

PIN – 07

Evidence Review

Productivity Perspectives Synthesis

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About PIN

The Productivity Insights Network was established in January 2018 and is funded by the Economic and Social Research Council. As a multi-disciplinary network of social science researchers engaged with public, private, and third sector partners, our aim is to change the tone of the productivity debate in theory and practice. It is led by the University of Sheffield, with co-investigators at Cambridge Econometrics, Cardiff University, Durham University, Glasgow Caledonian University, SQW, University of Cambridge, University of Essex, University of Glasgow, and the University of Leeds. The support of the funder is acknowledged. The views expressed in this report are those of the author and do not necessarily represent those of the funders.

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1. Introduction to the Recent Productivity Debates

Productivity is one of the most important concepts in economics. Productivity reflects how resources and factors are utilized in the production of goods and services, including all of the interactions with, and roles played by, the market, technological, institutional and cultural settings. National productivity is the observable outcome of all economic relationships operating between people, firms, organisations and institutions, and after many different theoretical and empirical challenges, productivity still provides the best overall index of living standards and prosperity. As Paul Krugman (1994) famously remarked “*Productivity isn't everything, but, in the long run, it is almost everything. A country's ability to improve its standard of living over time depends almost entirely on its ability to raise its output per worker.*” Amongst economists this is generally understood to be true, but for many years amongst the wider public, media, and political arenas the awareness of these issues has been far more limited, at least possibly until now. However, while this has been a longstanding topic of core concern to economists, in many countries including the UK it is only relatively recently that productivity has become a topic in mainstream media and political debates.

The major reason for this is that the growth in productivity has fallen sharply in many countries in the aftermath of the 2008 Global Financial Crisis. These falls can have profound and adverse societal implications in terms of opportunities for employment, access to the housing markets, implications for the funding of pensions, education, health and social services, as well as for the pattern of income inequalities, and finding ways to improve productivity growth is once again seen as an urgent economic, social and political priority in many countries. However, the productivity slowdown discussed today was already evident long before the 2008 (Gordon 2016). Across the industrialised world productivity growth has been declining since the 1980s (Wren-Lewis 2017) and Gordon (2016) argues that today the combined effects of population ageing, stagnating education attainment levels and student debt are putting fundamental breaks on productivity growth, especially when compared with the first seven decades of the 20th Century.

Gordon's (2016) analysis was focused on the USA, but it is arguable that these productivity growth concerns are even greater in the case of Europe. Indeed, the apparently weaker growth experiences of many European countries since the mid-1990s relative to North America, as especially in terms of the impacts of Information Technology, was already a topic of widespread discussion amongst economists by the early years of the 21st Century (Ortega-Argilés 2012). However, it is since the 2008 Global Economic Crisis that the effects of the productivity slowdown have become more marked and widely observable in many different parts of the world. McKinsey Global Institute (MGI 2018a) attribute the productivity slowdown to three main causes, namely the weakened demand effects of the 2008 global financial crisis, demographic ageing, and the lack of uptake of many digitization opportunities in many parts of the economy.

2. Eight Decades of Productivity Analyses

Krugman's (1994) observation remains as true as ever, although the way we think about productivity has evolved significantly over recent years. During much of the post-war era thinking about economic growth and productivity was dominated empirically by the national output and income accounts framework of Kuznetz (Coyle 2014) and analytically by the growth accounting framework based on the Solow (1956)-Swan (1956) framework. In the Solow-Swan set-up, the stock of capital per worker was seen as being critical, and beyond this it was assumed that deregulated and well-functioning markets will maximise both productivity levels and growth. This neo-classical approach was also extended to incorporate both sectors and places (Borts and Stein 1964; Barro and Sala-i-Martin 1992, 1995) on the assumption that the mobility of factors in response to price signals will drive underlying processes of convergence in which lower productivity arenas will experience faster productivity growth. Deregulated markets with mobile

capital and labour was largely assumed to be sufficient for growth-equalisation processes and maximum technological diffusion across all sectors and regions.

The influence of this neo-classical tradition lasted almost three decades, even though these frameworks showed that typically one half of productivity growth remained unaccounted for by stocks, allocations or mobility of capital and labour factor inputs. This Solow 'residual' element was often relabeled as a technology parameter, reflecting the prevailing thinking that technology was largely disembodied from the production factors. Yet, doubts about these assumptions, along with the fact that many other previously unspecified issues also appeared to be influencing productivity growth, meant that questions began to be raised regarding how technological dissemination and diffusion processes operated (Pavitt 1986, 2000) and how these related to the rates of entrepreneurship and innovation (Nelson and Winter 1982). Whereas in orthodox neo-classical factor-allocation models these had generally been assumed to be largely instantaneous and ubiquitous processes, the emerging empirical evidence started to cast doubt on these assumptions.

Much of the evidence on these matters initially emerged from the fields of business and management, science and technology policy, evolutionary economics, and even sociology and geography. The evidence arising from these fields pointed to the fact that both the levels of technology as well as the speed and patterns of technological and innovation diffusion and dissemination throughout the economy were highly contingent on issues which were largely outside of the existing orthodox economic frameworks. These issues included factors such as corporate structures, the organization of supply chains, the organization of intellectual property rights, the entrepreneurial incentives, as well as the interrelationships between the private and public sectors in key areas of R&D, procurement and investment. As such, these fields were also offering new ideas regarding the role played by scale, systems, networks and spillovers (Piore and Sabel 1985; Porter 1985, 1990; Best 1990) in driving competition and productivity-enhancing innovation and entrepreneurship.

Soon these ideas about the role played by knowledge and knowledge spillovers in driving productivity growth also became increasingly central to economic thinking about productivity from the late-1980s onwards (Romer 1986, 1987; Krugman 1991a; Krugman and Venables 1995; Aghion and Howitt 1992), and attention started to shift towards the effects played by scale and externalities in shaping economic outcomes. In particular, it became increasingly clear that market competition has no natural tendency towards productivity equalization and as such, productivity convergence processes are only one of many possible alternative outcomes. Sectors, places, technologies, organizational systems and networks all overlay firm-specific behavior and understanding the interplay of these forces is necessary in order to identify the productivity outcomes of competitive processes.

Taken together, these analytical developments provided the conceptual underpinnings of a fundamental re-think of how much of the economy operates, and such a re-think was essential in order to understand the nature of the economy in the latter years of the 20th Century. Yet, it was the scale of the changes which were about to arise that could never have been envisaged. Productivity processes in advanced economies were about to be fundamentally re-shaped by the onset of the new global order, with profound economic, social and political implications, implications that we are still living with today.

The 1980s had witnessed many advances in computerisation and information technologies but it was the 1991 invention of the world-wide web by Tim Berners-Lee which transformed how the global economy operates, by allowing different technologies to 'talk' to one-another on a common platform. These technologies would re-shape the relationships between geography and trade, but in much more complex ways than most people understand. In particular, rather than simply making the world 'flat' these technologies gave a premium to product and service

quality and timeliness, and these in turn strengthened the advantages of proximity (McCann 2008; Iammarino and McCann 2013). Meanwhile, at the same time as these technological transformations were taking place institutional transformations were also occurring, from the early 1990s onwards. A series of key institutional changes including the opening up of the BRICs countries, the Fall of the Berlin Wall, the establishment of the EU Single Market, NAFTA, and the WTO, along with the dramatic advances in information and communications technologies facilitated enormous flows of out-sourcing and off-shoring. These in turn drove deeper levels of global trade regionalism, whereby groups of adjacent and neighbouring countries (within Europe, North America and East Asia) became more and more integrated with each other in terms of all aspects of trade, foreign direct investment and human capital flows (Iammarino and McCann 2013). Within these integrated global trading blocs we also observed the rise of global city hubs which played host to the key knowledge and decision-making roles within the new corporate structures and global value-chain networks.

These rapid changes all gave rise to new thinking regarding the relationships between trade and geography (Krugman 1991b), and the spatial patterns of knowledge spillovers and technological diffusion processes (Audretsch and Feldmann 1996). In particular, the role played by cities and industrial clusters in driving growth and productivity emerged as a key theme (Krugman 1991a,b; Porter 1990). Cities became increasingly seen as drivers of national productivity growth by acting both as places which maximise local knowledge spillovers while also providing conduits to global networks of knowledge, trade, ideas, money and people (McCann and Acs 2011). The emerging evidence on these issues confirmed that productivity is indeed heavily contingent on economic geography, with cities often being in the vanguard of productivity growth, especially during the first decade of modern globalization in the 1990s.

