Statistics and Research Agency, monitors how satisfied people in Northern Ireland are with their lives, their levels of happiness and anxiety.**

- The average wellbeing ratings across four measures of personal wellbeing in 2018/19 (year to end March 2019) were:
  - 7.89 out of 10 for life satisfaction;
  - 8.07 out of 10 for feeling that what you do in life is worthwhile;
  - 7.69 out of 10 for happiness yesterday;
  - 2.83 out of 10 for anxiety yesterday.
- All four measures of personal wellbeing have improved since 2011/12, however life satisfaction, worthwhile and happiness have not changed since 2017/18.
- Anxiety scores have shown consistent improvement each year. However, in the last year (between 2017/18 and 2018/19) the mean anxiety score increased significantly from 2.53 to 2.83.
- As has been the case in previous years, people in Northern Ireland gave better average ratings for life satisfaction, feelings that things done in life are worthwhile and produce greater happiness than people in England, Scotland or Wales. The increase in average anxiety score seen in 2018/19 brings Northern Ireland closer into line with the rest of the UK.
- The average score for happiness within Northern Ireland was higher and anxiety was lower among those aged 65+, which is indicative of better wellbeing in both measures. The average personal wellbeing score for feelings that things that people do in life are worthwhile was higher among females. However, females reported a higher anxiety score on average than males, which is indicative of poorer wellbeing in this measure.

***Living longer: is age 70 the new age 65?*, published by the Office for National Statistics (ONS), suggests measuring ageing in terms of remaining life expectancy, instead of years lived as it may provide a better indicator of the health of our ageing population.**

- In the UK, 65 years of age has traditionally been taken as the marker for the start of older age, most likely because it was the official retirement age for men and the age at which they could draw their State Pension.
- In terms of working patterns, age 65 years as the start of older age is out of date. There is no longer an official retirement age, State Pension age is rising, and increasing numbers of people work past the age of 65 years. People are also living longer, healthier lives.
- In 2018, a man aged 65 could expect to live for another 18.6 years. So, on average, at age 65 years, a woman could expect to live for 21 more years, meaning women still have a quarter of their lives left to live and men just over one fifth.
- The balance of older and younger people in the population has also tipped more towards older people, reflected in a rising median age up from 34 years in 1950 to 40 years in 2018. By the middle of this century it is projected that median age will reach 43 years.
- From an economic and societal point of view, longer lives mean people can continue to contribute for longer – through longer working lives, volunteering, and possibly providing care for family members, for example, grandchildren.
- It has been suggested that instead of taking a fixed chronological age as the start of older age, a better alternative would be to set the threshold at a fixed remaining life expectancy (RLE) of 15 years.

- The age at which a person has an RLE of 15 years changes over time in line with changes in life expectancy and will also be different for men and women because of differences in their life expectancies.
- In 2017, in Great Britain a man with RLE of 15 years was aged 70 and a woman was aged 72. In terms of RLE this is equivalent to a man aged 57 and a woman aged 60 in 1911. It is projected that by 2066, the equivalent ages will be 75 years for a woman and 77 years for a man.

***Who owns all the pie?*, published by the Resolution Foundation, presents the latest statistics on Britain's total and household wealth, providing a better understanding of changes in the sources, accumulation and distribution of wealth.**

- Total wealth has continued to surge relative to national income. In the 1970s, the total amount of wealth held by households in Britain was around three times GDP. Today's data shows that it's now more than 7 times, the highest such ratio in over 100 years. This increase has been driven in part by low interest rates.
- Private Pensions are the largest (42% of total household wealth 2016-18) and fastest-growing component of household wealth, marginally bigger than total property wealth (35% of total household wealth 2016-18). This reflects a slight cooling in the housing market, while the valuation of pension assets has been pushed up by rising longevity and continued low-interest rates, alongside more auto-enrolment into workplace pensions.
- Britain may be wealthier than ever as a country, but that wealth is still very unequally shared. The fall in wealth inequality over the 20th century is over. Wealth is twice as unequally distributed as income, as measured by the Gini coefficient, implying a bias towards perfect inequality.
- In 2006-08 the proportion of individuals living in a household with wealth below £500,000 was 26 percentage points higher for those aged between 35 and 44 compared to those between 55 and 64. This gap rose to 34 percentage points by 2016-18. This increasing gap reflects the fact that the relatively well-off cohort born in the 1950s has been able to accumulate wealth at a faster pace than the generations before or after. This has been due to increased homeownership and relatively generous pensions for many of the individuals in this group.

