Understanding productivity: Organisational Capital perspectives

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Date:

November 2021

The Productivity Institute

Working Paper No. 013

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Key words
organisation capital, productivity

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Suggested citation

N. Driffield, J. Du, J. Godsell, M. Hart, K. Lavoratori, S. Roper, I. Surdu, W. Zhang (2021) *Understanding productivity: Organisational Capital perspectives*. Working Paper No. 013, The Productivity Institute.

The Productivity Institute is an organisation that works across academia, business and policy to better understand, measure and enable productivity across the UK. It is funded by the Economic and Social Research Council (grant number ES/V002740/1).

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Publisher

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Abstract

The central theme of this programme of work is the need for greater understanding of heterogeneity, in terms of the drivers of productivity, the types of firms and their particular role in the productivity puzzle. Starting with the premise that there are only three ways of improving firm level productivity in a given environment. These are, to encourage and facilitate the growth of new high productivity firms, to encourage productivity growth in existing firms. We will therefore proceed with analysis of these main themes, of entrepreneurship and small firm growth, innovation and collaboration, internationalisation, inward investment, supply chain coordination and corporate governance.

The international aspects of this theme, focussing on exports and FDI, have at their heart notions of international knowledge transfer and learning, linking to innovation, and understanding of the importance of where international firms choose to locate different activities (and in turn what locations can do to influence this, or to at least understand the process and seek to maximise the benefits for their stakeholders.

Continuing the theme of heterogeneity, we also highlight the heterogeneity in the benefits of exporting, and also the productivity gains through attracting FDI. We also highlight heterogeneity in firm governance, and in supply chains configuration and competitiveness. On the one hand, one could argue that this makes the focal firm more "productive" but too many varying signals simply pass the problem onto others, who may be less well resourced and able to address the problem. Taken together therefore, we set out an agenda that sees much commonality between these themes, and highlights the additionality of exploring these issues together, rather than as disparate strands of very different literatures, as has been the case hitherto.

This paper is part of a series of working papers outlining the key issues and questions of The Productivity Institute's key research themes. This paper covers the Organisational Capital research theme. Other papers will provide an overview of Human capital, Knowledge Capital, Institutions & governance, Macroeconomic trends & policy, Measurements & methods, Geography & place and Social, environmental & technological transitions.

Executive Summary

The central theme of this programme of work is the need for greater understanding of heterogeneity, in terms of the drivers of productivity, the types of firms and their particular role in the productivity puzzle. Starting with the premise that there are only three ways of improving firm level productivity in a given environment. These are, to encourage and facilitate the growth of new high productivity firms, to encourage productivity growth in existing firms, and to attract inward investment. We will therefore proceed with analysis of these main themes, of entrepreneurship and small firm growth, innovation and collaboration, internationalisation, inward investment, supply chain coordination and corporate governance.

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1. Introduction

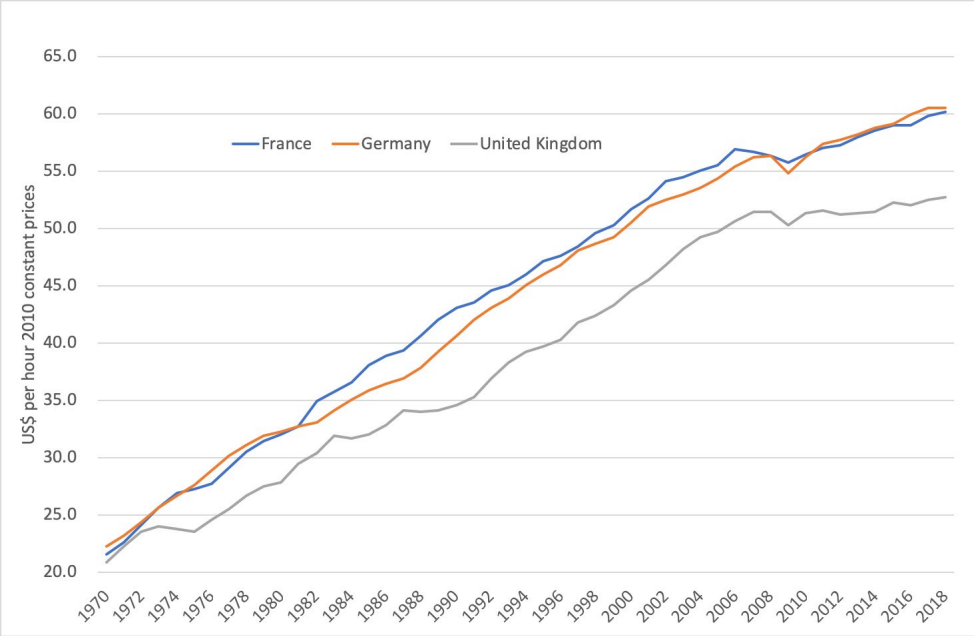
The fundamental premise of this work programme is that there are only three ways of improving firm level productivity in a given environment. These are, to encourage and facilitate the growth of new high productivity firms, to encourage productivity growth in existing firms, through innovation and cooperation, and to attract new firms, who have higher productivity than the incumbents. Too often, these are treated as either alternatives, or as issues requiring independent initiatives, focusing narrowly on start-ups, for example, or scale-ups, or the attraction of large scale inward investment. It is our assertion that this is misguided, and that the failure to connect these issues is one of the reasons why there is so little understanding of the UK "productivity puzzle".

We will proceed with analysis of these main themes, of entrepreneurship and small firm growth, innovation and collaboration, internationalisation, inward investment and corporate governance, on the basis that for example, supply chains are important for inward investors, and inward investment stimulates new firm formation, and drives innovation. Equally, high-growth firms tend to be more innovative, and drive new demand.

2. Background

The UK's business productivity puzzle has attracted much attention which has focussed on the growing gap in productivity between the UK and its key international competitors. Often denominated in terms of 'value added per employee' or 'value added per hour worked' – both measures of labour productivity - the UK's productivity slowdown has been longstanding but has been particularly notable during the post-recession period (Figure 1). While the productivity slowdown in the UK has been more marked than that in other G7 economies, a number of other Western economies have also experienced a decade or more of below trend productivity growth.

Figure 1: GVA per hour worked: UK, France and Germany



Notes: GDP per hour worked, US$ constant 2010 PPPs. Source: OECD.Statistics

Recent OECD research also emphasises the changing nature of the productivity distribution across firms and the increasing gap between firms operating at the global productivity frontier and less productive 'laggards' or 'non-frontier firms'. Across the OECD the evidence suggests that over the last decade internationally focussed and trading 'frontier firms' have achieved labour productivity growth of around 3.5 per cent pa., while more domestically focussed, 'non-frontier firms' (or 'laggards') have only achieved productivity growth of around 1.5 per cent pa[1]. International discussion of non-frontier firms echoes longstanding concerns in the UK about the 'long-tail' or 'fat tail' of low productivity firms[2].

At the heart of this issue is the "productivity puzzle". If one starts with a typical distribution of firms, then the most simplistic argument concerning productivity is that the mean is "too low", such that we need to move the productivity distribution to the right. However, in the absence of technological change, this is unlikely, so one needs to consider the shape of the distribution.

[1] See OECD (2015) 'The Future of Productivity', Figure 11, p. 34.

[2] See https://www.bankofengland.co.uk/-/media/boe/files/speech/2018/the-uks-productivity-problem-hub-no-spokes-speech-by-andy-haldane.

In some recent analysis, Haldane (2017) asserted that the "problem" in the UK was in the tails of the distribution. One assertion is that the UK has a somewhat more skewed distribution say than Germany, with a large tail of firms who are underperforming, and as a result the mean performance for the UK is below that of Germany. Reasons for this we explore below.

However, we argue that one must extend this analysis further. It is assumed that within a given sample the distribution of firms follows something akin to a normal distribution (Figure 2). However, the evidence suggests that the population of UK firms in terms of productivity is somewhat different from this.

Figure 2: Productivity Distributions

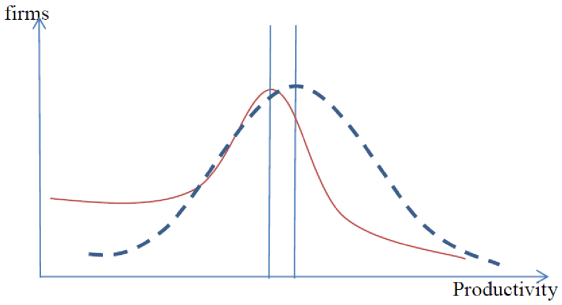


Figure 2.1

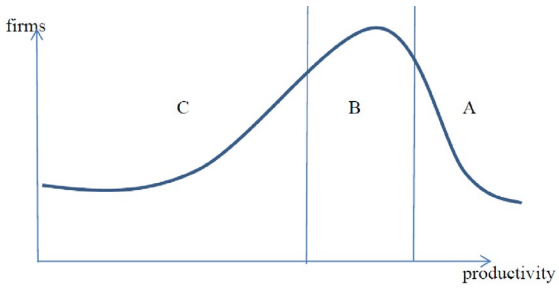
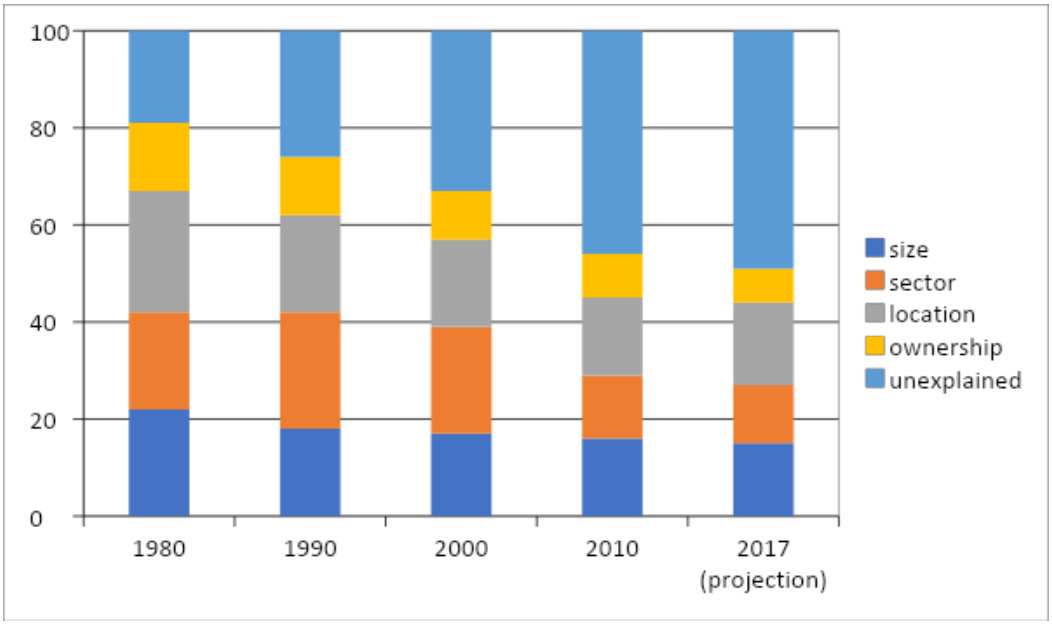


Figure 2.2

Traditionally a very high proportion of the variance in firm level productivity could be explained by just four variables, size, location, sector and whether the firm is foreign owned. OECD data, across all OECD regions and sectors however reveal that this historical relationship is breaking down (Figure 3).