In the modern globalized economy the importance of rapid and widespread access to knowledge centres cannot be over-emphasised. The dramatic rise of the 'weightless' economy (Quah 1999) in the last decade of the 20th Century and the rapidly-growing role of intangible and knowledge-related goods which were both associated with, and facilitated by, these new technologies (Varian 2001), led to a fundamental transformation of how many parts of the global economy worked. New types of economic activities, occupations, and economic relationships arose with dramatic speed and these technological changes have transformed social and political relationships, as well as economic relationships, both within countries as well as between countries. However, while these information and communications technologies appeared to be taking giant leaps forward, their impact on the economy appeared to be less than might have been anticipated. As Robert Solow (1987) famously remarked "You can see the computer age everywhere but in the productivity statistics." Indeed, this was the first time that the notion of a 'productivity puzzle' or a 'productivity paradox' was raised (*The Economist* 2000), in this case referring to the productivity measurement issues around these new information and communications technologies. The profound nature of these continuing changes have subsequently spurred renewed thinking about the whole nature (Haskel and Westlake 2018) and measurement (or mis-measurement) of productivity in the largely weightless parts of the economy (Coyle 2014, 2017) and raised questions about the extent to which our analytical and empirical frameworks reflect the new realities. If high-technology sectors do indeed generate productivity growth which is higher than the current standard measurement techniques suggest then at the same time it also implies that productivity growth in other non-high-technology sectors is lower than we think (Byrne et al. 2017a,b), without necessarily raising the overall productivity growth figures. Work on these matters continues today (Riley et al. 2018), but the 'Solow Paradox' still refuses to go away (Acemoglu et al. 2014; Wolf 2018).

Haskel and Westlake (2018) argue that the key features of the new knowledge economy, which is increasingly a weightless capitalist economy with no capital, are 'the four Ss': namely that knowledge is *Scalable*, knowledge incurs *Sunk costs*, knowledge displays *Synergies*, and knowledge provides and benefits from *Spillovers*. The scalability and sunk costs features will

tend to provide competitive advantages to particular firms, places or sectors, while the synergies and spillovers features in some cases may either accentuate these advantages or alternatively may provide new competitive opportunities for different firms, places and sectors. The balance between these different forces may differ in different contexts and understanding these complex relationships is essential for understanding productivity performance.

If we consider the relative productivity growth and income-growth effects of modern globalization at a global scale we see that the major 'winners' have been the highest income earners in the advanced economies, along with masses of people in developing countries. For these two cohorts productivity growth and income growth has been very significant since the latter years of the 20th Century. In contrast the main 'losers' of modern globalization are the middle and lower income groups in advanced economies (World Bank 2018), whose productivity growth and wage growth has stagnated and stalled over two decades, along with the very poorest cohorts in developing countries, whose prosperity has barely improved. Those working in manual occupations structured around routines are losing out to those working in non-routinised roles reliant on cognitive skills. At the same time, within individual sectors we observe long tails of low productivity firms employing significant numbers of workers in low wage jobs co-existing with high productivity firms in the same sectors employing smaller numbers of highly paid workers (Haldane 2017a,b). The result of these changes has been the famous 'elephant' global income distribution curve (Milanovic 2016)¹.

Evidence from numerous sources also demonstrates that these changes have had profound spatial effects, with different parts of the same country often experiencing dramatically different responses to modern globalization, depending on the types of activities and occupations operating in each area. Many regions within OECD economies which were experiencing convergence processes of 'catching up' during the 1990s and early 2000s, and especially those which had been relying on the expansion of local non-tradeable sectors such as retail or construction, experienced rapid declines in the aftermath of the 2008 Global Financial Crisis which wiped out all of the earlier productivity gains. As of 2015, almost 40% of OECD regions were still operating at productivity levels below their pre-Crisis levels (OECD 2018). The growing income differences between people and places both between and within countries has led to profound social and political implications in many advanced economies. These income differences are fundamentally underpinned by growing productivity differences between firms and between places, so understanding the drivers and inhibitors of productivity is essential. What we do know is that the persistence of 'superstar' firms and 'superstar' cities seems to be greater than for 'superstar' sectors (MGI 2018b) with dominant research-driven and market-leading firms tending to be persistently, and even increasingly, anchored in these dominant cities.

Today we understand that productivity and productivity growth is a result of a complex interplay between many different influences. Yet, identifying the precise interplay between these influences is very difficult and may well be contingent upon the context and time (Gelauff et al. 2008). Moreover, in the coming years these relationships may again be further altered due to the rapidly-increasing levels of automation, artificial intelligence and big data (MGI 2017) and there is already evidence that this has been happening. Prior to the mid-1980s productivity tended to increase in post-recession periods whereas more recently this has not been the case (*The Economist* 2017a), such that the dynamics of productivity growth appear to have fundamentally shifted. Furthermore, societal processes of ageing (Munnell and Sass 2008), inequality (Berg and Ostry 2011; OECD 2014, 2015; *The Economist* 2014), student debt and

¹ <https://www.brookings.edu/research/whats-happening-to-the-world-income-distribution-the-elephant-chart-revisited/>

<https://www.vox.com/policy-and-politics/2018/2/2/16868838/elephant-graph-chart-global-inequality-economic-growth>

government debt may all act as further inhibitors on productivity growth (Gordon 2016; Summers 2013). Yet, although these various influences are common to all economies, the precise interplay between these different influences may well differ between countries, and a major challenge of productivity research is therefore to identify which factors are generic and which are specific to the context, and how these factors can be positively influenced.

Although these challenges seem immense, and indeed the nature and scale of the changes wrought by modern globalization since the late 1980s were far beyond comprehension of scholars and policy-makers in the latter years of the 20th Century (McCann 2008), many of the tools, data and analytical frameworks necessary to consider the new realities of the global economy were starting to emerge at exactly the same time that the global economy was beginning to undergo the rapid transformation towards modern globalization. Today we understand that productivity and productivity growth is a result of a complex interplay between many different influences including the quality and quantity of factor inputs, the levels of R&D (Goodridge et al. 2015), the institutional and governance settings, market incentive systems, knowledge diffusion mechanisms (Cœuré 2017), and economic geography.

This broader understanding builds on newer discussions regarding the other potential factors which may shape productivity relationships, over and above traditional neo-classical explanations, which have also been advancing. In particular, the role played by culture (Florida 2002) and institutions and governance (Ostrom 1990, 1998; Charon et al. 2013) in fostering economic development have become central to thinking in the fields of political science and sociology and subsequently these ideas have also become influential within many areas of economics (Rodrik et al. 2004; Rodrik 2007; OECD 2018).

Meanwhile, new sources of data were also emerging which allowed these issues to be empirically examined in ways which were previously not possible. Prior to the New Millennium many of the discussions about productivity issues had remained largely in the conceptual realm, because there few standardized and consistent data sources on productivity which could be compared across regions and nations. It was only with the work of Angus Maddison (2006), the building of the Penn World Tables², the construction of the EU KLEMS³ and World Input-Output databases⁴, the Community Innovation Survey and allied surveys (Hong et al. 2012) and the European⁵ and OECD Regional and Metropolitan datasets⁶, that standardised and broadly comparable productivity-related evidence became simultaneously available at the levels of firms, sectors, cities, regions and nations, and importantly data which allows us to examine the productivity specifics of the UK in comparison to other countries.

Only now with these broader and more comprehensive datasets are we able to gain a clearer understanding of where we have come from, where we are, and possibly also where we are going to in terms of productivity.

3. The UK Productivity Context

While productivity is nowadays a topic of concern in most industrialised countries, in the case of the UK's national policy debates it has recently become a core policy agenda item because the UK's downturn in productivity growth rates has been one of the most marked and wide-ranging in the industrialised world (MGI 2018c). Moreover, the downturn also appears to have been

² <https://www.rug.nl/ggdc/productivity/pwt/>

³ <http://www.euklems.net/>

⁴ <http://www.wiod.org/home>

⁵ <http://urban.jrc.ec.europa.eu/download-dataset>

⁶ https://www.oecd-ilibrary.org/fr/urban-rural-and-regional-development/data/oecd-regional-statistics_region-data-en

greatly accelerated both by the 2008 crisis and also the 2016 EU Referendum vote (Wren-Lewis 2017; *The Guardian* 2018), so there are also broader political economy considerations at work. Discussions about the UK's 'productivity puzzle' concern not only the reasons why the UK's growth has been so weak during the post-crisis era but also the ways in which the downward productivity growth trend can be shifted upwards. In spite of numerous policy changes and fundamental structural and economic reforms since the 2008 Crisis, when it comes to productivity the UK economy has failed to respond in the expected manner.