Innovation and Enterprise

INNOVATION

***Testing Innovation in the Real World*, published by Nesta, highlights the positive externalities for people and places as a result of testbed implementation, alongside providing insights to help design and implement successful testbeds in the real world.**

- Real-world testbeds are an important policy tool that can increase innovation and achieve the aims of national and local industrial strategies. Research shows that they can play multiple roles for national and local government.
- Public engagement should be central to the design of testbeds and considered from the start. A framework for how the public will be engaged and involved should be set out from the start of the design phase of a real-world testbed.
- Governments should compile a national overview of the infrastructure available to test and demonstrate innovation.
- Research has concluded that developing real-world testbeds can help people and places:
  - Strengthen collaboration within a clear and structured framework between the public sector, business, universities and other research-intensive organisations;
  - Focus and attract investment and resources in innovation in specific technologies, sectors and research areas where the local area is seeking to develop and strengthen a competitive advantage;
  - Reduce risk in the process of developing new products and processes for firms, providing a safe space for them to iterate, fail, influence regulatory and policy change and support them to develop to an investment-ready stage;

- Promote the local area as a good place to invest and develop knowledge-intensive functions, giving potential investors and existing firms in the area confidence that there is a supportive and enlightened local innovation ecosystem.

***Determinants of green innovations: Firm-level evidence*, published by the Economic & Social Research Institute, examines the determinants of firms' innovation with environmental benefits.**

- The key results indicate that environmental regulations, in-house research and development and acquisition of capital assets are major drivers of green innovations. Larger firms are more likely to introduce green innovations.
- Relative to foreign-owned firms, indigenous firms are more likely to introduce green innovations with benefits for the end user. This result holds across all firms as well as for manufacturing and services firms.
- Results indicate that firms engaged in co-operation for innovation with firms in the same enterprise group and with competitors are more likely to introduce green innovations. The effect of co-operations with firms in the same enterprise group is driven by foreign-owned firms while the positive effect of co-operations with competitors is driven by firms in services and indigenous firms. Co-operation with private clients increases the propensity of firms to introduce green innovations.
- Public funding appears to play a limited role on fostering the introduction of green innovations. Results indicate a positive albeit marginally significant effect in the case of funding from local authorities on the propensity of firms to introduce green innovations. This effect appears to be driven by firms in services while it does not appear to be statistically significant in the case of the other groups firms.
- Public funding from the European Union is found to be positively and significantly associated with green innovations with benefits for the end user in the area of more durable products. This effect is identified for manufacturing firms and for indigenous firms. It is not statistically significant in the case of firms in services and foreign-owned firms.

***Seeing is Believing*, published by PWC, explores how Virtual Reality and Augmented Reality may add value to the economy by 2030.**

- Virtual Reality (VR) and Augmented Reality (AR) have the potential to deliver a $1.5 trillion boost to the global economy by 2030. From creating new customer experiences to speeding up product development and improving workplace safety, there are many compelling uses for these technologies that promise to drive growth from the current GDP contribution of $46.4 billion.
- Business benefits of VR and AR range from:
  - Improved training of employees and testing of procedures, including the simulation of realistic scenarios and even high-risks environments;
  - Speeding up the product design and delivery process. For example, automotive companies are using VR to cut the time between initial design and physical modelling from weeks to days;
  - Reducing costs and boosting efficiency in all kinds of ways, from improving the picking and packing productivity of warehouse workers with AR glasses, to providing information for engineers and technicians in the field;
  - Growing existing and creating new revenue streams through developing and designing VR and AR services and technologies, with the potential to sell and showcase products using VR and AR technology. Such potential is already being explored by the Retail, Hospitality and Automotive sectors.
- As this technology is now reaching a stage of maturity, with headsets becoming lighter, cheaper and more comfortable to use alongside improvements being made around the field-of-view, resolution and software, businesses should be further incentivised to explore the benefits.