Figure 3: Structural explanations of productivity



In other words, factors which helped explain productivity differences between firms in the past are becoming less and less relevant. This becomes even more severe when one seeks to explain productivity growth.

UK-focussed research which has sought to explain the stagnation in productivity, post-recession, reaches diverse conclusions reflecting between-sector rigidities in resource re-allocation, within-sector competitiveness and/or intra-firm factors such as management and leadership. At the intra-firm level, evidence of the positive relationship between management and leadership quality and productivity is persuasive as is that between investment and productivity (Ollivaud et al. 2016). Evidence of gaps in management and leadership quality and investment levels between the UK and main our international competitors is also clear (Bloom and Van Reenen, 2018; Bloom et al. 2012; Bloom and Van Reenen, 2007).

Recent sectoral analyses have provided a more detailed perspective on the nature of the UK productivity puzzle by considering separately the impact of within-sector and between-sector effects. Riley et al. (2018) examine pre- and post-recession productivity growth across a range of different levels of industrial aggregation and conclude that 'the vast majority of labour

productivity growth weakness arises due to changes in productivity growth within detailed industry groups' (Riley et al. 2018, p. 27). This leads them to conclude that '… the stagnation in productivity remains widespread across detailed industry groups, pointing to the importance of macroeconomic or economy-wide explanations for the puzzle' (p. 4). As Riley et al. (2018) also demonstrate, however, sectoral productivity trends in the UK vary markedly also suggesting the potential for significant sector-specific influences on labour productivity.

In particular Riley et al. (2018) suggest that the most marked slowdown in labour productivity growth is evident in those sectors which experienced the strongest productivity growth prior to the recession. Their analysis also suggests that more than half of the labour productivity gap is accounted for by five sectors: telecommunications, finance, mining and quarrying, electricity and gas, pharmaceuticals and computer programming. Other sectors have either maintained or significantly increased labour productivity over the last decade. These variations in sectoral productivity trends since the recession provide the starting point and rationale for this report. What are the origins of these diverse trends? Are these the consequence of intra-firm issues linked to leadership and management or technology? Or, sector specific factors such as regulatory regimes or market competition?

Another perspective on the productivity puzzle is associated with the literature on business dynamism and the associated metric of job reallocations derived from job creation and destructions accounts (Davis et al., 1996; Barnes and Haskel, 2001; Davis et al., 2008; Hijzen et al., 2010; Anyadike-Danes et al., 2011; Prashar and Hart, 2019; Goldschlag and Tabarrok, 2018). The number of start-ups in an economy is often seen as the headline metric of 'enterprise' and 'entrepreneurial ability'. It is argued in the economics literature that the movement of resources from low-productivity firms to high-productivity firms drives economic efficiency and growth. Start-ups contribute significantly to this reallocation process. Many start-ups fail within a few years, so start-ups contribute to both job creation and job

destruction. A small subset of start-ups, however, grow quickly, and contribute disproportionally to net job growth and to improvements in industry productivity. Workers also move among firms at tremendous rates which means that gross job creation and destruction are much larger than net job creation. As workers reallocate, it is argued that productivity increases, knowledge diffuses, and the structure of production changes.

The work on the United States by Davis et al., (2008) on "Turmoil and Growth: Young Businesses, Economic Churning and Productivity Gains", showed that for the 30-year period 1975-2005 turmoil or churn in the market place as represented by job creation and destruction rates had a dynamic and positive impact on productivity.

2.1 'Productivity' – the view from the boardroom

In a recent study (Roper et al. 2019) we interviewed around 80 business leaders across six sectors to gauge their understanding of the term 'productivity'. Each of the interviews started with a focus on value added per employee. In the vast majority of cases, however, this concept was either unfamiliar or had little meaning in the context in which interviewees were operating. Instead, interviewees tended to equate the term 'productivity' with measures of operating efficiency often linked to physical outputs or throughput. In some sectors – insurance, pharmaceuticals – the term 'productivity' itself had very little resonance and was dismissed as meaningless by a number of interviewees. In other contexts such as banking and beverages complex supply chains and/or organisational structures created the potential for highly efficient and much weaker business units to co-exist limiting the perceived value of generalised measures of 'productivity' or value added.

The lack of recognition and use of the term 'productivity' and – in many cases – the lack of understanding of the notion of value added per employee suggests a marked disconnect between policy dialogue and business practice. However, this should not be interpreted as a lack of interest or commitment to improving efficiency. The majority of companies interviewed

utilised diverse sets of performance metrics at operational unit and corporate level. In our interviews the lack of understanding and awareness of value added on the part of many interviewees often made it difficult to have a meaningful conversation about this specific measure of productivity. Instead discussions often focussed on measures of operational efficiency with little reference to their contribution to overall value added.

These findings introduce one of the central tenets of this research theme, which is the need to understand firm level heterogeneity, and the part that it plays in explaining productivity differences. This take a number of forms, from growth trajectories in different sectors, different forms of innovation, access to finance, supply chain configuration, exporting, and the types of inward investment that different sectors / locations attract.

3. Organisational capital and Productivity – our research programme

Coronavirus and Brexit are creating immediate and potentially critical challenges for UK firms. The climate emergency and increasing digitisation (Industry 4.0) will also shape firms' future options for increasing productivity and competitiveness (OECD, 2017). Addressing both will require radical innovation in technology and business models by frontier or leading-edge firms along with more effective diffusion mechanisms to drive economy-wide adoption (OECD, 2015). At the same time there is evidence of declining business dynamism in the US and the UK (Crafts, 2018). The current UK Industrial Strategy sees change being driven by local, place-based policy and inter-locking sector deals within an enabling macro-environment. This emphasises the importance that research adopts a strongly contextualised view of business productivity reflecting sectoral, supply-chain and locational influences alongside internal productivity drivers (Zahra et al., 2014)

To reflect these long-term challenges our 'Organisational Capital' projects are organised in five themes addressing the mechanisms through which local productivity transformation can be achieved (in no particular order):

- Inward investment and UK productivity
- Trade and UK productivity
- How does governance influence productivity?
- Business Dynamism, Entrepreneurship and Ethnic Pluralism
- Supply chain productivity

Each of these areas are outlined below. In the short-term, however, an important research question relates to the impact of the Covid-19 pandemic on finance, investment, innovation and productivity in UK firms. Lockdown, social distancing and market disruption have put significant strain on many firms during the Covid-19 crisis. To understand this we will also undertake a short-term project to examine the short-term and longer-term productivity impacts of UK government support measures during the first nine months of the Covid-19 pandemic. We build on the literature on policy-mix effects to consider how the different combinations of support measures accessed by firms – labour subsidies, continuity loans and grants - have influenced productivity and productivity drivers. Logic models are developed for each support measure and used to identify intermediate investment and capability indicators which might provide a short-term indication of potentially longer-term productivity effects. Linking imports and exports transactions with firm indicators allows us to examine firms' internationalisation strategy and how it affects productivity during a period of uncertainty and disruption. Firm level analysis using propensity score matching approaches help to control for selection issues using data taken from the quarterly SME Finance Monitor. This provides timely information on the investment behaviour of firms and their use of a range of public support schemes introduced during the Covid-19 crisis. ONS data from the Business Impacts of Coronavirus survey (BICS) will provide a broader perspective on firms' supply chain and customer linkages. A key theme will be the impacts on short and longer-term productivity, something which may also be impacted by Brexit in early 2021.

4. Why is inward investment so important in productivity debates in the UK ?

According to ONS turnover by foreign owned businesses in the UK is just over £12500m (some 80% of this is in firms employing more than 250 people in the UK). This is about 37% of all non-financial turnover. This is not evenly spread. The North of England, Wales and Scotland have much higher shares of non-financial foreign owned activity as a % of their total than the SE of England for example. It is also important to note that over 50% of UKs private sector R&D is carried out by foreign owned firms.

4.1.1 International business and productivity

The essential premise, dating back to the conceptual work of Dunning (1979) or Caves (1975) is that multinational firms have an inherent firm specific advantage over domestic firms, that facilitates their internationalisation, and that this advantage (perhaps through higher levels of innovation or higher capital intensity) translates into higher productivity. Typically, inward investors in the UK have productivity some 40% higher than the average for UK firms, and pay wages some 20% higher. This statistic has been stable for some thirty years. Roughly however half of this difference is accounted for by the fact that MNEs are more prevalent in higher value added sectors, and it should also be noted that the productivity gap between inward investors and the highest performing UK firms (who themselves are outward investors) is much smaller than this headline figure, perhaps as small as 3%. However, what is less well understood is why this varies between for examples regions of the UK, or how these effects in the UK compare with like for like comparisons with Germany for example. Much of the existing literature has focussed on measurement issues, or on factors such as agglomeration or absorptive capacity in explaining differences (typically between samples of non-comparable data), rather than focussing on for example the different types of investment that is attracted to different locations, and the importance of this for both direct and indirect effects.

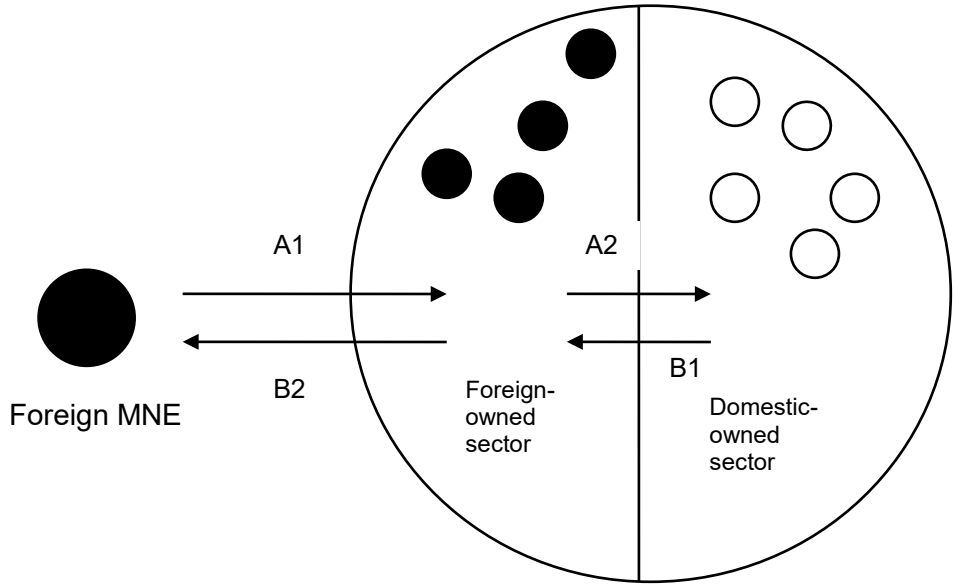
4.1.2 The indirect effects on productivity growth of inward investment

This centres on the question of externalities, or spillovers, and has been the subject of vigorous debate for 30 years. To summarise:

- The presence of Multinational Enterprises (MNE)s, as leaders in both technological and capital accumulation, will serve to stimulate further the possibility for agglomeration in such locations. This will serve to increase the potential for technology transfer, and therefore improvements in the technological capabilities of domestic firms.
- The non-technological advantages, such as managerial abilities, the exploitation of scale economies, or superior co-ordination of resources, if adopted by host country industry, may improve performance, sometimes referred to as the 'demonstration effect'. The so-called 'Japanisation of UK industry' is a case in point.
- Knowledge capital is likely to be a more important source of ownership advantages, than is physical capital. Knowledge capital is clearly more easily transferable internationally than is physical capital.
- Finally, while this is distinct from the pure spillover process, potentially more important is that technology transfer occurs directly, through the licensing of a particular technology, through supplier networks or subcontracting arrangements, or indirectly as knowledge becomes public, and spillovers are assimilated by the domestic sector.