Schneider (2016) argues that there are actually two UK productivity puzzles, one of which relates to the productivity levels and one to the productivity growth rates. The major productivity hit to the UK economy took place almost entirely during 2008 and this resulted immediately in a marked downwards shock in productivity levels. However, although during 2009-2010 there was a very slight uptake in productivity levels and growth rates to almost the pre-Crisis values (Wren-Lewis 2017), whereas from 2010 onwards the UK's productivity growth trend has been markedly lower than the pre-crisis rate (Schneider 2016). Since then productivity growth rates have been little more than zero, except for 2013-2015, such that overall productivity levels are today barely at the pre-Crisis levels (Schneider 2016). UK economic growth since 2008 has been achieved almost entirely on the basis of longer working hours (*Financial Times* 2018a).

Schneider's (2016) argument is that the *productivity level puzzle* relates to why the economy did not move back to its pre-crisis level after a short interval, while the *productivity growth puzzle* relates to why the productivity growth trend appears to have fallen sharply. The evidence suggests that the initial levels effect was been driven almost entirely by technology while the growth effect has been driven by both technology and capital shallowing. Yet, this argument also raises question as to why would 'technology' go into reverse so suddenly? Once technological blueprints, templates, systems and protocols - and all of the associated human capital investments working with these templates - are all understood and widely distributed in the economy, they cannot be un-learned, and especially so in a matter of months. So what does it mean to say that technology has fallen? To answer this question we simply need to re-label the notion 'technology' in terms of its original Solow-Swan meaning of simply a residual term incorporating all other (unidentified) growth drivers over and above capital deepening (*The Economist* 2018a). This implies that the original post-Crisis productivity levels shock was primarily due to influences unrelated to capital deepening or shallowing, but then subsequently over time almost half of the productivity growth rate slowdown was due to capital shallowing. The unidentified influences that drove the initial productivity levels shock continue to account for about half of the productivity growth rate slowdown.

Wren-Lewis (2017) argues that the macroeconomic evidence is consistent with the notion that both the 2010 budget followed by the uncertainty around EU Referendum from 2015 onwards have reduced the appetite for investors to engage in capital deepening for almost a decade. While in early 2018 there were some glimpses of optimism that the trend may be slightly increasing (*The Economist* 2018b; Macpherson 2018) these appear to have been quickly quashed (*The Times* 2018) with the ONS having concerns about the underlying performance of the economy⁷. The UK appears to be falling further behind many of its EU, OECD and G7 competitors (*Financial Times* 2018b; *The Economist* 2018c).

Yet, this raises the question as to why the UK's productivity response to macroeconomic shocks has displayed such limited resilience in comparison to other countries? On this point, the reasons for the UK's weak productivity performance can be sought in different spheres.

⁷ "Interest rates on Hold as Bank Cuts Growth Outlook", BBC News, 10 May 2018, <http://www.bbc.co.uk/news/business-44065472>

Firstly, the UK's per capita levels of technology, R&D, skills training and advanced capital are all low by OECD standards (Wren-Lewis 2017) and the UK also displays only moderate to average levels of knowledge-investing (MGI 2018c) and innovation dynamism by EU and OECD standards (McCann 2016). These observations all suggest that the UK's levels of 'technology' are low, although during the boom years of modern globalization from the mid-1990s through to the 2008-Crisis the growth in UK financial services masked many of these underlying structural weaknesses. One of the weaknesses which has recently become more evident is the fact that most UK sectors exhibit very long tails of low productivity firms which co-exist with high productivity firms in the same sectors (Haldane 2017a). These patterns are also evident in other OECD countries (Bahar 2017), but there is the suggestion that the UK's long tails may longer than those in competitor countries.

As possible explanations as to why this is the case Haldane (2018) points to various pieces of evidence. Firstly, the UK also displays a longer tail of poorly-managed firms than competitor countries (Bloom and Van Reenen 2007) including large ones, many of which have Boards of Directors with low levels of global connectivity (Haldane 2018a). Secondly, stocks and flows of human capital are lower in UK firms than US firms, and churn rates in UK labour markets have fallen sharply in recent years (Haldane 2018a). Thirdly, a disproportionately large number of UK SMEs are slow adopters of new technologies (Haldane 2018).

In terms of the issue of management quality, the evidence here comes from international comparative surveys of management quality in which UK firms appear to have a larger share of poorly managed firms than many other countries (*The Economist* 2017b; Bloom and Van Reenen 2010), as well as lower levels of advanced capital, R&D and skills-training. Yet, it is still rather puzzling that the UK has lower levels of management quality than comparator countries, especially given that for three decades the UK has had amongst the highest numbers of young people in tertiary education studying business and management courses. However, the idea that UK displays serious deficiencies in management quality has encouraged the UK government to undertake more detailed evidence reviews and surveys of UK management practices and the initial results of this research are broadly in line with expectations in that structured management practices are more evident in larger firms, foreign firms, services, non-family-owned firms than in small firms, domestic firms, manufacturing, and family-owned firms (ONS 2018). Further results should become available from late 2018 onwards and potentially this will offer important new evidence and insights regarding the UK's dwindling 'technology' component of productivity growth.

In terms of the possible labour market explanations, the UK is not alone is experiencing falling churn rates, in that churn rates have fallen in many countries in the aftermath of the 2008 crisis. Yet, even with falling mobility, the UK still remains one of the most geographically mobile countries in the world (McCann 2016) and UK employment levels remain very high, so labour market rigidities would appear to be an unlikely explanation for productivity falls in comparison of our competitor countries.

In terms of the issue of technology adoption, the productivity dispersion between the top-performing 10% of firms and the bottom-performing 10% of companies in the UK is higher than in our competitor countries, and since 2001 these gaps have also increased by 2-3 times more in the UK than amongst our competitor countries. In the UK services sector this gap is now 80% higher than in other countries and in UK manufacturing it is around 50% higher (Haldane 2018a). In the years following the new Millennium the levels of dispersion in UK manufacturing productivity were not particularly different from those in our competitor countries, and even in service industries' productivity they were only 25% higher than in other countries. The dispersion started to increase slowly from 2004 onwards but the dramatic rise coincided with the immediate aftermath of the 2008 Global Financial Crisis (Haldane 2018a). Indeed across almost all UK sectors and regions, between 2004 and 2014, the firms in the top 0.1% of the productivity

distribution have outperformed those in the top 1% of the productivity distribution, who in turn have out-performed those in the remaining 99% of the productivity distribution (Haldane 2018a). Given the UK's levels of connectivity and openness as a country, our aggregate productivity levels are approximately 18% below what would be expected on our overall levels of international openness (Haldane 2018a). The most productive UK firms more than hold their own by international standards, whereas the lower-performing sections of UK industry under-perform by international standards. Around half of UK firms have seen no productivity gains during the 21st century and in some sectors and regions the figure is closer to two-thirds of firms.

Haldane (2018a) argues that these observations suggest that knowledge-diffusion and absorption processes within the UK economy are both limited and increasingly stalling. This is further supported by the fact that not only is the global ranking of the UK's performance in terms of knowledge-diffusion much lower than its innovation ranking, but its knowledge-diffusion ranking has also deteriorated sharply in recent years (Haldane 2018a). In terms of R&D, Haldane (2018a) therefore describes the UK economy as a 'hub without spokes', good at R but not at D, where D here includes not only Development, but also Diffusion and Dissemination to the long tail. In particular, while new technologies are adopted, their levels of penetration appear to be much higher in leading firms at the technological frontier than other firms inside the technological frontier (Haldane 2018a)⁸.

Taking all of these pieces of evidence together suggests that the apparent deterioration or stalling of the UK's knowledge-diffusion and knowledge-absorption processes is nowadays taking place almost right up to the technological frontiers and also in all regions of the UK except for the most productive firms and regions. However, Haldane (2018b) argues that this is part of a more general pattern. In particular, on the basis of more than seventy years of data from the 1950s onwards Haldane (2018b) argues that similar observations regarding the divergence in innovation and technological penetration that is evident amongst firms is also evident across countries, with those countries at the technological frontier experiencing greater technological penetration than those inside the frontier, especially since the 1980s (Haldane 2018b).