***Global AI Survey: AI proves its worth, but few scale impact*, published by McKinsey & Co, measures the benefits from AI where it has been deployed, alongside underlining the challenges ahead as the technology diffuses.**

- Adoption of Artificial Intelligence (AI) continues to increase, and the technology is generating returns. The findings of McKinsey's Global survey show a nearly 25% year-over-year increase in the use of AI in standard business processes.

- The majority of companies that have adopted AI have reported an uptick in revenue in the business areas where it has been deployed, with 44% saying AI has reduced business costs.
- Results suggest that workforce retraining will need to ramp up. AI high performers have been carrying out more retraining. 83% of respondents expect at least some of their workforce to be retrained in the next three years because of AI adoption, and 38% expect more than a quarter to be retrained.
- Respondents also expect AI adoption to cause shifts in their workforce across functions. About one-third of respondents say they expect AI adoption to lead to a decrease in their workforce in the next three years, compared with one-fifth who expect an increase.
- Despite extensive dialogue across industries about the potential risks of AI and highly publicized incidents of privacy violations, unintended bias and other negative outcomes, the survey results suggest that a minority of companies recognize many of the risks of AI use. Even fewer are taking action to protect against the risks. Less than half (41%) say their organisations comprehensively identify and prioritize their AI risks.

***Innovation Squared: A 'horizon scan' of emerging methods for supporting and managing innovation*, published by Nesta, covers new ways of organising for innovation and shaping activity across teams and new approaches to optimising resource allocation.**

- Through a review of innovation management literature and in-depth interviews it identified three emergent groups of novel practices, including new ways in which emerging technologies are being used to enable and speed innovation:
  - AI is reinventing the way we invent.
  - Creative Machines are developing the ability to generate novel designs.
  - Open innovation is going micro, breaking the process down into smaller parts.

RESEARCH AND DEVELOPMENT

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

SECTORS AND TECHNOLOGIES

***Unlocking the full power of automation in industrials*, published by McKinsey & Company, evaluates the current state of play and potential options for the effective employment of automation technology within heavy industry sectors.**

- McKinsey research shows that up to 50% of work performed today can already be automated with currently available technology. However, companies in the heavy industry sector (such as in energy, mining, utilities, and manufacturing) tend to struggle to set bold aspirations, develop robust business cases, and devise effective deployment approaches to take advantage of automation.
- Although an array of automation initiatives in the sector are targeted at physical processes that increase the efficiency of site operations, research indicates that non-physical core processes have higher automation potential.
- Non-physical core processes, which involve the collection, processing, and analysis of data, are more easily and effectively automated compared with their physical counterparts. And once automated, these non-physical processes can help bolster broader automation and digitization programs.
- Analysis suggests that automating repetitive work, such as data entry or verifying system trends, can double the share of a technician's value-added work. Doing so can help heavy industry secure significant economic benefits, increase efficiency, and improve employee experience.
- Streamlining core processes is becoming easier with maturing technologies, lower implementation costs, and greater awareness of and skills in lean processes, agile, and design-thinking methodologies. In such an environment, companies that don't prioritize automation in their core enterprise strategy risk falling behind more forward-looking competitors.
- The key and the challenge for industrials attempting automation transformations will be to act quickly without waiting for perfection. Managed properly, automation transformations can produce significant business impact and provide a strategic advantage.

***Seizing opportunity in today's construction technology ecosystem*, published by McKinsey & Co, assesses the construction technology ecosystem, distinguishing emerging trends and solutions that are disrupting how projects are planned, designed and executed.**

- In the long-term, artificial intelligence (AI) and analytics have boundless potential use cases in the engineering and construction (E&C) industry.
- In the immediate future, AI's proliferation in the E&C sector is expected to be modest. Few leaders have the processes, resources, and existing data strategies in place to power the necessary algorithms and meaningfully implement this technology. However, the potential impact is so large that the industry can no longer afford to ignore it.
- Parts of the construction industry are moving toward a manufacturing-like system of mass production, relying on prefabricated, standardized components that are produced off-site. Research finds that consistent use of these techniques, on projects where they are economically feasible, could boost the sector's productivity by five to tenfold.
- On the robotics side, the E&C industry is at the beginning of its journey to embrace the hardware innovations that enable field augmentation with exoskeletons and drone-enabled yard inspection. Pairing humans with robots can assist in tasks that would take a human worker more effort.
- Supply chain optimization and marketplaces are showing potential to be revolutionised. Currently, procurement of materials, equipment, and labour is a largely manual and cumbersome process. However, start-ups that offer marketplace platforms for the buying and selling of goods as well as hiring have begun to gain traction in certain regions.