This is best summarised by the following figure (adapted from Driffield, Love and Menghinello 2010).

Figure 4: FDI spillover process



Source: adapted from Driffield, Love and Menghinello, 2010.

If one starts with the premise, developed from analysis of the multinational enterprise, that the foreign multinational has some form of firm specific advantage over other firms, that allows it to internationalise, then the necessary condition for spillovers to occur is that at least some of the knowledge or technological advantage is transferred into its affiliates abroad (A1). The next condition is that at least some of this knowledge is then transferred into the local sector, either through formal measures such as supplier arrangements, or through informal mechanisms such as spillovers, or through labour mobility. These processes are discussed in more detail in Driffield and Love (2007) for example. Of course, there is also the possibility that FDI occurs not to transfer knowledge into the affiliate, but to acquire knowledge from the local environment (the process labelled B in the figure above). This is one reason why we observe variations in the levels of productivity growth resulting from inward investment.

4.1.3 The importance of Absorptive capacity

Moreover, the geography and spatial proximity between firms (domestic and foreign) can play a role in the extent and size of FDI spillovers as well. Domestic firms may benefit more from the proximity to surrounding foreign firms thanks to face-to-face and inter-organizational

interactions, that can facilitate knowledge transfer and transmission, and other channels (labour market and suppliers) that tend to be more localised. However, these gains can be different due to host country's level of development, firm size and its prior productivity level, horizontal and vertical linkages, as well as the sector involved in the foreign investment (e.g. manufacturing vs. services). Indeed, spatial decay effects in FDI spillovers can be less strong in the service sectors, where temporary proximity mechanisms can substitute the need for permanent geographical proximity.

4.2 Inward investment and the productivity puzzle

When considering the "productivity problem", it is assumed that within a given sample the distribution of firms follows something akin to a normal distribution, as depicted in Figure 2(a), the assertion being that to improve productivity one needs to move the distribution to the right. However, in the absence of technological change, this is unlikely, so one needs to consider the shape of the distribution. In some recent analysis, Haldane (2017) asserted that the "problem" in the UK was in the tails of the distribution. One assertion is that the UK has a somewhat more skewed distribution (say) than Germany, depicted by the red line in Figure 2 above.

When thinking about spillovers in this context, one could argue that there are three distinct problems. Type A firms may already be close to the technology frontier, such that the scope for learning from other firms is limited. Equally type C firms may have plenty of scope for improvement, but may lack the absorptive capacity or resources (such as skilled labour or access to finance) to facilitate growth through spillovers. Type B firms, that is to say those some distance from the frontier, but with the capacity to develop may be best placed to gain from FDI. Often such firms are firms which are performing above average, but in medium or even low-tech sectors.

One aspect that we can examine in more depth is whether firms with better governance will be more equipped to absorb the knowledge that comes with increased foreign ownership and therefore, use this knowledge to become more productive. First of all, firms with better governance – e.g. a greater proportion of outside directors – tend to be more transparent in their management practices and strategic choices, managers may be more accountable for the decisions they make, disclosure of information may be improved and all this may exert pressure on managers to use knowledge in an efficient manner. The presence of outside managers may also matter because we can potentially expect outsiders to be somewhat less biased as they are less dependent on internal colleagues for their future career prospects, and thus, they may be more likely to exercise pressure on management. This can stimulate the board to make good use of knowledge acquired from through foreign ownership. Outside directors also tend to bring expertise (Fama and Jensen, 1983) and therefore, have their own knowledge about how to use and diffuse resources to boost productivity.

Furthermore, particularly relevant here is the fact that firms with better governance tend to invest more in high risk – high return R&D activities as well as employee training (Baysinger et al., 1991; Hillier et al., 2009). Managers that are internal may be less likely to invest as much in longer-term activities which also have a high failure rate (such as the return on R&D investments). The wealth and organisational status of internal managers tends to be linked to shorter term returns. Firms with more R&D experience and investment as well as those with a more trained workforce may, in turn, be better equipped to absorb the knowledge that foreign investors may bring with them. Dominant coalitions formed of outside directors may lead to the formation of goals that support absorptive capacity, and thus, may lead to productivity growth over time.

4.2 Productivity and the changing nature of inward investment in the UK

This section has sought to highlight both the theoretical and methodological challenges to understanding how inward investment can help address the UK's productivity problem. In order to do this, it is necessary to understand how the patterns of inward investment will change, and how UK policy can adapt in the face of a less positive inward investment climate. Subsequently one needs to consider the nature of the relationship between different types of FDI, and host country productivity, and how one can maximise the benefits of inward investment, though the importance of absorptive capacity and embeddedness. Thirdly, one needs to consider how policy at both a national level and a local level can influence this.

In terms of the research challenges, this sets out an agenda for better, more up to date data, and for models that explore these relationships through a wider set of tools and metrics than have been hitherto employed. UK inward investment data is perhaps two years old at the time at which official data become available, so we need to work with private sector providers to improve this. Secondly, researchers need to be perhaps less focussed on seeking to quantify the direct and indirect effects of inward investment on productivity, and focus on the mechanisms by which FDI boosts productivity, and understanding how to enhance these, rather than relying on production function approaches, that are beset by identification problems.

This requires an understanding of place, and the importance of inward investment policy in a wider setting of policy designed to foster inclusive growth.

A policy interpretation of this literature over the last 20 years has been that prosperous regions should seek high tech investments, while less prosperous regions may seek more mundane activities. While this may be optimal in terms of generating employment, it runs the risk of re-affirming the "low skill equilibria" in less prosperous regions of the UK, and increasing the gap between the richest and poorest locations. There is a well-established literature that links globalisation, in its many manifestations, to increased inequality in developed countries, which

in itself can be seen as a drag on productivity, especially where local governance prioritises employment rather than solutions to long run productivity decline.

5. Trade and UK productivity

The UK exports reach more than 30% of its GDP in 2018 (DIT, 2020), and the UK exporting sector is undoubtedly a core national asset (Allas et al, 2019). It was the 11th largest global exporter in goods and the 5th largest global importer in goods in 2019 (declining since 2017), while it remains the second largest service market globally just after the US. Exporting, innovation and productivity are closely linked. Productive firms export and productive economies show strong export performance. In return, exporting in the global market promises opportunities to learn, innovate and become more productive. However, it is not fully understood the conditions in which firms may enhance productivity through exporting, nor the mechanisms through which the benefits could spread. The purpose of this review is to outline what we know about the relationship between export and productivity, in the UK context where possible but largely limited to the experience of industrialised economies, and discuss how these links may evolve over the Brexit transition and the COVID crisis, all in the long-term trend of slowing globalisation. It ends with some pertinent research questions as we move forward.

In very broad terms, the existing literature reaches the following conclusions:

- Firms self-select into exporting, where productivity is crucial. Upon export entry, productivity has limited explanatory power to the heterogeneity in export performance. Exporting can be complex and dynamic, where intermittent exporting is commonplace.
- Exporters do not necessarily become more productive, despite abundant and agreeable theoretical claims. Specific learning channels instead of catch-all productivity measures may help better identify learning-by-export evidence.

- Exporting (and importing) narrows productivity gaps between countries, and enhances productivity in a wider economy through externalities within countries. However, they have also been accompanied by polarization in the distribution of within-country income both within industrialised economies and developing economies.
- Services and manufacturing are increasingly interconnected. Facilitating trade in services is good for trade in goods, and restrictions of trade in services are harmful not just for service sectors but also for manufacturers.
- Brexit and the COVID cause disruptions to trade and the impacts are spatially uneven.

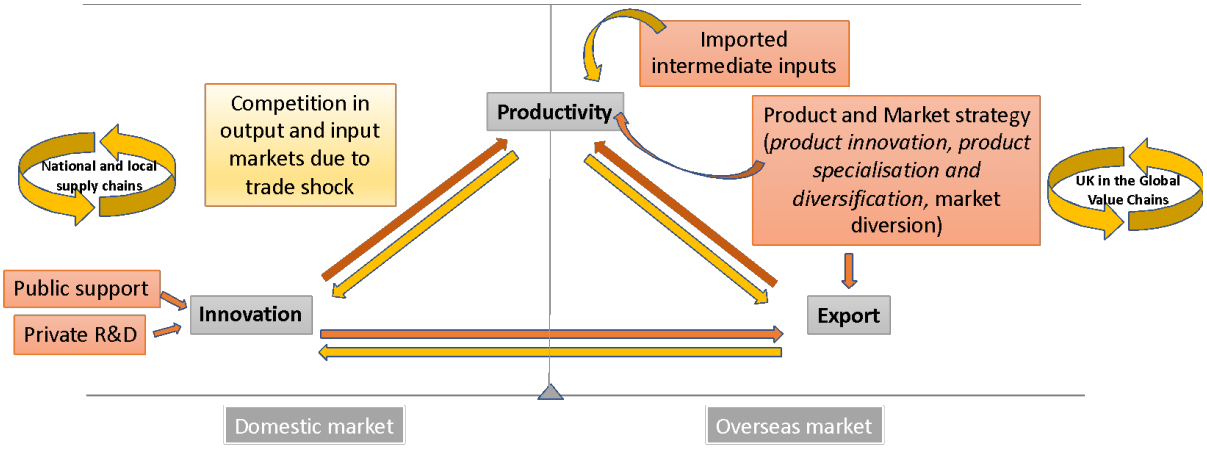
5.1 Which firms export?

Countries do not export; firms do. And, only some firms do. There, theory (Melitz, 2003) and evidence (Wagner, 2007) are in accord as to who exports – the most productive firms – and how – by self-selecting into export markets. This is because not all firms are able to either overcome the necessary sunk costs associated with trade activities or to bear the risks associated with entering into foreign markets. Building on this, the "exporter premia" literature suggests that exporters tend to be larger in size, more capital intensive, skill intensive, and pay higher wages (Frias, Kaplan and Verhoogen, 2009). They also import higher quality material inputs (Kugler and Verhoogen, 2008), spend more on R&D (Aw, Roberts and Xu, 2008; Harris and Li, 2009), produce more products (Bernard et al 2009) and better-quality goods (Amiti and Khandelwal, 2009), and even pollute less (Halladay, 2008). In short, better firms export. Equally, the UK has become much more integrated in global value chains, in part due to the changing activities of both its inward and outward investors.