However, recent analyses suggest that in the case of the UK it has been the under-performance of the *more productive* firms (Schneider 2018) and the *larger* firms (Giles 2018) which has dominated the UK's productivity downturn (Schneider 2018). Moreover, these under-performing high productivity firms which account for three-fifths of the productivity fall only account for one-fifth of output, and are concentrated in sectors such as telecommunications, financial services excluding insurance and pensions, services auxiliary to financial and insurance services, retail (excluding vehicles), various primary extraction and power sectors, and the manufacturing of basic pharmaceuticals, basic metals and metals parts (Riley et al. 2018). Many of these were the same sectors which dominated UK productivity growth in the period before the crisis (Riley et al. 2018).

The diffusion arguments and observations do not explain why it is that the fall in productivity amongst the UK's highly-productive companies, as reported by Schneider (2018) has tended to be in firms which were close to, but not on, the technological frontier, while those firms at the technological frontier have tended to surge even further ahead (Haldane 2018a), unless we also introduce *economic geography*. The Centre for Cities (2018) found that it is the exporting firms in the parts of the UK outside of London and the Greater South East, and particularly those in cities outside of London and the Greater South East, that have experienced the most significant productivity falls since the 2008 crisis. This is critical, because both exporting firms and foreign-owned firms display higher productivity levels (Haldane 2018a). If exporting firms outside of London and the Greater South East which have faced the most severe productivity contractions

⁸ Similar observations are also evident for countries, with those at the technological frontier experiencing greater technological penetration than those inside the frontier (Haldane 2018b).

since the 2008 crisis, then this provides not only an explanation for the observations of Schneider (2018). evidence but it also puts the UK's economic geography centre-stage in these debates. It implies that that the UK's technology Diffusion and Dissemination issues are also very spatial in nature, and this argument fits the picture evident in the OECD regional productivity statistics (McCann 2016). However, the increasing productivity dispersion between the leader and follower regions documented⁹ by Haldane (2018a) is neither automatic nor necessarily reflective of a more general worldwide phenomenon as Haldane suggests. Indeed, the evidence suggests that there exists a much more diverse picture at the regional levels than these national figures suggest. In particular, across the OECD, since 2000 there are very different broad types of growth relationships between technological frontiers and regional growth (Oliveira-Martins 2018). In countries such as Spain, Germany, Austria, Czech Republic, Italy, Poland, Portugal and Romania, national productivity growth has been dominated by regions inside the technological frontier catching up the leading technological frontier regions. In contrast, in countries such as the UK, France, Finland, Greece, Bulgaria, Hungary, The Netherlands, Slovakia, Denmark and Sweden, it is the technologically leading regions which have dominated growth with the lagging regions falling behind (Oliveira-Martins 2018). Indeed, the UK is one of the countries in with the growth imbalances between regions has been the most pronounced over recent decades, and as yet we still are not clear as to why this is the case.

Another area where explanations about the UK's poor productivity are often sought concerns the entrepreneurial dynamism of the UK economy. The UK is a highly deregulated economy in which many of the key foundations for entrepreneurship are already in place across all UK regions (European Commission 2013). Moreover, it is well known that many areas of innovation are driven by new firm start-ups which embody the new and emerging technological possibilities and turn these into growth opportunities. Over the last decade, in the UK interest has tended to focus on the role played by high growth start-up firms, or so-called 'gazelles', start-ups and SMEs which are able to scale up rapidly (NESTA 2009). Although these account for only 6% of new firms, they account for almost 50% of the jobs generated by new firms and display far higher productivity than the average SMEs (NESTA 2009). However, rising concerns about the 'long tail' of poor productivity UK firms, of which a disproportionately large share are small firms, means that interest is also now shifting more towards understanding the productivity inhibitors operating in the less dynamic parts of the SME environment.

It is well documented that the US has seen dramatically falling entrepreneurial rates in all regions and sectors (EIG 2017; Hathaway and Litan 2014) in which the number of high-growth start-up firms in particular has dwindled, especially since the New Millennium (Decker et al. 2015; Alon et al. 2017), although metropolitan urban areas still display a slightly more dynamic entrepreneurial environment than non-metropolitan areas (Hathaway and Litan 2014). The UK has not experienced similar downward trends in either new firm formation or the share of high growth rate firms, and if anything has seen slight increases in both (Hart et al. 2017; ERC 2018), so theory would suggest that the dynamism of the UK economy ought to have been potentially enhanced relative to that of the US economy, at least in this regard. However, the productivity data do not point to this outcome, so the role played by UK entrepreneurship in fostering productivity levels and productivity growth still remains somewhat unclear.

Other possible lines of enquiry regarding the UK's productivity problems concern the effects of the costs of developing new ideas (*The Economist* 2017c; Bloom et al. 2018), the impacts of demographic ageing (McCann 2017), problems relating to the UK's financial systems, questions about the functionality or quality of the UK's infrastructure (*Financial Times* 2018c), the UK's policy settings across different domains such as skills and training, and also its overall institutional and governance set-up. All of these avenues of enquiry may provide clues as to the decline in 'technology' embodied in the residual, and each of these areas are currently being

⁹ In Table 1

addressed and investigated by our ongoing PIN+ Evidence Reviews and Gap Analyses. However, in the particular case of the UK there is also one other aspect which has largely been ignored in previous productivity narratives, but which now is becoming increasingly central to government policy-thinking, and is the question of geography, and in particular of economic geography.

On the basis of all of the available evidence Haldane (2018a) concludes that the challenge of enhancing UK knowledge, innovation, technology and best-practice Diffusion and Dissemination is the most urgent. In particular, he argues that both the *diffusion infrastructure* and the *financial infrastructure* of the UK need to be upgraded. Drawing evidence from the institutional fabric of the German model, he compares the UK business-support set-up with that of Germany where a system of regionally-based industrial banks with different tiers target different size-cohorts of local firms, and operates alongside innovation institutions supporting German business, including the Fraunhofer institutes (Haldane 2018a). UK firms appear to have much more limited opportunities for accessing bank financing or innovation support, and this is especially so for SMEs, while the UK Business Bank agenda is tiny in comparison to that of Germany. However, the Centre for Cities Yet, whether we consider that the UK's lack or limited availability of these types of infrastructure are causally related to the productivity problems and potential solutions required us to dig a little deeper regarding the key idea that diffusion and dissemination are fundamental to the UK's productivity problems. We can do this by considering the different aspects of the UK's productivity puzzle.

It is possible to argue that there are in reality *three* UK Productivity Puzzles, namely the *productivity level puzzle* and the *productivity growth puzzle* as articulated by Schnieder (2016) and also a *regional productivity puzzle*, which both shapes and is shaped by the other two productivity puzzles. The *regional productivity puzzle* concerns why productivity gains in the more prosperous parts of the UK consistently fail to diffuse across the rest of UK in a manner which is typical of most other advanced economies. The Centre for Cities (2018) recent findings provide robust evidence pointing to these economic geography issues as being central to the current UK productivity downturn. At the same time, the UK's growing interregional inequalities also largely explain why the country's overall productivity performance remains only very modest in comparison to our competitors (McCann 2016), even while London and the Greater South East have enjoyed consistently high productivity levels and growth over the last three decades. This lack of productivity diffusion effects within the UK is especially puzzling because the UK institutional set-up in which markets operate is broadly very good and the UK as a whole is rather small in area, indeed smaller than the US state of Wyoming, and England which accounts for approximately 85% of the UK population is smaller than the US state of Iowa. A combination of small country and well-functioning markets ought to imply fairly easy and rapid 'technology' transmission and diffusion mechanisms throughout the country, but that is not what the productivity data suggest.

The economic geography of the UK tells a story of a longstanding lack of technology diffusion between regions, to a degree which is almost unprecedented in other OECD countries. Nor can declining UK interregional human capital mobility be an explanation (Shuttleworth et al. 2018) as this also occurs in the US (Partridge et al. 2012, 2015), and the UK today is still more mobile than most advanced economies which are richer than the UK. The UK's *regional productivity puzzle* or alternatively the UK's *geography-technology diffusion puzzle* concerns the question of - why is it that UK interregional productivity differences are so great over such short distances when a good institutional set-up ought to allow for rapid and efficient technology diffusion across all regions?

There are strong grounds for believing that the *regional productivity puzzle* relates to the interactions between the UK economic geography and the UK institutional set-up. Yet, before we can consider in more detail how the questions of economic geography may relate to

questions of UK productivity, is important to set these debates in a broader and longer-term setting.