***Destination Digital: How small firms can unlock the benefits of global e-commerce*, published by the Federation of Small Businesses, presents the opportunities and challenges facing small business as the digital trade revolution develops.**

- Digitalisation is changing the way small firms are offering goods and services internationally. Whether trading through their own website, online platform, or through a variety of different interfaces and selling channels, small firms are embracing digital trade and contributing to a competitive, seamless and convenient shopping experience.
- A particular digital medium used by small businesses to import and export goods and services is online platforms and marketplaces. While this digital medium brings a range of benefits and acts as a gateway to internationalise, it also gives rise to new policy and regulatory challenges, especially for those small firms whose business models rely heavily upon them.
- Alongside these developments, there has been a race to regulate the different aspects of digital trade across the globe: from the protection of personal data, cybersecurity, intellectual property, to the relationship between online platforms and business-users.
- The race to regulate has profound challenges for small firms trying to operate internationally, largely due to the different approaches adopted. Consequently, small firms operating internationally have to contend with a multitude of barriers impacting trade and work with a patchwork of rules.
- This is problematic for small firms, as they are less resilient to regulatory changes, have fewer resources to adapt, are less able to absorb the costs of new administrative and regulatory requirements, and cannot spread the costs of obtaining information and acquiring knowledge about compliance across a larger cost base.
- Such changes in regulation not only threatens the competitiveness of small firms, in comparison to their larger counterparts, but also deprives consumers of those innovative and unique offerings of the vibrant small business community.

***Digitising Agri-food*, published by Centre for Economic Policy Studies, suggests how digital solutions can be implemented on the ground to help the agri-food chain transform itself to achieve more sustainability.**

- Agriculture represents 9% of global GDP but has been slow to digitise and remains inefficient. Digital technology can revolutionise agriculture, address food waste, and support healthier diets, achieving sustainability.
- Precision agriculture achieves efficiency and sustainability through the smart use of artificial intelligence (AI), sensors and internet of things, cameras, robotics, blockchain, and data in various use cases.

- Small farmers can benefit enormously from the digitalisation of agriculture connecting them to markets; information and services through blockchain platforms can resolve trust and traceability challenges.
- AI-powered apps tackle food waste and create personalised nutrition services by incorporating a variety of user data.
- Although while being potentially beneficial, digital technology can feature a variety of risks, in terms of economic, social and environmental sustainability. Technology can, if not adequately coupled with a smart policy framework;
  - Aggravate inequalities when it comes to connectivity, skills and capital.
  - Produce negative consequences for the environment and human health due to energy consumption and e-waste.
  - Lead to job loss and further tilt the power balance from labour to capital.
  - Reinforce capitalism's tendency towards market concentration.
  - Open new ethical questions when it comes to privacy, bias and hyper-nudging consumers.
- As digital technology matures and diffuses throughout the Agri-Food chain, bringing with it vast opportunities and benefits, consideration should be given to the challenges and risks facing stakeholders involved and wider society. However, with that said, the positive net benefit of such a revolutionary transition should be welcomed granted the required policies are in place.