Since productivity determines export selection, what drives or hampers productivity – technology and its diffusion, or the lack of innovation and diffusion, skills shortages and mismatches among others – will determine firms' capability to export. In particular, innovation plays an important role in enhancing productivity, developing a competitive edge and

stimulating exports. Product, process and organizational innovators are in a better position to acquire more market share from non-innovators and to grow at their expenses. In the long run, they will grow faster, be more efficient, more profitable, and hence be more likely to export. Furthermore, more productive firms self-select into investing in R&D and exporting, and they innovate with the anticipation of tougher international competition in the future. Engaging in international trade broadens knowledge and hence promotes firms' investment in R&D activities. Cost reductions from access to cheaper inputs and the exploitation of economies of scale, increase the profitability of investment in R&D, which in turn drives more productive firms to enter foreign markets to satisfy a larger demand. This triangular relationship between productivity, innovation and export has intrigued significant research attention to understand the causal mechanisms linking them, illustrated in Figure 5 below, with still many open questions to date (Love and Roper, 2015).

Figure 5: Triangular relationship: Productivity, Innovation and Export



Source: Adapted from Du and Oleksandra (2021).

Recent evidence suggests that firms often engage in relatively intermittent exporting for extended periods, and that sporadic exporting is commonplace among UK SMEs with a coherent strategy for entering or leaving foreign markets (Crick 2003). Similar patterns emerge among firms of all sizes in Italy, France, and also outside Europe, for example, Colombia and

Chile.[3] Bernini, Du and Love (2016) find that firm re-entry and previous exit from export markets are closely linked. Exporting history and experience matter for the odds of the firm's re-entry into exporting. Knowledge gaps exist as to the causes of intermittent exporting, to understand what public support might be useful to encourage intermittent exporting into continuous exporting.

5.2 How does exporting raise productivity?

The question of if and how firms learn from exporting is important for policy and businesses. This is also part of the triangular relationship shown in Figure 5. For policy-makers, it is essential to grasp how firms' exporting activities affect their performance to justify intervention and design effective support measures. For businesses, understanding the range of potential benefits from engaging with the international markets could help develop strategies and make informed decisions about business operations.

From the aggregate economic perspective, trade theories show that exports affect productivity positively through: (1) Learning effect that transmits technology; (2) Duplication-reduction effect, which prevents R&D efforts in producing the same technologies by openness to trade; (3) Allocation effect that reallocates domestic productive resources and variations in the rewards of factors of production such as capital and labour (in the Heckscher-Ohlin model tradition); and (4) Integration effect, which allows competitive firms to export and increase economies of scale, which in turn benefits consumers to enjoy more varieties of goods at lower prices (Feenstra, 1996; Alesina et al. 2000, 2005). The country-level evidence suggests that the trade value/volume of exports is not a sufficient single metric for explaining the impact of trade activity on productivity growth. The 'quality' and 'variety' of exports are important moderators of the impact of exports on productivity in the long term (Feenstra and Kee, 2004).

[3] The evidence can be found in Italy (Bonaccorsi, 1992), France (Bernini, Du, Love, 2016) and outside Europe, such as Colombia (Eaton et al. 2008) and Chile (Blum et al. 2013).

At a firm level, one of the key challenges in affirming the benefit of exporting is to separate the 'selection-into-exporting' effects from the 'learning-by-exporting' effects. The extant theories propose mutually incompatible causal chains that relate exporting to performance, while empirical literature delivers mixed messages. For example, De Loecker (2011) emphasizes how the previous theoretical literature may have failed to identify the direction of the causal link between innovation and exports by not decomposing aggregate productivity growth into (i) within-firm productivity gains that arise from innovation and (ii) between-firm productivity gains. The large empirical literature has provided rich insights on if and how the complex relationships between innovation, export and productivity may take shape and what moderating effects there may be. Wagner (2008) surveys early work, while Love and Roper (2015) provide a more recent review with emphasis on small businesses.

Conceptually, broadly three channels through which exporters may become more productive following their exposure to international markets – competition effect, learning-by-exporting effect and economies of scale. First, exporters that experience increased competition from the international market are forced to become more productive by improving their efficiency and innovation (Atkeson, 2010; Bustos, 2011). Second, the learning-by-exporting effects occur through accessing of international markets, when exporters have the opportunity to acquire superior knowledge and technology from foreign markets, thus improving productivity in a way that would have been otherwise unlikely since this expertise is unavailable in the domestic markets (Bustos, 2011; Iacovone et al, 2012). For instance, Crespi, Criscuolo and Haskel (2008) find evidence that exporters learn from their customers. Third, firms benefit from economies of scale as the increased market scale allows them to earn extra margins, which is beneficial when fixed costs such as intangible investments can be recouped via a larger sales volume. In addition, the management literature asserts additional channels of learning by exporting. international growth including exporting leads to some degree of organisational

learning which can make firms make better decisions at home and abroad and that boosts productivity (e.g., Baldwin and Gu, 2004; De Loecker, 2007; Love and Ganotakis, 2013; Surdu, Mellahi and Glaister, 2019).

There is a high level of heterogeneity in the manner in which exporters benefit from international experience. The large existing literature suggests that firms' absorptive capacity is key to benefitting from the exporting experience (De Loecker, 2013; Rebelo and Silva, 2017). Exporters are more likely to learn from exporting when they are medium-sized and already innovators (Damijan et al. 2017), and if they are product innovators rather than process or organisational innovators (Damijan et al. 2017). The learning is more likely when exporters sell more diversified products and in diversified markets (Yang, 2018). Export destinations matter too, in that foreign technological spillovers and accessible foreign demand can make the difference in a higher level of innovative outcome as the result of learning (Fassio, 2018). Furthermore, firms with better governance are likely to more successfully manage the trade-offs associated with productivity investment on the one hand, and international competition, on the other. In firms with poor governance, managers are less incentivised to take the necessary measures in order to benefit, and learn from, international competition and equip their firms to simultaneously deal with domestic and international pressures and risks. Firms with poor governance also have reduced operating performance due to the manner in which they dissipate cash (Dittmar and Mahrt-Smith, 2007). This links to the above argument around how firms with better governance are more likely to develop the absorptive capacity to take advantage of learning-by-exporting, innovate and enhance their productivity.

5.3 How to maintain the current competitiveness of the UK trade?

This involves an understanding of how COVID and Brexit have already and will do harm to the traders in the UK. These are less than obvious and the effects of Brexit differ by sectors and goods/services traded, and therefore unevenly distributed spatially. The disruptions of

trade by COVID may be sharp, immediate and short-term, while the shocks due to Brexit will be long-term and deep. Some of the specific questions include:

- How have the UK traders been affected by COVID disruptions, and what's the implications on firm productivity, jobs and supply chains?
- To what extent trader's resilience in storming this crisis depend on trader's own productivity, local supply chain resilience, regionalised international trade network resilience (i.e. EU) and factors further fields (i.e. trade elasticities of income and price of destinations)? These would provide important lessons for this crisis and the future ones.
- Given the final Brexit deal the UK has reached with the EU, how are UK merchandise exporters affected by the rule of origin and non-tariff barriers, and how these challenges will impact on firm productivity? How are UK services exports affected in terms of their trade performance and productivity by the final Brexit deal which is largely silent on services trade?
- Brexit creates new tensions and opportunities for international trading firms and those considering entering export markets. Our project aims to explore the links between two critical areas of policy making – supporting innovation and exporting – and their joint link to improving UK productivity. Despite significant research attention the causal mechanisms linking productivity, innovation and exporting are still unclear (Love and Roper 2015). Is exporting causing firms to grow or be more productive and/or innovative or the other way round? Or, do each of these effects work through some fourth mechanism? An analysis using successive waves of the Longitudinal Small Business Survey.

5.4 How to enhance the competitiveness of UK trade?

Both the recovery from the disruptions of the COVID pandemic and the Brexit and the future success of 'levelling up' progress depend upon the ability of the UK to innovate and at least in part achieve a diversified or reoriented production away from the European focus and towards further-flung supply chains and destinations. How can this be achieved? Specifically:

- To what extent does complexity of the regional economy drive the flexibility of exports and export destinations and help its exporting resilience over economic crises? What industry strategy can help build up the complexity, both in financial terms and in skills terms?
- To what extent do firms' exporting strategies and learning by exporting capability drive the agility of exporting performance? How does this differ between exports in goods and services? What policy can help promote continuous exporting and maximise learning from exporting dynamics to drive innovation and productivity?
- Who are the gainers and losers from trade, and what mechanisms need in place to spread the benefits from trade?
- What are the opportunities to upgrade technologies and facilitate de-carboning in products and services that develop potentials to serve global markets? How to encourage private investment alongside public funding to achieve this goal?
- In a more broad concept, how does a link between internal and governance instruments with external market dynamics drive productivity? Given higher levels of competition encourage firms facing international markets to be more productive by reducing managerial slack and inefficiency (e.g. Allen and Gale, 2000; Masulis et al., 2007; Tian and Twite, 2011), we will explore better governance helps firms transform the learning acquired from competing intensely in international markets into organisational routines, organisational innovation and subsequently, higher productivity? Or is there

a substitution effect between internal governance and external market dynamics such as international competition.

Firm and industry characteristics play a part in determining whether a firm undertakes a *make* or *buy* decision (or a combination of the two) to source knowledge for innovation. For example, small firms may decide to source knowledge externally because they do not have the resources or capabilities to carry out knowledge-sourcing activities in-house, whereas large firms may be less likely to source knowledge externally due to their scale advantages in R&D, for example (Veugelers and Cassiman 1999). Industry appropriability conditions may also affect a firm's knowledge-sourcing decision; a strong appropriability regime may encourage a firm to source knowledge internally because it will be more likely to appropriate the returns from its innovation investment (Teece 1982**.**

6. Innovation, imitation and value added

6.1 Innovation and firm growth

Firm success, in the form of growth or performance, often derives from innovation (Freel and Robson 2004; Hall et al. 2009). Innovation may be new-to-market or simply new-to-the-firm, an imitation of innovations previously introduced by other firms. Innovation can be in products, processes, or services and it can happen at all levels within an organisation. During the innovation process, a firm undertakes a complex sequence of decision making to enable it to acquire and internalise the necessary knowledge to accomplish its innovation goals (Veugelers and Cassiman 1999). Firms draw on a diverse range of internal and external knowledge sources for innovation during the process. Each knowledge source may contribute different knowledge for a firm's innovations, and in addition, each knowledge source may impact innovation of different types (product, process or organisational, for example) differently. Some knowledge sources (for example, investment into R&D) may require that the firm decides to develop its own knowledge in-house (a so-called *make* decision), while others (for example, investment

into new machinery) require that the firm decides to source knowledge externally (a so-called *buy* decision). These *make or/and buy* decision(s) (Veugelers and Cassiman 1999) form part of a firm's innovation strategy.