What is often referred to as the ‘productivity puzzle’ has slightly different meanings in different countries, but these types of discussions, including the UK discussions, actually derive from a much longer tradition. The first time where the so-called ‘productivity puzzle’ or ‘productivity paradox’ was explicitly discussed in terms of a *country* was New Zealand (McCann 2009), with continuous discussions on the theme first emerging from the mid-1990s onwards (Easton 1996; OECD 2003; de Serres et al 2014). In the case of New Zealand, the basic puzzle or paradox derived from the fact that although wide-ranging (and textbook in design) structural and institutional policy reforms were implemented throughout the economy during the 1980s, the economy did not seem to respond to the reforms in the ways that were anticipated. The expected links between competition and institutional reform and productivity growth never fully materialized, although during this same period between the mid-1990s and 2008, almost all other OECD economies were experiencing strong and consistent growth.

The essential nature of the puzzle or paradox was that the internationally-accepted analytical frameworks and standard growth arguments appeared to have little or no traction or relevance to the NZ case, and this was the first time that orthodox explanations (*The Economist* 2018a) were really questioned. In many ways the UK today faces similar problems to New Zealand in that many of the orthodox and internationally-accepted productivity explanations seem to have little relevance or traction for the UK.

In reality, however, policy-makers in NZ were looking in the wrong place for answers and ignoring the fact that new generations of economic geography models (Krugman and Venables 1995) provided robust explanations as to what had taken place (McCann 2009; OECD 2014). The economic geography logic of modern globalization since the 1990s onwards had fundamentally changed since the period of New Zealand’s 1980s structural reforms, reforms which were based on a pre-1980s understanding of trade and economic performance, in which neither scale nor distance were seen as of particular relevance in comparison to competitive factor allocations, flexible currency prices and also market and structural flexibility. In contrast, in the modern global economy of the late 1980s onwards issues of scale, proximity and market access had become even more important in the modern era, not less important, even though transport and communications costs had fallen by so much. As such, New Zealand’s productivity was hampered by geography in a manner which had never before been apparent, even though its institutional and structural reforms were so fundamental and well-crafted. In the case of NZ economic geography, institutions and productivity were interrelated in a manner which had previously not been understood. New Zealand was caught in a geography-institutions trap whereby improved domestic institutions facilitated greater outflows of both people and capital, primarily to Australia, with few spillover or feedback mechanisms benefitting New Zealand. The lessons of New Zealand are also highly pertinent to the UK because they imply that economic geography, and in particular the differential responses of the different regions of the UK to modern globalization, are likely to be key components of the today’s UK productivity puzzle(s), over and above issues such as competition, market flexibility and institutional reform. Key aspects of the UK productivity puzzle are also related to geography, and institutions, although in a manner which is quite different to that of New Zealand.

4. The UK Regional Productivity Puzzle

The nature of the productivity problems, challenges and puzzles faced by the UK today are in various ways markedly different to those which exist in most other advanced economies, and these differences are primarily due to questions of economic geography and institutions (McCann 2016). In particular, it is scale of the UK’s interregional productivity variations which marks the UK out. Every region of the UK has both world-leading and highly productive firms as

well as many low productivity enterprises. However, in the UK there is a specific geographical logic to these patterns which is rather different to most other OECD countries.

In terms of productivity, the key distinction is between being part of the London and its Greater South East hinterland economy, or being outside of these regions (Harris and Moffat 2012), and in the UK these regional features dominate questions of large cities versus towns or rural areas. The extent to which these low productivity problems are regional in nature is almost unparalleled amongst the advanced OECD economies, and it is this geographical aspect of the UK's productivity performance about which we probably know the least. Observation OECD and EU data suggest that there are few, if any, underlying productivity problems, puzzles or paradoxes in core areas of London and its immediate hinterland area, regions which consistently outperform both OECD and EU productivity indicators and whose productivity performance has remained robust in the post-Crisis era. London has much higher share and a markedly less skewed distribution of medium and high productivity firms than other UK regions (Haldane 2017b). Yet, this is not simply a matter of regional differences in sectors because these same regional patterns are also largely replicated within sectors (McCann 2016). Nor are these outcomes due to regional differences in market efficiency because by both OECD and European standards both the UK as a whole (LTPD 2018) and also all UK regions today exhibit high levels of total factor productivity (Beugelsdijk et al. 2017). In contrast, outside of London and its hinterland, UK regions systematically underperform both OECD and EU productivity benchmarks by a degree which is similar to the over-performance of London and its hinterland (McCann 2016). Indeed, at the local area level the UK's enormous interregional productivity differences are today as great as those which exist across the whole of the Eurozone. These same economically weaker areas, many of which are large urban areas outside of the London hinterland area, also appear to have been the most vulnerable in the post-Crisis era (Centre for Cities 2018). The lack of any productivity upturn since the 2008 crisis allied with greater business insolvencies (*The Economist* 2017d) is overwhelmingly dominated by the experiences of the geographically non-core regions of the Midlands and the Northern regions of England plus Wales and Northern Ireland, while there have been productivity upturns concentrated in the geographical core of the economy of London and its surroundings (McCann 2016). The weaker regions act as a productivity drag on the overall economy, and their problems appear not in any way to be ameliorated by any enhanced productivity in the core of the economy in London and the South East. Moreover, if in reality the productivity growth of the weightless parts of the economy is actually under-valued in current GDP measurements (Coyle 2014) while the performance of other sectors is likely to be over-valued (Byrne et al. 2017a,b), then the fact that the UK's knowledge-intensive service industries are so heavily dominated by London and the Greater South East economy means that the UK's interregional productivity variations are likely to be even greater than is currently understood.

We know that when measured at the level of Metro areas the UK inter-city productivity variations are less than the interregional productivity variations (Gal and Egeland 2018), but this depends almost entirely on the definition of London used and these OECD Metro areas only account for 40% of the UK population. Moreover, within the UK the broad north-south divide in city productivity within England has also increased in recent years (Martin et al. 2018), so the overall picture does not change. The central conundrum therefore is why exactly the UK exhibits by far the highest inter-regional variations in both GDP per capita and also total factor productivity in western Europe (Beugelsdijk et al. 2017) and of any large advanced OECD economy, and why the weaker UK areas are also less economically resilient. In other words, the differences between the pre-1980s and post-1980s macroeconomic-productivity dynamics which are evident nationally are today both evident in the UK, with the core regions of the UK economy conforming more to the pre-1980s features and the non-core regions of the UK economy conforming more to the post-1980s features (*The Economist* 2017a).

The extent to which the productivity performance of the UK prosperous regions¹⁰ has outperformed both EU and OECD averages over the last two decades is almost exactly countered by the extent to which the UK's weaker regions¹¹ have under-performed those same averages over the same period. While London and its hinterland are prosperous on almost every indicator, today almost half the UK population live in regions whose productivity levels are no better than the poorer parts of the former East Germany and poorer than the US states of Mississippi and West Virginia (McCann 2016). Indeed, given the UK's geographical scale, the UK interregional contrasts are something akin to US states of Massachusetts and Connecticut being adjacent to Alabama and Mississippi. Given that the population weighting of these two parts of the UK economy are almost the same, the overall result is that the UK's productivity performance has not improved relative to our competitors since 1991 or even 1971 (McCann 2016). Today the UK is the 14th richest country in Europe when defined in terms of GDP per capita, and the UK has not overtaken a single country in terms of productivity during the last three decades, since it overtook New Zealand in 1983 (McCann 2009).

Part of the argument is that the UK appears to exhibit major geographical variations in the allocation of knowledge, innovation and communications assets, and there is very little evidence of any knowledge spillovers emanating beyond London's hinterland (McCann 2016). The geographical differences in productivity-enhancing assets are also closely related to governance and institutional issues (McCann 2016), which themselves may also contribute indirectly to regional productivity differences. Understanding the causes and consequences of these variations is essential for understanding the UK's overall productivity performance. Meanwhile, productivity-related inequality pressures on social cohesion, health, longevity, (Buchan et al. 2017) and wellbeing (McCann 2016) are also far more of an interregional issue in the UK than in any other advanced country, with major differences in each of these societal characteristics between different places within the UK. Indeed, the average demographic age differs between UK cities by seven years (MGI 2016) and by twenty years between local authority areas (Howse 2017) while local housing costs vary by a factor of more than five. These variations differ spatially from each other so within the UK the social cohesion and demographic inhibitors of productivity as well as the drivers of productivity differ by region to an extent which is not evident in most other advanced economies. As such, examining UK productivity issues without explicitly addressing the spatial dimensions of the UK's productivity performance and problems misses much of what is specific and challenging to UK productivity debates.