ENTREPRENEURSHIP

***GEM UK: Northern Ireland Report 2018*, published by The Global Entrepreneurship Monitor (GEM) is an international project, involving 49 economies, which seeks to provide information on the entrepreneurial landscape.**

- The rate of total early-stage entrepreneurship (TEA) in Northern Ireland in 2018 is 6.5%, unchanged from 2017. The 2018 rate compares to a figure of 7.9% in the UK overall, 8.1% in England, 6.9% in Wales, and 6.3% in Scotland.
- The TEA rate in Northern Ireland in 2018 is not significantly lower than the UK, however when the rates are combined over 2016-18 Northern Ireland has a significantly lower rate than both England and the UK.
- Entrepreneurial activity is driven by opportunity motives; necessity-driven TEA in Northern Ireland is 0.9% in 2017 while opportunity-driven TEA is 5.6%.
- The female TEA rate in Northern Ireland in 2018 is 3.2% compared to a male rate of 9.9%. The female to male entrepreneur ratio in Northern Ireland of 32% compares to a UK ratio of 50%.
- TEA rates tend to vary by age with those aged over 30 generally more likely to be engaged in entrepreneurial activity. In 2018 those aged between 25-34 in Northern Ireland were most entrepreneurial, with their rate significantly higher than for those aged 35 and over.
- Within Northern Ireland the highest TEA rates are typically found in the Mid-Ulster Council area, while Derry City and Strabane have the lowest. The rate in Mid-Ulster is driven by male entrepreneurial activity; in Derry City and Strabane there are relatively low female rates of entrepreneurship.
- High job expectation rates amongst TEA entrepreneurs in Northern Ireland fell to 14% over 2016-18 compared to a stable UK rate of 19%. High job expectation is typically lower for established businesses; in Northern Ireland the high job expectation rate fell to less than half the UK rate over 2016-18, at just 2%.

***GEM 2018/19 Women's Entrepreneurship Report*, published by the GEM Consortium, considers women's entrepreneurship within the context of entrepreneurship ecosystems.**

- Globally, the total early-stage entrepreneurial (TEA) rate for women is 10.2%, approximately three-quarters of that seen for men. Low-income countries show the highest rates of women's TEA at 15.1%. Low-income countries report the smallest TEA gender gap, in which women's TEA is over 80% of that of men. Women's TEA rate drops to 8.1% for high-income countries with a corresponding TEA gender gap of slightly more than two-thirds that of men.

- The global average for women's intentions to start a business within the next three years is 17.6%, only four points less than for men. The highest rates of women's entrepreneurial intentions are found among low-income countries (37.8%), followed by middle-income (21.3%) and high-income countries (12.6%).
- Globally, 6.2% of women entrepreneurs own established businesses, about two-thirds the rate of men (9.5%). The highest rates are seen in sub-Saharan Africa (11.3%) and Asia (9.1%) with the lowest rates of established business ownership reported in Middle-East & North Africa (4.5%), Europe (5.3%), North America (5.7%), and Latin America (6.5%).
- Globally, women (39.1%) and men (42.5%) are almost equally likely to believe in the ease of starting a business.
- Overall, men are about 10% more likely to be undeterred by fear of failure than women; and, across all regions, men have a more positive response than women.
- Innovation rates tend to increase with economic development for both men and women entrepreneurs, from about 20% in low- and lower–middle-income countries to 30% in high-income countries.

Business Growth

***NI Local Growth Dashboard 2019*, published by the ERC, presents a set of growth metrics for startups and existing firms across a range of sub-national geographies in NI with a specific focus on each of the 11 Local Government District (District Council) areas.**

- The number of start-ups in the UK fell in 2018, with Northern Ireland following suit. Generally, start-up rates in Northern Ireland are much lower than the UK at 22 per 10,000 population, below the UK average of 43.
- The Fermanagh and Omagh, and Newry, Mourne and Down districts have the largest rate of start-ups with the rates falling in the north and east of NI. Belfast is an exception within the east and also exhibits rates of start-up above the Northern Ireland average.
- The overall survival rate for the 2015 cohort of start-ups is 59.3% in NI and 55.1% in the UK, so two fifths of all start-ups do not make it to their third year.
- The number of high-growth firms, in the UK has declined slightly over the last number of years – falling from 11,855 (2012/15) to 10,968 (2015/18) meaning that the overall incidence rate has fallen from 6.2% to 7.5%.
- The incidence rate of high-growth firms in Northern Ireland varies from 4.0% in Fermanagh and Omagh to 6.9% in Mid Ulster. The spatial pattern within this range also shows above average incidence rates in Derry City and Strabane and Ards and North Down. High levels of start-up activity do not correlate with the presence of high-growth firms.
- The productivity metric reveals that only 8.3% of all job-creating employer enterprises in the UK achieved positive productivity gains (revenue per employee) while still increasing jobs over the period (2015/18). Northern Ireland had the highest proportion in the UK at 11.1% while the proportion in Wales was 7.1% and Scotland 7.3%, both below the average of 8.4% for England.
- As with previous years this overview of a range of business growth metrics has underlined the fact that, irrespective of the measure adopted, there are very few firms in Northern Ireland or the UK which can be categorised as 'high-growth' or 'scaling' and indeed contributing to productivity growth.