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Examining the effects of innovation on business productivity and performance is not straightforward due not least to the time lags between any innovation and its effects on firms' bottom line. Moreover, previous studies suggest weak correlations between different performance metrics such as sales and employment growth (Chandler et al. 2009; Baum et al. 2001; Delmar et al. 2003), and growth in sales per employee. Moreover, it is clear from analyses of high-growth firms and population cohorts that high growth – on whatever metric – is rarely sustained, and is therefore inherently unpredictable – the 'picking winners' problem (Coad et al. 2013; Anyadike-Danes and Hart 2018). Other studies note differences in the order in which firm performance metrics change as a firm grows and therefore levels of productivity. Coad et al. (2017) suggest that, for most firms, growth begins with employment, followed by increases in sales, profits and assets. Their analysis also suggests that high-growth firms – perhaps those more likely to be innovating – exhibit a different pattern where sales and profits growth precede that of employment. These findings lead Kiviluoto (2013, p. 572) to conclude

that ‘determining what exactly characterizes the success of a firm is a multifaceted task ... As success can take different forms and shapes, one could assume that only one measure cannot possibly represent the preferred outcome of all possible choices made within the firm’.

Innovation itself can also take a number of forms relating to firms’ products or services, business processes, operating routines and organisational structures. Each might be expected to have differential impacts on the different dimensions of firm performance (Roper et al. 2008; Roper and Arvanitis 2012). For example, Exposito and Sanchis-Llopis (2018) report recent evidence of the impact of product/service, process and organisational innovation on the financial and operational performance of Spanish manufacturing SMEs. Based on cross-sectional survey data for 1,424 SMEs they find: a positive correlation between product innovation, sales growth and costs; few significant process effects on sales growth or costs; and, a negative association between organisational innovation and costs. They conclude: ‘the strength of the innovation-performance relationship depends on the type of innovation and on the performance dimension considered … our findings confirm that the impact of innovation initiatives on business performance should be analysed from a multi-dimensional approach’ (Exposito and Sanchis-Llopis 2018, p. 925). Turner and Roper (2020) extend this analysis using UK panel data confirming the differential – and not always positive – impact of ‘innovation’ on performance and suggest the importance of process innovation to shorter-term positive growth and productivity outcomes.

6.2 Investing in innovation

An innovating firm’s introduction of a new product, process or service represents the end of a process of knowledge investment and sourcing (for example, R&D activities) and transformation (i.e. turning knowledge into an innovation) and the beginning of a process of exploitation by the firm in an attempt to improve performance and generate value added (Roper et al. 2008). Firms invest in innovation through a number of different *make-or-buy*

mechanisms (Veugelers and Cassiman 1999; Becker et al. 2016) including R&D, the acquisition of advanced machinery and equipment, the acquisition of knowledge from other businesses or organisations, the acquisition of market intelligence, training and design. Each type of intangible investment may have different impacts on different types of innovation activity. However, whether or not a firm is able to successfully exploit the benefits of any investment depends upon its ability to appropriate innovation returns. The appropriability problem (Arrow 1962) arises because firms are unable to completely stop other firms from accessing their knowledge or imitating their innovations, and as a consequence of this, firms fail to appropriate all of the returns from their R&D investments (Ceccagnoli and Rothaermel 2008). Firms are faced with a risk of imitation by both existing competitors and new competitors (Hurmelinna-Laukkanen 2009): a fast second entrant or even a slow third may outperform the innovator (Teece 2012). A firm therefore faces a key strategic challenge: it somehow needs to capture returns from its investments, and its ability to do so may determine its performance and continued survival (Ceccagnoli and Rothaermel 2008).

R&D is often viewed as a contributor to innovation through a process of discovery and invention (Ray and Bhaduri 2001). However, the translation of R&D investments into new knowledge is complex and may be influenced by firm characteristics, internal resources, and the market environment (Griliches 1992; Roper et al. 2008; Love and Roper 1999). In addition to generating new knowledge, R&D investment can also enhance a firm's absorptive capacity, i.e. its ability to assess, assimilate and exploit existing information (Cohen and Levinthal 1989; Griffith et al. 2000 and 2003)[4]. It is these 'two faces' of R&D (Cohen and Levinthal 1989) which provide firms with the incentive to invest in R&D activity.

[4] Tilton (1971) finds that firms in the semi-conductor industry invest in R&D in order to gain a technical capability which allows them to keep up-to-date with the latest developments. In addition, this capability helps firms to assimilate new technologies developed elsewhere.

Other forms of intangible investment linked to the adoption of digital technologies can also have significant innovation impacts. However, previous studies of investment in advanced machinery and equipment and innovation suggest more mixed results than those for R&D investment, perhaps due to short-term disruption effects and learning-by-using effects when new equipment is implemented (Bourke and Roper 2016, 2017). Barge-Gil et al. (2011) do, however, find a positive relationship between the adoption of CAD/CAM and robotics and product and process innovation in Spanish firms. While there is strong evidence of the positive relationship between skill levels and innovation (Toner 2011; Doran and Ryan 2014), evidence on the impact of investments in training on innovation is relatively limited with studies highlighting the potential for both positive (Capozza and Divella 2019) and negative effects where firms' existing knowledge base is strong (Caloghirou et al. 2018). Investments in the acquisition of knowledge from other businesses or organisations typically have more consistently positive effects on innovation outcomes, although the scale of these effects may depend on firms' internal resources (Klueter, Monteiro, and Dunlap 2017). Similarly, investments in design have been shown to have a strong, positive influence on innovation outcomes, particularly where designers are involved in all stages of the innovation process (Roper et al. 2016). The acquisition of market information relating to customers and competitors has also been shown to be a strategic driver of firm innovation (Atuahene-Gima 1996; De Guimaraes et al. 2019), with those firms acquiring such information being able to create competitive differentials and achieve a sustained competitive advantage. A competitor-oriented firm, for example, monitors its progress against that of rival firms continuously. Opportunities to create differentiated products and services arise, helping their innovations stay ahead of competitors' innovations (Han et al. 1998).

6.3 Collaborating for innovation

Numerous studies have demonstrated the value of collaboration with universities (Petruzzelli 2011; Laursen and Salter 2004; Mansfield 1995; Bellucci and Pennacchio 2016), customers (Mansury and Love 2008; Love and Mansury 2007), suppliers (Takeishi 2001), consultants etc. (Tether and Tajar 2008) as part of firms' innovation activity. Typically, the benefits of such collaboration are thought to relate to knowledge-sharing. However, collaboration may also have other advantages, for example, in sharing risks, in accelerating or upgrading the quality of the innovations made and signaling the quality of firms' innovation activities (Powell 1998). There is also increasing evidence that developing external collaborations involves organisational learning as firms' ability to structure and manage such relationships improves with experience (Love, Roper, and Vahter 2014). Two main learning mechanisms are envisaged in existing studies: the possibility that firms may become better at managing or structuring external collaboration; and, the possibility that experience may enhance firms' cognitive capacity to absorb external knowledge extending the number of useful collaborations (Laursen and Salter 2006; Leiponen and Helfat 2010).

The gains from collaboration may also be unevenly distributed with some studies suggesting that innovation in smaller firms may benefit disproportionately from collaboration (Vahter et al. 2014). Paradoxically, there is also substantial evidence of the difficulties which many smaller firms, encounter in establishing, structuring and sustaining productive collaborative relationships with universities and other partners (Laursen and Salter 2004; Roper et al. 2006). Building university-business relationships, in particular, firms confront what Hall (2003) describes as the 'two-worlds' paradox, and the difference in institutional logics and priorities between businesses and universities (Dasgupta and David 1994). This creates 'orientation-related barriers' and 'transaction-related barriers' to university-business collaboration reflected in conflicts over the creation or exploitation of knowledge, the timeliness (Hamisah et al, 2010)

as well as the time-horizon of research projects (Dunowski et al. 2010), the prioritization and management of intellectual property (IP) and the bureaucracy of university administration (Bruneel et al. 2010)[5]. This paradox often means that, despite significant impacts, firms rate universities contribution to their innovation relatively poorly (Howells et al. 2012) and that levels of university-business collaboration are often below those between individual firms (Drejer and Jorgensen 2005).

6.4 Innovation in context

6.4.1 Innovation eco-systems

Firms' ability to innovate is driven by knowledge; technological, commercial and strategic. Firms' ability to access and implement relevant knowledge is shaped by their own search capabilities and their ability to access learning opportunities (Keeble and Wilkinson 1999). In any specific locality, learning is therefore related to knowledge sharing and matching (Scott and Storper 2015) and the intensity of local interactions or 'buzz' (Storper and Venables 2004). Spatial contrasts in learning processes have typically been considered at the scale of cities or regions reflecting notions of regional innovation systems, but more recent studies have also emphasised the micro-geographies within which innovation takes place. Rammer, Kinne, and Blind (2020), for example, examine the knowledge environment for firms in Berlin and demonstrate that knowledge environments differ over distances as short as 50 to 250 metres. Localised learning processes, enabled by proximity, may be enhanced and reinforced by non-local knowledge sharing opportunities which may enable learning (Hjaltadottir, Makkonen, and Mitze 2020) and help avoid local lock-in (Visser and Boschma 2004) through knowledge pipelines (Trippl, Todtling, and Lengauer 2009; Aarstad, Kvitastein, and Jakobsen 2016; Esposito and Rigby 2019).

[5] Clearly orientation- and transaction- related barriers are not mutually exclusive, with differences in institutional logic, particularly around publishing and/or the protection of knowledge manifest in conflicts around IP.

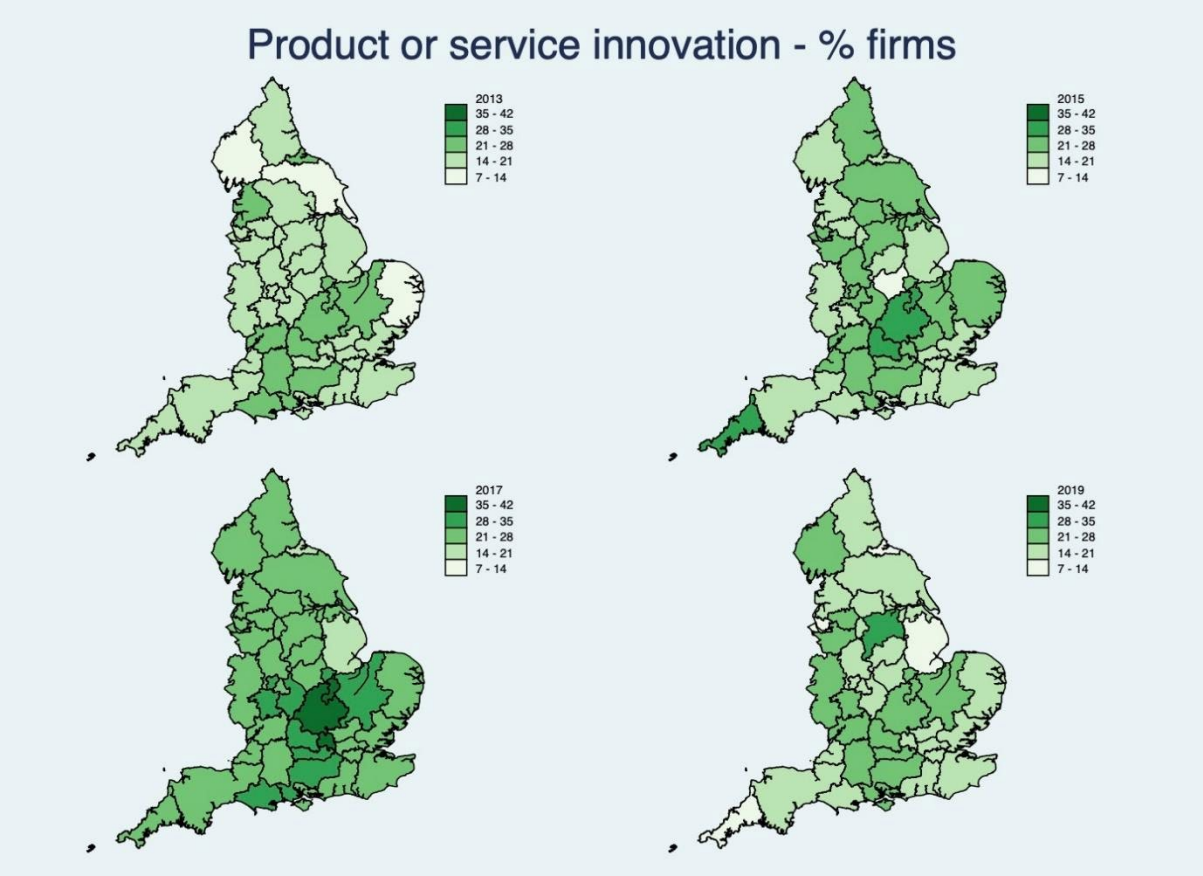
6.4.2 Innovation in the UK – a disparate landscape