From a national governance perspective these enormous interregional productivity disparities are problematic because they greatly limit the efficacy of 'national' policies, especially in a highly-centralised state such as the UK. The reason is that the likelihood of any particular region reflecting a hypothetical 'representative' region on which the policy design is based is very low indeed for almost all regions, with policy decision reverting to those which maintain the interests of the dominant capital city (Barca et al. 2012). Moreover, in the case of the UK, the combination of the asymmetric impacts of modern globalization and the highly centralised UK governance system means that the UK's non-core regions have been caught in a geography-institutions trap whereby there appear to be little or no spillovers or feedbacks from the core regions and no devolved power to respond to the institutional trap (McCann 2016). What took place in New Zealand at a national level appears to have taken place in the UK at a regional level, in the UK's non-core and peripheral regions.

Indeed, in many ways the productivity differences between the UK core and non-core regions are more reminiscent of a developing or a transitioning country than an advanced economy. This also potentially limits the efficacy of many policy narratives or lesson to be gleaned from the experiences of other advanced economies because the UK case is just so different, even

¹⁰ London, South East, East, South West and Scotland

¹¹ West Midlands, East Midlands, North West, Yorkshire & Humberside, North East, Wales and Northern Ireland

from other English-speaking countries such as the USA, Canada, Australia, New Zealand or the Republic of Ireland where many of our policy ideas tend to be borrowed from.

Yet, precisely why these productivity linkages and spillovers largely fail to travel and diffuse across the UK is still in many ways unknown. Knowledge-related linkages, along with technical and technology-related productivity linkages and spillovers, are mediated via a variety of possible channels including market mechanisms, trade relationships, inter-personal networks, inter-firm linkages, inter-organisational networks and intra-organisational linkages, and these are also facilitated or constrained by a variety of factors such as labour mobility, digital infrastructure, transport and infrastructure assets, land use regulations, demographic changes, and financial linkages. Following the Haskel and Westlake (2018) logic of the four Ss, it appears that the balance of these within the UK tends towards concentration and centralisation in and around the London economy in a manner which is very different to many other advanced countries (OECD 2018). Both smaller economies such as The Netherlands or Denmark and larger economies such as Japan and Germany are far more equal interregionally in terms of productivity than the UK. Yet, standard growth accounting approaches can tell us almost nothing about why this is the case.

Productivity is a result of complex interactions between factors of production and institutional settings and systems-type thinking argues that a system is only as strong as its weakest links or interaction mechanisms. When we adopt an interdisciplinary perspective on productivity, these various productivity channels are not entirely independent of each other and finding ways to articulate these linkages is essential. It will require a multi-disciplinary approach to achieve this, but even here we are hampered because of limited data availability. The lack of a citizen registration system means that the UK has no centralised system of data management, unlike many other European countries. Therefore finding ways to better link datasets in order to improve our knowledge of productivity drivers and inhibitors is imperative (UKDF 2013), and this also critical for developing a more comprehensive place-based understanding of the UK's productivity challenges.

The importance of making real progress in our understanding of how these productivity drivers and inhibitors are related to geography was highlighted in the recent 2017 Green Paper on Industrial Strategy (HM Government 2017a) and then subsequent 2017 White Paper (HM Government 2017b) both of which explicitly linked place-based dimensions to productivity. Moreover, these issues are likely to become even more critical in the future as the productivity gaps between the more prosperous and less prosperous UK regions are likely to widen. This is because the UK's economically weaker and non-core regions are relatively more vulnerable to (i) Brexit-related trade risks (Chen et al. 2018) due to their relatively greater economic dependence on EU markets (Los et al. 2017); (ii) robotisation and 'industry 4.0' (Centre for Cities 2018; *Financial Times* 2018d) due to their industrial structures, and; (iii) demographic change due to their faster ageing profiles (MGI 2016).

Inequality is a threat to our democracy (Wolf 2017) and recent political shocks in many countries including the UK have raised questions about whether our institutional set-up is sufficiently robust and resilient to cope with further shocks. In the UK the importance of these issues is reflected in the wide-ranging moves towards a more devolved governance system. If well implemented this has the potential to redefine and reshape many of the productivity-related linkages and factors described above, although as yet it is too early to tell what the long-term productivity outcomes of these governance reforms will be.

In order to throw light on these various issues our Productivity Insights Network+ Co-Investigators have been working on a series of *Evidence Reviews and Gap Analyses* to identify the state-of-the-art in our current knowledge and understanding of productivity drivers and inhibitors as they relate to both the international evidence as well as the UK-specific evidence.

These ongoing reviews have been conducted on a thematic basis which the major themes reviewed being: Innovation, Knowledge and Technology (Robert Huggins); FDI, Capital and Investment Markets (Richard Harris); Entrepreneurship, Small Firm Business Growth and Productivity (Andrew Henley); Skills, Education and Labour Markets (Maria Abreu); Demography and Ageing (Katerina Lisenkova); Well-being and Inclusive Growth (Leaza McSorley); Transport Infrastructure (Iain Docherty and Ian Waite); Regional and City Productivity Debates (Ben Gardiner); Governance, Institutions and Organisations (Gary Dymski); Scale-Up Challenges of SMEs (Colin Mason); Work and the Workplace (Kirsty Newsome); Data Challenges (Vania Sena). This work is continuing, but some of the emerging themes, issues and questions arising from the reviews include:

5. Summary of the Results from the Productivity Thematic Evidence Reviews and Gap Analyses

Innovation, Knowledge and Technology

- Knowledge diffusion and innovation systems are acknowledged as a vital component for improving productivity and economic development, with cluster and agglomeration being a key themes of economic theory and policy.
- Less is known, however, with regard to innovation systems and cluster ‘failure’ and the extent to which this occurs due to a lack of effective coordinating and governance mechanisms
- Open innovation practices are advocated as an important source of productivity gains, but the evidence to support this is patchy
- *Regional Innovation Paradox* - The inability of lagging regions - i.e. those with low productivity - to effectively utilise public support. It is argued that such regions lack the absorptive capacity in both the public and private sectors to make good use of such funding, but how can we overcome this?
- A gap normally separates the production-possibility frontier, i.e. the innovations available to maximize productivity, and their use.
- Long tail of low productivity firms
- McKinsey Global Institute analysis of three principal drivers of the productivity slowdown: weakened (post-crisis) demand, waning of ICT effects, and limited take-up of digitisation
- McKinsey Global Institute estimates that not all firms and industries in the United States have taken full advantage of ICT for productivity.
- Understanding the reasons for this gap remains a significant challenges for researchers and policymakers.
- Is it poor management, a lack of knowledge, a lack of diffusion effects? Why does it appear to be different in UK from other countries – Japan, The Netherlands, Finland, New Zealand, Canada?
- The long-run decline in the ratio of patents to workers engaged in R&D suggests a possibility of increased difficulty in producing innovations, even though many countries have not experienced rises in patent enforcement costs.
- Another possibility is that the composition of industrial sectors has moved toward an increase in the activities of those sectors that are less likely to patent inventions
- Another idea is that the costs of new knowledge are increasing, not decreasing. McKinsey argue, ‘there is disagreement around the impact current technological innovation is having on the economy and what potential it has to once again boost productivity growth’

FDI, Markets and Investment

- The detailed micro-econometric literature has found no consensus emerging on what explains the UK’s productivity puzzle
- Total factor productivity declined almost exclusively in the (distributive and hospitality) service sector, and in smaller plants. However, when the data are sub-divided into plants that opened, closed and continued throughout 2007-12, they found that continuing plants in both manufacturing and services experienced significant falls in TFP (Harris and Moffat 2017)

- Manufacturing new plants had much higher TFP that helped to offset the decline experienced by continuing plants, while in services such offsetting did not happen
- A large part of the reason for the fall in TFP was as a result of a 2008-12 negative 'shock', and not changes in foreign ownership, or spatial factors - although these are important determinants of TFP levels
- Evidence confirming that finance impacts on long-run economic growth through capital accumulation and enhancing the productivity of factor inputs, especially through effective allocation of resources
- Causality runs from greater credit depth to higher growth for only a handful of countries, one of which is the UK
- Variety of US evidence shows the impact of financial deregulation on boosting both TFP growth and real investment in physical assets, especially in manufacturing – this is likely due to facilitation of firm entry and innovation
- The results of Harris and Moffat (2012) showed that plants located in cities generally performed better than plants in the same region outside of these cities; but with the exception of Bristol, no city had significantly higher TFP levels than the South East.
- This suggests that spatial externalities associated with (a non-London) city location were not as important as the benefits of being situated in the London and South East region
- Empirical microeconomic research priorities (e.g. using Orbis from Bureau Van Dyke):
- Analyse the motivations driving firms' engagement in FDI and trade, and its impact on productivity, including greenfield and brownfield, technology-sourcing versus exploitation, direct and indirect (spillover) effects, entry effects and the impact on competition, with a particular emphasis on explaining spatial differences across various UK sectors with associated likely 'branch-plant' effects.
- Examine the importance of investment in knowledge (intangible) assets, firms' absorptive capacity, innovation outputs, and how these relate to TFP, and whether there are significant differences across sectors and spatial locations.
- Discuss the role of competition, firm entry and exit (i.e., Schumpeter-type 'churning'), in past and future trends in globalisation and regulation, including the impact of Brexit, on productivity, accounting for likely different responses across sectors and spatial locations.
- Provide a deeper understanding of the specific shock effect of the Great Recession on UK productivity, both to understand its causes, whether it has resulted in permanent changes in TFP, and to build resilience for the future.
- Identify the extent to which location (such as clustering and agglomeration, and hence a wide range of spillover effects) impact on productivity, and why some locations have more 'leading/frontier' firms compared to others.