***Centre Stage: Keeping the UK's creative industries in the spotlight*, published by CBI UK, highlights the contribution and the growth ambitions of the UK's world leading creative industries.**

- The UK creative industries have grown twice as fast as the economy as a whole since 2010 and contributed £101.5bn to the UK economy in 2017. The sector employs over 3 million people and benefits communities across all regions and nations of the UK.
- Demand for British creativity, culture and content continues to grow, as evidenced by Portland's 2018 Soft Power 30 Index ranking the UK number one in the world for cultural influence.
- Innovation is synonymous with creativity. Originating new ideas, discovering new ways of doing things and looking to solve some of society's biggest challenges. The sector's ambition to

innovate has been a driver of its economic growth. The sector continues to innovate faster than the rest of the economy. Businesses of all sizes are digitally transforming, embracing new technologies and innovating at pace to seize new opportunities.

- Northern Ireland is home to a dynamic hub of animation and gaming companies. It also has a thriving screen sector with world class facilities and a highly skilled talent pool. Having gained prominence as the filming location of HBO's Game of Thrones, Northern Ireland has evolved into a world leader in TV and film production. The HBO series pumped £250m into the country and has helped to increase Northern Ireland's international appeal. To date, £30m in related tourism has been generated as fans of the series flock to visit their favourite filming locations.
- To harness the valuable economic contribution, government and businesses must work together and consider how they will maintain and develop the global reputation of the UK's Creative Industries. Particular focus is required in relation to the anticipated skills gap within the UK's creative talent pipeline. Encouraging diversity and inclusion within the creative industries alongside providing creative education that will contribute towards nurturing the skills required. Meanwhile, improving access to funding for Creative SMEs and entrepreneurs is vital to prevent a downturn in the establishment and growth of firms with the industry.

***EIB Investment Report 2019/2020*, published by the European Investment Bank, provides a comprehensive overview and analysis of investment and the financing of investment in the European Union.**

- Investment activity in the European Union has recovered from the last recession. Since 2013, investment growth has outpaced growth in GDP. Investment has risen to nearly 21.5% of EU GDP, 0.5 percentage points above the long-term average.
- Yet the economic climate is worsening. Real GDP growth has slowed over the last year in line with falling export demand and weakening manufacturing production.
- Investment is likely to join the slowdown in the coming year. So far, the impact of slowing GDP growth on investment has been limited, but this is likely to change as the slowdown spreads to the service sector.
- The European Union risks a gradual loss of global competitiveness. Its slow innovation, adoption of digital technologies and productivity growth stand in contrast to rapid technological change worldwide and the emergence of new global players. Structural barriers and rigidities lie behind many of these trends, often preventing the necessary reallocation of resources within the economy.
- Research and Development expenditure in the European Union lags behind that of peer economies and is over-dependent on traditional business leaders in the automotive sector.
- The adoption of digital technologies in Europe is slow, with a growing digital divide among firms. Firms that adopt digital technologies tend to invest more, innovate more and grow faster, enjoying a first-mover advantage. However, the share of digital firms in the European Union's manufacturing sector is 66%, lower than the level in the United States at 78%.
- Slow digitalisation in the European Union partly reflects a lack of European firms in tech sectors that were "born digital". The digital divide is growing between larger and younger European firms that have already adopted digital technologies and smaller and older firms that have not. Smaller and older firms are more likely to have difficulties finding finance, which potentially exacerbates this divide.