In international terms levels of innovation activity in the UK compare relatively poorly to those in many other leading industrialised countries. In part this reflects relatively low levels of UK R&D spending which have lagged international competitors. R&D spending in the UK is also strongly concentrated in a relatively small number of research-intensive, multi-national companies, suggesting that R&D investments among other firms is even more limited. This is reflected in wide disparities in innovation activity between different parts of the UK, with greater sectoral and regional dispersion in the UK than other major OECD economies[6]. This has longer-term implications for productivity growth and performance. Figure 1 below shows the proportion of firms introducing new product or service innovations across Local Enterprise Partnership areas in England for the last four waves of the UK Innovation Survey. This illustrates the stability of the picture and the concentration of innovation activity around the South Midlands and 'arc of innovation' corridor to the North of the M25. The same type of spatial disparities are evident in the distribution of patenting and trade mark activity across England[7].

[6] https://www.enterpriseresearch.ac.uk/wp-content/uploads/2020/05/ERC-Insight-International-sectoral-RD-trends-after-the-global-financial-crisis.pdf

[7] https://www.enterpriseresearch.ac.uk/wp-content/uploads/2021/03/ERC-ResPap92-Exploring-the-micro-geography-of-innovation-in-England-Roper-Revised-2.pdf

Figure 6: Proportion of innovating firms across England: 2013 to 2019



Source: ERC Local Innovation Benchmarks 2021.

6.5 Innovation, imitation and value added – our agenda

The enablers of innovation and the links between innovation and productivity are complex and strongly heterogenous across firms, sectors and localities. Competitive pressures locally and across industries may necessitate different innovation behaviours for firms to remain viable and competitive while regulatory and societal pressures – around net zero for example – may create new organisational challenges. This suggests the strongly contextual nature of much innovation activity and the importance of adopting a broadly-based approach to understanding the investment-innovation-productivity pathway. This links strongly to other aspects of the Organisational Capital theme but also to other aspects of the Productivity Institute's research programme around 'place', human capital and knowledge capital. Aspects of 'learning' are

also critical as firms engage with customers and suppliers and improve their innovation performance.

In this strand of the Organisational Capital theme we therefore propose three projects linking investment, innovation and productivity. The first project will focus on innovation, internationalization and productivity and will explore the links between two critical areas of policy making – supporting innovation and internationalisation – and their joint link to improving UK productivity. Despite significant research attention the causal mechanisms linking productivity, innovation and exporting are still unclear (Love and Roper 2015). Other recent studies have suggested that productivity enhancement starts before firms export (a learning-to-export) effect and continue after exporting starts (a learning-by-exporting) effect (Gypali, Love, Roper, 2021). This suggests a significant productivity premium from both developing export-capable products and then any subsequent move into exporting. Detailed studies of UK firms' exporting behaviour also suggests the diversity of firms export strategies – e.g. opportunistic, intermittent, consistent - and that these may be changing as a consequence of Brexit with firms reducing export participation (Crowley et al 2018) and aggregate trade flow (Graziano et al 2018). Building on these arguments our proposed project explores the causal links between innovation, export behaviours and productivity at firm level with a particular focus on the implications for policy support around innovation and internationalisation. Our empirical analysis will use firm-level panel (longitudinal data) which is available in the secure data setting provided by the ONS and HMRC datalabs.

A second and related project will explore the relationship between domestic competition, innovation and productivity. Competition can provide the impetus for innovation and productivity improvement but may also discourage innovation where competition is strong and the returns to innovation limited. These counteracting trends are evident in empirical studies which tend to find an inverted-U shape relationship between product market competition and

levels of innovation activity (Bonfatti and Pisano, 2020). This project – a counterpart to project (1) - will focus on the nature of domestic local and sectoral competition across the UK and its causal impact on innovation and firm-level productivity outcomes (Arvanitis et al. 2020). In localities where innovation activity is low is this due to too much or too little competition? The study will recognize that competition involves both quantitative and qualitative dimensions related both to the number of competitors and market share, firms' own technological capabilities and those of their competitors and the efficiency of their operations (Bento, 2020). Different aspects of competition may also have differential effects on new to the market and/or new to the firm innovation. The analysis will use a combination of population level, longitudinal information on firm performance and links to the public science system in combination with survey information on firms' innovation activity which is available within the UK Secure Data Service. We aim to explore the causal relationship between market structure, technological capabilities, levels of local innovation activity and productivity performance.

A third project, closely related to the 'place-based' strand of work within the Productivity Institute, will explore the contribution of local technological strengths to local innovation and productivity. Current policy approaches emphasise R&D-led local development with a focus on capitalizing on existing or emerging capabilities within areas' local innovation eco-systems (Morgan 2015; Grillitsch 2016). Less well understood are the contingency factors within local innovation eco-systems which may either enable or inhibit local benefits from public R&D investments. Elements of absorptive capacity in local firms are likely to be important here as are the availability of risk capital. Local competition and links to export markets may also either provide an incentive or disincentive for firms to engage in the commercialization of new technologies. The project will build on a geographical analysis of public R&D investments to calibrate local leverage effects through innovation and their productivity counterparts.

7. How does governance influence productivity?

7.1 What are the problems with our current understanding?

This project also recognizes heterogeneity in governance as part of understanding the UK "productivity puzzle" is to explain the observed heterogeneity. Traditionally, studies have focused on explaining heterogeneity mainly by looking at productivity as a function of industry and/or macro-level factors such as: type of industry sector, industry-specific R&D investment, intra-market competition, government policies, developments in information technology and location choices (e.g., "north-south"). Implicit in the assumptions of the productivity literature – much of it being rooted in economic theory (Friedman, 1970) – is the idea that managerial decision makers are perfectly rational and as such, decisions made by them have the evident goal of profit maximization (achieved by reducing costs and boosting productivity efforts).

Yet, much remains unexplained around why some firms experience such high levels of productivity and others so low. The heterogeneity – we argue here – can be explained by looking at the governance of the organisation. Corporate governance (CG) refers to the relationships that exist between the management of a firm, its board of directors, its shareholders and other relevant stakeholders. Corporate governance consists of a set of rules, processes and practices by which an organisation is controlled, managed and monitored; therefore, CG indicates how and to what purpose an organization is governed and who has power in that organization, as well as who is held accountable for the strategic decisions made. The interests, values and motivations of CG actors may become those of the organization at that given point in time. We argue specifically that, different CG mechanisms and their combinations may influence organizational decisions and goals (Connolly et al., 1980; Core et al., 1999; Klein, 1998), and therefore, they may influence organizational performance outcomes such as productivity.

Much of the current literature ignores that organizations (including seemingly similar firms operating in the same industry) have different organizational and performance goals, which will potentially lead to different performance outcomes (Argote and Greve, 2007; Greve, 2008; Nardella, Narula and Surdu, 2020; Surdu, Greve and Benito, 2020; Surdu, 2020). For example, goals related to operational performance aim to reduce production time and increase efficiency. Goals related to market growth tend to focus mainly on addressing customer needs and achieving high market share, becoming more sustainable (often at the expense of short-term profitability – see Nardella, Brammer and Surdu, 2020). Goals related to financial performance, aim to create resilience for firms to have slack resources and bounce back after crises and disruptions (which may decrease efficiency). These are different outcomes, with different implications for firms and they may result in an incompatibility of goals. Operational efficiency may be beneficial in the short term but create long term problems for the firm. This makes it important for organizational decision makers need to be aware of the fact that these parallel goals exist and make strategic decisions that reduce some of these decision biases.

Behavioral theory and agency-theoretic explanations can enrich and complement prior technical, economic and competitive explanations of organizational outcomes such as productivity. We, therefore, propose that organizational goals will vary with the governance mechanisms of the firm. This is because internal CG mechanisms around firm ownership and control determine key strategic decisions - such as a firm's choice of technology and inputs, speed of innovation diffusion, changes to organizational structure and practices, growth aims, reward systems, extent of slack resources and so on. Decision makers will have certain strategic reference points which will help them choose amongst these key decisions (Fiegenbaum et al., 1996; see also Surdu and Ipsmiller, 2020); hence, banks, institutional investors, foreign owners, communities will be more focused on certain organizational goals and performance outcomes than others. Amongst original works on organizational goals, March and Simon (1958) talked

about the different motivations that drive the the manner in which strategic options are assessed and thus, the formation of organizational goals. The goals the organization sets in the end are expected to result from a process of negotiating these options and determining which are the dominant coalitions in the organisation; hence, firm goals depend on those dominant coalitions (Cyert and March, 1963). For example, a greater proportion of foreign ownership may lead to an emphasis on learning and new technology development; a greater proportion of family ownership may lead to socio-emotional wealth being pursued above profit goals (Gomez-Mejia et al., 2007); and CEO duality may increase instances of opportunistic behavior. These CG mechanisms and the organizational goals they lead to may enhance or reduce productivity outcomes. In turn, organizational goals are contingent on changes in firms' environments and time.

Organizational goals are depicted here as a function of CG mechanisms and CG mechanisms are expected to influence firm productivity. We therefore ask:

- What is the effect of different CG mechanisms, and thus, different goals on firm productivity?
- Which CG mechanisms have the greatest impact on productivity and why?
- How does external governance influence internal governance and thus, productivity?