Entrepreneurship, Small Firm Business Growth and Productivity

- The UK self-employment rate has grown from under 8% in 1980 to around 15% in 2015, with growth particularly marked since the 2008 global financial crisis. Microbusiness numbers (i.e. below 10 employees) show a similar pattern.
- It is still the case that around 75% of the UK self-employed are business owners, as opposed to working as free-lancers or subcontractors
- In principle there is no guaranteed connection between SME growth and productivity-enhancing improvement in value added.
- SME owners or decision-makers may often suffer from "don't turn business away" syndrome, and therefore operate away from the efficiency frontier. This has arguably contributed, at the level of policy design, to a preoccupation with "fast-growth" or "high growth" firms
- Absorptive capacity, the ability of the business to translate knowledge into performance, is largely a concept explored in the management and innovation literature. It seems likely that SMEs display high heterogeneity in absorptive capacity, but we need to understand more about this
- Aside from understanding its association with indicators of workforce skill, R&D intensity and access to knowledge spillovers, the issue of absorptive capacity has tended to be avoided by mainstream productivity analyses

- Research is edging towards an understanding of productivity drivers in SMEs but a thorough analysis (in the British context) requires matched/linked datasets which include both data on the firm and on the characteristics/capabilities of owner-managers
- Building from the somewhat limited evaluations of more “holistic” approaches to improving SME leadership and management (e.g. the Lancaster LEAD programme), there remains an important unresolved question as to whether it is specific management practices which raise productivity or the promotion of improved SME leadership mindsets, networking and ability to access tacit knowledge
- Small business formation and performance appears to display high levels of spatial dependence. While it is straightforward to model and describe this, there is still a need for significant work in terms of explaining spill-overs
- In particular there is scope for more research to understand how local norms and entrepreneurial culture considerations influence small business performance

Skills, Education and Labour Markets

- The returns to schooling literature has found an individual average rate of return of around 6.5% across a majority of countries, but there is significant variation depending on the measure of schooling used → returns tend to be higher for higher income groups
- There are persistent regional differences in the percentage of pupils achieving 5 A*-C GCSEs (including English and Maths), with highest values in London (60%), and lowest in the East and West Midlands (55%). The gap has increased since the 1970s.
- The UK Employer Skills Survey shows that skill gaps reported by employers are lowest in London and the South East, and highest in the East and West Midlands, and Yorkshire and the Humber
- Different roles played by international versus interregional migration are important
- Job skill surveys, such as the UK Employer Skills Survey (UK CES) and the Skills and Employment Survey, have a larger sample sizes and are regionally representative, but there is relatively little research at the regional level
- There is a large amount of research on human capital externalities and migration propensities arising from cognitive skills, but very little research on the relevance of non-cognitive skills (personality, inter-personal skills, attitudes to risk, adaptability)

Ageing and Demographic Trends

- US and European evidence that an increase in the proportion of workers aged 55-64 is associated with an economically and statistically significant reduction in the growth rate of labour productivity and TFP
- Workers (40-49) having a strong positive impact on patent applications and older workers (50-59) having a strong negative impact on patent applications
- Aspects of productivity, such as experience, leadership and managerial skills, knowledge of human nature usually improve with age but they are much harder to measure.
- Productivity is also difficult to measure at the level of individual, since it is a group phenomenon → it is the combined sets of skills and experience which counts
- Education and training can also help to slow or even reverse the decline in productivity with age. However, fewer training opportunities are offered to older workers, because the beneficial effects of training can be used for shorter period
- As the population becomes progressively older this will influence the sectoral composition of demand and supply towards services, especially low productivity-growth and labour intensive health, care and leisure services
- Decline in the ratio of the between the working-age population and the non-working age population → big differences between places
- Regional differences in ageing depend crucially on human-capital migration interactions
- Impacts on long-run fiscal devolution regarding health and social care

- Baumol's Law and the Moynihan Corollary?

Well-being and Inclusive Growth

- The OECD (2016: 5) highlights that going forward for OECD countries “there is no guarantee that the benefits of higher levels of growth, or higher levels of productivity in certain sectors, when they materialise, will be broadly shared across the population as a whole. On the contrary, there is a risk of a vicious cycle setting in, with individuals with fewer skills and poorer access to opportunities often confined to operate in low productivity, precarious jobs”
- Young people have now replaced the elderly as the group most at risk of relative poverty (OECD 2016)
- Evidence from Germany and UK that better-managed firms recruit and retain workers with higher average human capital. Thus indicating that there may be a link between better managed firms and worker productivity, and that “lower happiness is systematically associated with lower productivity” (Oswald et al 2015)
- Productivity remains a direct method of increasing wage for typical workers Stansbury and Summers (2018), although the link between productivity and pay is weakening Mishel and Bivens (2015) → due both to compensation inequality and reductions in labour's income share
- Addressing shortfalls in soft infrastructure (skills, access to know-how) will be an important aspect of improving living standards and economic potential in towns and areas that are not going to be part of a high-productivity urban agglomeration (Industrial Strategy Commission 2017: 52)

Transport Infrastructure

- There is very significant disagreement about the causal linkages between the outputs of infrastructure investment and economic gains
- Decades of research have *not* been able to pin down the causal relationships between transport investments and economic performance as effectively as policy makers might like
- Although precisely quantifying the economic impact of transport investment is difficult, there is substantial empirical evidence in favour of the assertion that locations with poor quality transport are at a disadvantage when compared with those places with high quality transport infrastructure
- Standing Advisory Committee on Trunk Road Assessment (SACTRA), 1999) set out a series of six specific positive outcomes that empirical evidence suggested can occur as a result of transport investment, and therefore might explain the economic value of investment in improved transport:
- New transport infrastructure can have multiple economic effects at different scales: (1) Reorganisation or rationalisation of production, distribution and land use; (2) Extension of labour market catchment areas; (3) Increases in output resulting from lower costs of production; (4) Stimulation of inward investment; (5) Unlocking previously inaccessible sites for development; (6) A ‘catalytic’ effect whereby triggering growth through the elimination of a significant transport constraint unlocks further growth
- Eddington (2006) Review → noted the increasing gap in standards of connectivity between most UK cities and those increasingly commonplace across much of urban Europe
- Eddington went on to make two further important points: first, that the cumulative impact of several relatively small improvements to the transport system can often be at least as big as that of the large ‘megaprojects’
- Even if the links between better transport and improved economic performance are hard to measure precisely, then more compelling evidence for the link might be found in those places where poor transport acts as a significant constraint on growth
- Displacement versus additionality is a crucial discussion
- Additionality of infrastructure may depend on threshold effects (e.g. for agglomeration or more general connectivity) and system design effects → monocentric versus network switching systems

- Different impacts on tradeables versus non-tradeables production locations?
- Department for Transport regards estimates of the actual economic uplift – e.g. improved productivity and additional overall GVA – generated by transport schemes as to be at best *evolving*, and often *indicative*. This is not only because of the uncertainties about the causal mechanisms highlighted by the underpinning research, but also because the actual numbers generated in such estimations can vary significantly with relatively minor adjustments to the assumptions used, such as the cost of fuel or average vehicle occupancy