GROWTH FINANCE

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

BUSINESS REGULATION

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

Succeeding Globally

TRADE

***Irish Exporters Association Annual Report 2018*, published by the Irish Exporters Association, scrutinises Ireland's 2018 export figures alongside assessing factors impacting upon 2019's export growth.**

- 2018 proved to be the second-best year for Irish export growth in recent years. As in 2015, growth was broadly based, with strong contributions from both goods exports and services exports as both indigenous and foreign-owned firms continued to flourish. Total exports for the year reached €321bn, an increase of over 80% in just five years.
- Job growth in Irish and foreign-owned exporting companies continued to grow strongly in 2018. The total across all firms topped 400,000 for the first time on record in 2018, representing an increase of 100,000 over five years.
- Goods exports rose 15% in 2018, or by over €18bn in value terms, driven by continued growth in the Chemicals sector.
- Ireland's services exporting firms, reported very strong growth in 2018, building on the surge in revenues witnessed in 2017. The total value of services exports topped €180bn in the twelve months to end-December 2018, an increase in €18bn on 2017.
- There has been a significant global weakening of economic conditions, which has affected the immediate prospects for Ireland. While economic growth in Ireland is projected to remain robust, it is expected to ease gradually to 3.9% in 2019 and 3.3% in 2020.
- Ireland's growth has stalled after a remarkable decade which has seen unemployment fall from greater than 15% to a position of full unemployment in 2019. While challenges remain, Ireland is in an immeasurably better position than a decade ago to deal with challenges like Brexit, a slowdown in world trade or any other demand or supply shock that may emerge over the next eighteen months.

INWARD INVESTMENT

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

TOURISM

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

Economic Infrastructure

ENERGY

***Biogas: a real option to reduce greenhouse gas emissions*, published by the Economic & Social Research Institute, examines how European countries are developing their biogas and biomethane industries.**

- Biogas is a versatile fuel that can be used for multiple purposes such as electricity and heat production.
- By removing carbon dioxide and other impurities, the upgraded biogas, namely biomethane, has similar chemical properties to fossil gas and can be fed directly into existing gas grids or dispensed as a vehicle fuel at fuelling stations.
- Europe is the world leader in biogas production, with total production doubling since 2010 and increasing by more than 700% since 2000.
- A descriptive analysis was conducted for 12 European countries with the highest biogas production between the years 1990-2017.
- While Ireland has a relative nascent biogas industry, it is included in the review because it has a large animal herd and large areas of grassland pasture with latent biogas production potential.
- The research reviews the policy drivers for biogas and biomethane development across these European countries and examines the impacts associated with large-scale implementation of biogas production.

TELECOMS

***Gigabit broadband: What does it mean for consumers and society?*, published by Oxera, highlights how the mass-market roll-out of gigabit broadband has the potential to transform lives.**

- Digital services have already brought significant benefits to society in terms of wellbeing, convenience and user experiences. More of these could be unlocked as a result of the widespread roll-out of gigabit broadband (a high-capacity network), which is likely to allow a new generation of digital services to tackle some of the challenges faced in society today.
- Previous improvements in connectivity have led to significant benefits in terms of communication, sharing and reducing barriers to trade. Gigabit connections could continue this trend by reducing the significant frictions that remain.
- The report identifies four key areas in which the mass-market roll-out of gigabit broadband has the potential to transform lives by eliminating some of the 'frictions' that remain.
- Revolutionising healthcare - Gigabit broadband could enable applications such as diagnostics-quality video streaming and sharing, which could allow consultations from home, reducing costs and the need to travel. Remote healthcare is likely to allow patients to avoid travelling and the elderly to live independently at home for longer.
- Changing the way we work - Applications such as holographic conferencing and augmented reality presence enable professionals to collaborate more effectively without having to travel. In addition, a number of workers in professions that involve visualising 3D models or sharing immersive content will be able to collaborate and co-create with professionals from other countries and even continents.
- Improving social and digital interaction - Social contact and interaction is good for reducing loneliness and improving mental health. Enabling easier and more realistic interactions between people can alleviate isolation and increase social capital.
- Helping to fight climate change - By reducing the need to travel by making more connections virtually rather than physically, carbon emissions from transport can also be reduced.