7.2 The relationship between internal governance and external governance

In the UK, the structure of ownership is such that the two most important groups of shareholders in listed firms tend to be (1) institutional shareholders (mutual funds, pension funds and insurance companies) and (2) directors. There is a tendency to broadly assume that the presence of outsiders (e.g. institutional shareholders) will lead to increased productivity as often purported in the literature. Yet, the relationship between internal governance and the external governance is somewhat more complex. First, directors - the second most important group of shareholders – may have weaker monitoring roles and (in the absence of other

pressures) may pursue their own goals and benefits rather than to maximize company value (agency-theoretic problems). Second, concerning institutional investors, this shareholder group may not always lead to firms boosting productivity (Faccio and Lasfer, 2000). One explanation for this is that institutional investors often have diverse investment portfolios and may lack the resources or knowledge to be involved in the strategizing of all the businesses they invest in (and may intentionally stay away from being actively involved to avoid insider trading allegations which would reduce their ability to further diversify investments). What this means with regards to productivity growth: the *negative insider effect may be stronger* in the UK, and the *positive outsider effect may be weaker*.

By comparison, in Germany, the most prevalent category of shareholders tends to be the private outsiders (family owners or individual shareholders) (Franks and Mayer, 2001). Other nonfinancial corporations (including non-profits and other associations) may also hold memberships in boards of companies. Large banks (e.g., Deutsche Bank, Dresdner Bank) tend to hold smaller stakes in companies but, in turn, they gained increased power through proxy votes and seats in supervisory boards. One of the notable benefits of a system reliant on bank debt financing is that financing reduces free cash flows and thus requires some recommitment from management and an incentive to plan and show that they can, indeed, be productive. Therefore, the incentive of "outsiders" to supervise managerial choices may increase, and the incentive of managers to pursue their own personal goals, may decrease. We may see *the positive effect of outsiders stronger* in countries such as Germany, as well as some strong benefits from outsider ownership. Overall, a more nuanced understanding of the specific types of shareholders (beyond "insider" – "outsider" dichotomies) and how they may influence managerial goals and decision making (behavioural and agency explanations) may further contribute towards explaining the UK productivity "puzzle" and theoretically, lead to conceptual developments in this arena.

7.3 The CG-P relationship and the market/resource environment

The benefits of what may be considered as "better" corporate governance for strategic decision making and performance may also vary according to the characteristics of the firm's market and resource environment at a given point in time (Pye and Pettigrew, 2005; Ruigrok et al., 2006). Environmental conditions may moderate the CG-P relationship, with organizations having different goals at different points in time (Dess and Beard, 1984; Li and Simerly, 1998; Pfeffer, 1972). As the environment of the firm changes, so will the dominant coalitions. To the subject of environment characteristics, most notably perhaps Dess and Beard (1984) identified three main characteristics of an organization's environment: (1) munificence, (2) dynamism; and (3) complexity.

Munificent environments tend to offer surplus resources for the organisation, and when the resource dependence of the organization (Pfeffer and Salancik, 1978) is reduced and firms do not compete for resources, the presence of inside directors may perhaps be less useful (Dess and Beard, 1984; Yasai-Ardekani, 1989; see also Goll and Rasheed, 2005). The rationale is that, when resources are abundant, firms should search for alternatives. Conversely, when environments are not munificent, coherent and speedy decision making may increase productivity, as insider directors have knowledge about the internal practices and processes of the organization, and can make strategic choices, reorganize and form dominant coalitions to resolve internal conflicts more easily.

Environmental dynamism – change that is difficult to predict and that increases choice uncertainty – is also a potential moderator of the CG-P relationship. Changes in the environment of the firm require more rapid decision-making processes with potentially fewer choice alternatives; organizational goals may change as dominant coalitions weaken and new coalitions are formed to better serve the new environment and the new firm goals. In this context, outside directors may provide information and managerial skills that the organization

may not have access to (Pfeffer and Salancik, 1978) – here, the board of directors can be viewed as the most important link the firm can have with its outside world (Nicholson and Kiel, 2007) formed of key stakeholders such as customers, suppliers, investors and so on. Hence, when the environment is uncertain or changing, the effect of a higher proportion of outside directors may lead to greater productivity for firms (note that the focus here is less on "agency" and "agency costs" and more on resource dependency and how the organisation can source key resources in order to manage its dynamic environment – see also Hillman et al., 2000/2003).

Complex environments (i.e. how diverse and competitive the environment of the firm is, cf. Dess and Beard, 1984) may also moderate the CG-P relationship. Executives of companies operating in these environments are much more exposed to risk and uncertainty when making strategic decisions which will affect their ability to effectively learn (Surdu, Mellahi, Glaister and Nardella, 2018; Surdu and Narula, 2020). Outside directors with key access to Business Dynamism, Entrepreneurship and Ethnic Pluralism needed tangible and intangible resources will be preferred (Boyd, 1990), e.g. this may be board members who also sit on the boards of other companies that have relations with the company and can help it navigate its environment, access resources and reduce co-ordination costs. This then begs the question: what CG mechanisms are most suited in a recession? (Giroud and Mueller, 2017) What CG mechanisms are most suited in times of crises and disruption?

8 Business Dynamism

8.1 Introduction

Entrepreneurial ecosystems are currently in vogue within research and policy circles (Spigel and Harrison, 2018). In simple terms successful and unsuccessful entrepreneurship within an ecosystem generates critical resources such as investment capital, skilled and engaged workers and entrepreneurial knowledge. The types and quality of these resources that flow through the ecosystem are what separates well-functioning ones from poorly functioning ones. In brief,

they are seen as those characteristics within a region/local area that support high-growth entrepreneurship and enhanced productivity and include cultural, social, economic, and political factors and processes. Current UK policy emphases on 'place' and levelling-up emphasise the importance of understanding how different types and characteristics of local entrepreneurial eco-systems can better support growth and productivity. In this theme we therefore plan an initial project focussing on the role of entrepreneurial ecosystems in explaining the variation in firm-level productivity levels and growth across UK regions and local economic areas. A unique feature of this project will be to examine the complex relationships between business dynamism, entrepreneurial activity and ambition, ethnic pluralism (diversity, migration and immigration) and how they combine to influence productivity outcomes at local level in the UK. A final aspect will look at the extent to which local and sectoral competition can impact business dynamics and hence productivity. We envisage four further projects within this theme the latter of which provides a link to work on exports and trade outlined earlier.

8.2 Business Dynamism in the UK and US – 1998-2020

This project will develop the work by Anyadike-Danes, Bonner and Hart (2011) and Hijzen, Upward and Wright (2010) using a simple but comprehensive job accounting framework. We do this by using employee data for all employer enterprises in the UK private sector and create the average annual job creation and destruction rates between 1998 and 2020, as well as entry and exit rates, and disaggregated both these by sector, size and region. This framework has also has been used in many previous studies in the UK and the US (Davis et al (2008); Goldschlag and Tabarrok (2018)), which sets out the level of turbulence in jobs and identifies the type of firms (i.e., small or large) which most contribute to job creation/ destruction.

It has been well-established that the UK has struggled to reach pre-recession levels on many economic metrics, most notably when looking at productivity and GDP growth. However, there

has been limited up-to-date evidence on job creation and destruction since 2010. Previous literature has focused mainly on the manufacturing sector (Konnings (1995), Barnes and Haskel (2002), Foote (1998)) or are based on data from other countries. As we noted earlier the work on the United States by Davis et al., (2008) showed that for the 30-year period 1975-2005 turmoil or churn in the market place as represented by job creation and destruction rates had a dynamic and positive impact on productivity.

Decker et al (2016) explain that industry-level productivity growth is partly driven by productivity-enhancing reallocation of jobs. They explore two sources of business dynamism drivers and link to a lack of or slower responsiveness of firms to productivity differences within sectors and higher productivity dispersion among firms as key issues causing a decline in business dynamism and subsequently productivity in high-tech firms in the U.S post-2000. The link between business dynamism and productivity is also discussed in Davis et al (2008) where it is noted that higher turbulence and reallocation of jobs in the economy is productivity enhancing and leads to better living standards. Although this body of work focuses on the U.S., similar patterns can be seen the U.K. where higher levels of reallocation rates can improve productivity. Recent analysis of these metrics in the UK.

Most recent literature on the UK include Hijzen et al (2010), who looked at both services and manufacturing industries between 1997 and 2008 using the same dataset as this paper. They found difference between levels of job creation, where the service sector experienced higher rates than manufacturing. They also found that firms in all sectors with less than 20 employees accounted for a high proportion of job creation and destruction relative to their share of employment. Neumark et al (2008) looked at the role of smaller firms on job reallocation rates in the U.S. context for the manufacturing and service industries and found similar results; a negative link between size of firms and job reallocation rates.

Anaydike-Danes et al (2011) also compiled a report on for the Department for Business, Innovation & Skills (BIS) giving an overview of job creation and destruction in the UK from 1998 to 2010. They also use the same data used in this paper and look at regional, sectorial and size differences. Their results are very similar to that of Hijzen et al (2010) and Neumark et al (2008), showing a disproportionate level of job creation and destruction by smaller firms. Regional differences showed higher than the UK average reallocation rates in the South of the UK, Greater London, North West and Wales and when disaggregated, there were clear differences in what was driving job creation and destruction in each region.

In exploring the reasons behind the decline in business dynamism in the U.S., Goldschlag and Tabarrok (2018) using U.S firm-level date to investigate the tightening of federal regulation on business dynamism. Although expecting to find a strong link, results suggested that federal regulation played little to no role in the decline. An important finding when looking in the U.K. context as results presented in this paper show a decline in job reallocation rates and future research should be steered towards investigating potential causes.

The intention is to work with colleagues in the US (e.g., Decker) to construct a rigorous comparative analysis of business dynamism in the UK and US economies. It may be possible as resources and data permit to include other European countries in the analysis and we are well connected to the OECD DYNEMP and MULTIPROD projects.

The most recent metrics on job creation and destruction in the UK and hence job reallocations are shown in Figure 6. The data used in this analysis has been compiled by the Office for National Statistics (ONS) from data provided by the HMRC and is called the Business Structure Database (BSD) and is accessible through the ONS Virtual Micro-Data Lab (VML). Virtually all UK firms with employees are covered by the BSD (which contains all VAT and/or PAYE registered enterprises). The data does not distinguish between part-time and full-time workers nor provide a breakdown between skill levels or functions (management, office

workers or operatives). In brief, the analysis simply treats a job as an employee in the business irrespective of their role and skill level. We cover 20 years in the data between 1998 and 2019. We use our longitudinal firm-level BSD dataset created by combining the individual BSD datasets to provide a summary of average annual rates of job creation and destruction, entry, exit and reallocation rates in the UK disaggregated by region and firm size (employment). The job creation and destruction rates presented below are defined in the following way:

- **Job Creation** – total employment change due to new firms entering the market or firms expanding.
- **Job Destruction** – total employment change due to of firms exiting the market or firms contracting.