Regional and City Productivity Debates

- There is a persistent prosperity gap between the Northern regions and the rest of the UK, which was mostly driven by a performance gap rather than an employment gap
- The gap in skills (as proxied by highly-qualified workers) is the indicator which mirrors the performance gap most closely, while measures of investment, agglomeration, and research-innovation also show persistent gaps between the North and its comparators
- The results of Martin et al. (2018) show that Northern cities led productivity growth over 1971-91 southern cities then led after 1991. However, at the same time, the rate of productivity growth slowed across almost all cities between these two periods.
- There is evidence of considerable structural convergence across cities and a general tendency for the degree of specialisation to fall (Martin et al 2018).
- Structural change – and especially the shift from manufacturing to services - has had a negative impact on productivity growth across almost all UK cities (Martin et al. 2018)
- But within-sector productivity developments - while positive and outweighing structural change effects, have also declined over the past forty-five years, as well as varying across cities (Martin et al. 2018)
- The growth of employment accounts for just less than one-third of GVA growth
- GVA growth is driven more by the utilisation of higher-skilled labour. However, several high comparative advantage sectors (such as financial services, advanced manufacturing) comprise relatively large proportions of professional and skilled occupations, but they also have relatively high productivity and so their higher output growth tends not to create many jobs
- Policies to promote the UK's sectors of high comparative advantage will likely benefit the macroeconomic balance, but potentially may exacerbate sectoral and spatial disparities
- Successful regions tend to have a larger than average share of the comparative advantage sectors and so boosting growth in these sectors will tend to further widen spatial disparities
- Spatial externalities associated with (a non-London) city location are not as important as the benefits of being situated in the London and South East region
- Questions about knowledge spillovers, knowledge diffusion, knowledge dissemination, knowledge transfer
- UK regional GDP per capita or TFP differences are similar to the whole of the Eurozone or Mississippi and West Virginia next to Connecticut and Massachusetts
- OECD evidence on the crucial role played by tradeables versus non-tradeables in city or regional development
- Growth in dispersed governance countries dominated by catch-up of weaker regions (convergence) whereas growth in centralised governance countries dominated by leading regions (divergence)
- UK is one of the most divergent countries in OECD since the 1990s

Governance, Institutions and Organisations

- To what extent can the observed stagnation in UK productivity growth be understood as a side effect of the sustained austerity policies?
- If the budgetary squeeze has constrained effective demand, then the aggregate 'output' figures may reflect binding demand-side constraints, not capacity limits.
- This could be so if the economy has adjusted to a sustained period of reduced demand through making price adjustments rather than quantity adjustments in the labour market

- Has the margin between offered rates for business credit and the bank rate widened in the post-crisis period?
- There have been several distinct configurations of business-support/industrial strategy, government/cabinet-level offices and agencies in the past several decades
- In a period of rapid industrial change and technological advance, is the instability in national-agency and governance architecture a factor in the slowdown of productivity growth for the UK? → Conversely now, positive developments now with City-Regions?
- To what extent are national and regional business-encouragement efforts on the part of national government pulling in the same direction? Are Innovate UK, Foresight UK, the Catapult Centres, the centres of excellence, and the Industrial Strategy, competing or complementary to each other?

Scale-Up Challenges of SMEs

- The UK has high numbers of both small firms and start-ups. However, there is a widespread consensus that it lacks sufficient scale-up companies. Evidence is presented by The Scale Up report on UK Economic Growth by Sherri Couti (2014). The lack of scale-up companies, in turn, is argued to be damaging to overall UK productivity.
- An emerging line of enquiry conceptualises the notion of key ‘growth triggers’ as a fundamental determinant of firm growth. Understanding why (and how) some firms are able to capitalise on these growth opportunities or overcome these ‘growth triggers’, or ‘critical junctures’, is central to our understanding of ‘high growth firms’ (HGFs).
- The focus of HGFs is often on what some have termed ‘mid-level innovation’ (Bhidé, 2008) and others “minnovation – that unexpected twist on an existing idea” rather than something genuinely radical.
- It is also argued that HGFs follow a distinctive business strategy, seeking market niches with little in the way of effective competition. This is achieved in three ways: first, by favouring business rather than consumer markets; second by developing close relationships with a small number of large customers; and third, by emphasising customer service as a key basis of differentiation in the market which, in turn, requires a significant emphasis on staff training.
- Four key founder-related variables are associated with high growth (Dodds and Hamilton, 2007): (i) start-up motivation, with the desire to exploit a market opportunity much more important than push-related motives; (ii) amount of education and subject along with soft skills such as search, foresight, imagination and communication; (iii) experience—the role of prior entrepreneurial experience is a distinct advantage; and (iv) size of the management team—with larger teams linked to high growth on account of their greater resources and expertise.
- In the UK various studies have reported that gazelles are much more prevalent in London and the South East than in other regions although HGFs can be found in all types of location—core regions and peripheral regions, and large cities and rural areas.
- Gallagher and Miller (1993) reported that gazelles in the South East had a much higher turnover and created twice as many jobs on average as those in Scotland and accounted for a much bigger share of job creation. They also note sectoral differences, with manufacturing firms over-represented in Scotland and financial services firms under-represented compared with South East England. Similarly, in The Netherlands, Stam (2005) found that the gazelles in knowledge-intensive business services have a different geography to gazelles in high-technology manufacturing: the former are disproportionately concentrated in highly urbanised regions, whereas the latter are concentrated in rural areas.
- Several barriers to scale-up have been identified, including access to markets, lack of entrepreneurial experience, although the two key ones are access to finance and access to management talent.
- A further explanation for the lack of scale-ups in the UK is that many entrepreneurial firms with the potential to scale-up get acquired at an early stage by larger businesses, either because they have raised venture capital and their investors now seek an exit, or because they are unable to access finance to grow, or both.
- There is limited evidence on the post-acquisition performance of such firms. Do they continue to grow under their new ownership? The evidence is limited and inconsistent. However, several studies suggest that acquisition has a negative impact and hence adverse implications for productivity.

Work and the Workplace

- Centrality of the workplace to the understanding of the productivity puzzle. There is a dearth of empirical work on workplace social dynamics and performance outcomes
- Productivity and Job Quality - productivity, sustainability and the decent work agenda.
- Policy debate – the recent Taylor Review of Modern work practices highlights the importance of job quality and decent work. A growing research agenda is exploring the relationship between job quality and productivity outcomes (evidenced in Skills and Employment Survey). Yet more could be done to explore the relationship between better jobs content and productivity?
- Sectoral analysis – we know the low job quality/low productivity sectors, but what is the possibility for better job quality solutions. What is regional dimension of job quality solutions – e.g. Scottish Fair Work Commission, possibility of state sponsorship of better work?
- Dynamics of the employment relationship: parties, power and regulation – comparative analysis of the institutional apparatus and arrangements for high productivity economies. Calls for better management, but what does that mean? Is the employment relationship a source of inefficiency?
- What is the role of employee voice in promoting change and innovation? There is some evidence linking employee voice and productivity outcomes, but the research is patchy and dated? What is effective voice? There is some evidence of a positive relationship between union presence in the workplace and higher productivity, but the research again is dated.
- Insecure work and productivity – we need more evidence of the relationship between insecure work and productivity? There is some evidence of a regional dimension to insecure work. How is output measured in the gig economy?
- Work Pressures: effort, intensification and (un)paid hours. There is evidence from case studies and surveys, of growing work pressures and unpaid working hours. What is the impact on productivity outcomes? How does unpaid work affect the measurement of productivity in official statistics?
- Autonomy and involvement - UK low levels of worker autonomy. Is this stifling initiative, proactivity and productivity?
- Innovation - what role does technology play in securing innovative work practices with better productivity outcomes? Research to date indicates that technology is being utilised to secure closer surveillance and monitoring of worker effort rather than promoting innovative work practises stimulating better job quality. More research evidence is needed to explore the links between innovation, technology and job quality.
- There is very little research exploring productivity from the perspective of those who play the most obvious role in generating productivity, namely workers. This is a major gap in our knowledge.

Empirical Data Sources and Networks

- There are a lot of data resources within the ESRC data portfolio that can be used to analyse drivers of productivity. These include data resources from government departments and ONS (that are accessed through the UKDS) and studies funded directly by ESRC.
- However, both types of data are poorly signposted with the result that researchers tend to use only resources they are familiar with – there a lot of path-dependence in this area
- Most of these data cannot be linked as the data were collected only for a specific purpose and no attention has been paid to the possibility of linking them to other data sources.
- The problem is particularly severe in the case of the longitudinal studies which should be designed in such a way that they can be linked to government data, as is the case in many other OECD countries.

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