***5G networks: to slice or not to slice*, published by the World Economic Forum, suggests how 5G network slicing can provide several services on the same network.**

- 5G network slicing enables us to slice physical networks into partitions, which can be further assigned for dedicated use. It empowers an operator to structure several services on the same network, but with an assurance on service quality, reliability, and enhanced security.
- Slicing 5G networks into partitions allow mobile and network operators to meet the requirements of different services; this is based on a variety of factors such as latency, quality, capacity, reliability, and security. A city, for instance, could isolate its traffic management system into a slice designed for monitoring in real-time, while bracketing emergency services to high-priority slices instead.
- Internet of things (IoT) applications such as smart metering, remote operations, telesurgery, and more require flawless connectivity, but with incredibly different characteristics. 5G network slicing addresses this complexity by enabling the creation of logical networks dedicated to meet the needs of each application; it offers enormous insight into matters such as network resource utilization and is even designed to stay on par with the complexity required by all the varied services.
- Additionally, network slices can also be set up based on service characteristics such as latency demands, network coverage, or bandwidth. It works rather favourably with some of the newer technologies. Augmented reality, for instance, requires high data speed and low latency; a massive IoT application such as a smart electricity meter, on the other hand, requires highly reliable data against specific data rates and levels of security.

***Lost Connection: How poor connectivity hinders small firms*, published by the Federation of Small Businesses (FSB), examines the impact of poor broadband and mobile connections on small business.**

- One third (33%) of small businesses consider their broadband speeds to be insufficient for their current needs, rising to 40% when considering their future needs.
- Over half (52%) of small businesses plan to upgrade to full fibre connectivity when it becomes available in their area.

- 41% of small businesses consider that their broadband is often unreliable.
- 45% of small businesses experience unreliable voice connectivity.
- Almost half (47%) of small businesses experience unreliable data connectivity.
- Around a third (34%) of small businesses are willing to upgrade to 5G when it becomes available in their area.
- As a result of poor broadband or mobile connectivity, just under a third (32%) of small businesses have been prevented from contacting, or being contacted by, customers.
- 31% of small businesses report that it has been a barrier to the growth of their business. This figure rises to 49% for small businesses that currently receive download speeds of less than 10 Mbps.
- 26% of small firms say that they have lost business or sales as a result, rising to 36% for those that currently receive download speeds of less than 10 Mbps.

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

***Wales Tourism Performance: January to June 2019*, published by the Welsh Government, presents the results on the overall performance of the Tourism industry in Wales.**

- There were 4.8 million overnight domestic (Great Britain) trips to Wales in the first 6 months of 2019, which was an increase of 6%, generating expenditure of £880 million.
- Over the 12 months ending June 2019, there were 10.294 million overnight trips to Wales, up by 10.1% compared to 2018. The expenditure at £1,915 million was also up by 11.3%.
- During the first six months of 2019, there were 37.7 million Tourism Day visits in Wales, which was a decrease of 19%. These visits generated expenditure of £1,474 million.
- The number of international trips to Wales during the first six months of 2019 rose by 3% to 446,000. Visitor spending was £174 million, which was a 4% increase on the same time in 2018.

***Tourism Barometer: Autumn 2019*, published by the Welsh Government, helps to develop an understanding on how the tourism industry in Wales is performing at key times during the year.**

- Over a quarter (27%) of businesses increased their visitor levels in autumn 2019, but the same proportion has seen a decrease. Among those reporting an increase in visitors, about a quarter (23%) cite 'own marketing' as a reason, and one in five (20%) cite 'repeat business'.
- Among those reporting a decrease, the top two reasons for being quieter are the weather (27%) and 'Brexit uncertainty' (22%). However, 'more British people staying in the UK' is cited by 14% of operators who have been busier, and some of them link this to Brexit uncertainty deterring holidaymakers from going abroad.

- In spite of a mixed autumn period and much uncertainty in the UK, confidence for 2020 is reasonable. About three in ten (29%) businesses are 'very confident' for 2020, and around half (49%) are 'fairly confident'. Confidence in the tourism industry is seasonal, and this result is typical for the time of year.

REPUBLIC OF IRELAND (ROI)

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

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