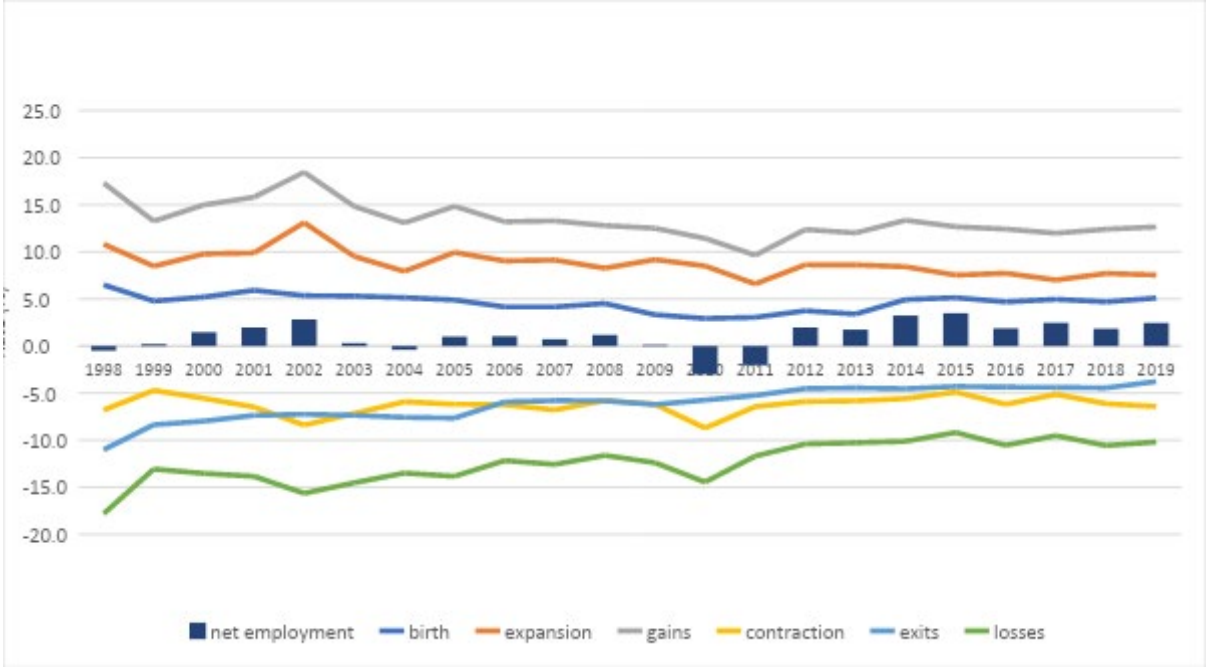
These job creation and destruction figures are expressed as rates by dividing by employment averaged over the current and previous year (businesses with no change in employment do not contribute to either job creation or job destruction). So, the change in employment between two years – often referred to as the net employment change – is equal to the difference between job creation and job destruction over the period and the net employment rate equals the job creation rate less the job destruction rate. The sum of the job creation rate and the job destruction rate is referred to as the job reallocation rate. It captures the total volume of change and represents the 'reshuffling of job opportunities across locations' (Davis et al., 1996). Tracking the job reallocation (JR) rate allows us to arrive at a measure of business dynamism for the economy.

Figure 6 shows the level of business dynamism in the UK between 1998 and 2019. In 1998, job creation is slightly lower than job destruction and thus net employment is negative signifying more jobs were lost than created resulting in an overall decline in UK job market. The sum of the job creation rate and the job destruction rate is referred to as the job reallocation rate. It summarises the overall volume of change and in essence represents the 'reshuffling of

job opportunities across locations' (Davis et al., 1996). Tracking the job reallocation rate allows us to arrive at a measure of business dynamism for the economy.

On average, job destruction is lower than job creation in the post-GFC period and job reallocation rates are noticeably higher before 2008, with an average of 28.5% of jobs being created or destroyed. This is much lower after 2008, with just 23%, indicating lower business dynamism and a lack of recovery to pre-recession levels. In 2019, net employment rose to 2.5% but was lower than in the recovery period after the GFC. Overall, business dynamism on the eve of the pandemic was much weaker than in the period before the GFC which combined with falling levels of investment, low productivity and slow growth in GDP meant that the UK economy entered 2020 in a relatively weak position.

Figure 7: Job Creation and Destruction in the UK, 1998-2019



Source: ONS BSD

Overall, business dynamism on the eve of the pandemic was much weaker than in the period before the GFC which combined with falling levels of investment, low productivity and slow growth in GDP meant that the UK economy entered 2020 in a relatively weak position.

Finally, by tracking reallocation rates over time as a measure of business dynamism and hence productivity we can then establish which subsets of firms are contributing to increases in overall productivity as resources (i.e., labour) shifts, or reallocates, from low-productivity to high-productivity firms and thus driving economic efficiency and growth.

8.3 Ethnic Pluralism and Entrepreneurial Ecosystems

A novel feature of this work will be the inclusion of the concept of ethnic pluralism as one of the key aspects of the entrepreneurial ecosystem. Previous work has shown that moving the emphasis from the concept of diversity, which accentuates wider and richer pools of knowledge, towards the one that stresses that sustained diversity goes hand in hand with transformation of attitudes (Mickiewicz et al., 2019). This shift in attitudes towards a more open local society, when embedded, becomes a factor supporting innovation and entrepreneurship. This way of local 'entrepreneurship capital' is extended: we put forward a proposition about what type of local social structures may be conducive to attitudes supporting entrepreneurship, ambition growth and perhaps productivity gains and why.

8.4 Role of types of small business decision-makers in productivity outcomes - entrepreneurs, owner-managers and managers

From a governance perspective, smaller firms have unsophisticated governance structures, with the role of the entrepreneur or founder being crucial; in that, dominant coalitions which influence organizational goals are likely to revolve around the entrepreneur.

In this context, the managers of SMEs become a "special" and "unique" factor of production which cannot be easily replicated (Reid, 1995) in the same way in which we may be able to replicable tangible factors and resources. Ownership and control in smaller firms are tighter which is reflected in the management and strategies of these firms, i.e. the objectives of the owner/entrepreneurs are often reflected in the strategy and performance of the company. Both the entrepreneur and the governance structures can play a role in making these firms more or

less efficient, as “the firm is essentially an institutionalised extension of the personality of the entrepreneur” (Casson, 1996, page 2).

Overall, we propose that traditional perspectives concerning the production function should consider the role of the goals of key decision makers and other non-direct labour inputs such as boards of directors, shareholders and management teams. At the very least, we should consider whether it is more or less efficient to combine or separate ownership and control, and which configurations of boards of directors may contribute (directly or indirectly) to boosting productivity in the UK context. Theoretically, we build on the behavioural theory of the firm and agency-theoretic assumptions to examine how different governance mechanisms and their combinations may influence organizational decisions and goals, leading to the formation of coalitions that contribute to a greater or lesser extent to subsequent firm performance such as firm productivity growth outcomes.

8.5 Innovation, internationalisation and productivity

Brexit creates new tensions and opportunities for internationally trading firms and those considering entering export markets. This project will explore the links between two critical areas of policy making – supporting innovation and exporting – and their joint link to improving UK productivity. Despite significant research attention the causal mechanisms linking productivity, innovation and exporting are still unclear (Love and Roper 2015). Other recent studies have suggested that productivity enhancement starts before firms export (a learning-to-export) effect and continue after exporting starts (a learning-by-exporting) effect (Gypali, Love, Roper, 2020). Detailed studies of UK firms’ exporting behaviour also suggests the diversity of firms export strategies – e.g. opportunistic, intermittent, consistent - and that these may be changing as a consequence of Brexit with firms reducing export participation (Crowley et al 2018) and aggregate trade flow (Graziano et al 2018). Early evidence suggests that UK traders, especially smaller traders, have also responded to Brexit uncertainty by

redirecting their trade away from the close, rich and currently frictionless EU neighbouring markets to places further afield (Douch, Du and Vanino, 2019). These trends are likely to weaken exporter's productivity, especially among SME traders which are more vulnerable to increased trade costs and risks. Elsewhere, other evidence also reports the UK trader's experience of trade destruction (reduced international trading) because of high dependence on European markets amid the Brexit uncertainty[8].

This project will consider four specific research questions related to the linkages between innovation, internationalisation and productivity and the role of public policy in supporting positive linkages:

- How do product, process and organisational innovation contribute to productivity and exporting? What comes first? Over what timescale do these effects occur?
- How does public support for innovation (though UKRI/Innovate UK) contribute to innovation, exporting and productivity?
- How do firm product innovation, product specialisation and diversification (related diversification and un-related diversification) and market diversion (from EU to elsewhere) impact on firms' exit from exporting, export re-entry, and prolonged exporting episodes?
- How do the above trade dynamics (export destruction, intermittency, product innovation and market diversion) affect firm productivity

[8] https://www.cityam.com/a-horror-story-brexit-and-covid-halt-international-trade-for-uk-smes/. According to the survey by Currensea, six per cent of SMEs – nearly 300,000 firms – have had to stop trading this year due to Brexit. This is in large part because of a reliance on trade with the continent – three quarters of SMEs said their main trading partner is Europe. Eight per cent of the firms surveyed said they will have to pause trading internationally once Britain leaves the EU, while a further 11 per cent will have to stop entirely.

9. Supply Chain Productivity

9.1 The problem

The underperformance of the UK's productivity growth to other developed economies, has attracted attention from academics, consultants and policymakers to address this so-called 'productivity puzzle'. Extensive studies have been conducted at both macro (i.e. country/sector) and micro (i.e. firm) level to diagnose the root cause of the productivity decline (Schiffbauer et al., 2017; Wales, 2019). Recent findings (Roper et al., 2019) indicate that the disconnect between macro- and micro-level measures is one of the key factors that undermine productivity improvement. This is as country/sector productivity is measured by 'growth value added (GVA) per employee', which does not align with industrial firms who view productivity as production efficiency measured by cost, quality and time within the bounds of their own firm. As a result firms tend to improve their own productivity often at the expense of their customers and suppliers, resulting in an unproductive supply chain (SC) (Lee, 2004). Common manifestations of poor productivity can be context specific. For instance, in construction it results in project delays & cost overruns (Larsen et al., 2016; Olawale and Sun, 2015). In manufacturing, unfilled customers' orders, excess inventories & overloaded suppliers (Storey et al., 2006).

Industry has long recognised that it is supply chains that compete, not individual firms (Christopher, 1998). Taking a SC perspective in addressing the productivity issues provides a step changing opportunity, in which the efficiency of each entity is considered and improved through integration and management of resources in the SC network (Schoenherr and Swink, 2012). The recent presence of COVID-19 and Brexit made it even more challenging for UK firms to achieve high SC productivity due to severe disruptions to both demand (i.e. volatile demand) and supply-side (i.e. delivery disruptions, operations shutdown, supply shortage) (Sreedevi and Saranga, 2017). Given the inevitability of external disruptions, SC resilience

becomes a critical capability for firms to maintain continuity of operations, which if done effectively can sustain SC productivity in the long term (Christopher and Peck, 2004).

This work stream aims to define end-to-end (E2E) SC productivity and explore how it can be improved to tackle productivity issue at the national level. Although SC productivity is a concept that not generally discussed in the operations management literature, the following findings from existing studies provide a theoretical foundation for this work:

- Firms must understand the difference between supply chain (SC) and supply chain management (SCM). SC refers to the physical network/global value chain (GVA), whereas SCM refers to the operating model of managing the SC.
- The goal of SC is to deliver customer value at the lowest possible cost, which can be achieved through effective SCM by managing relationships with business partners, coordinating the flow of material, cash and information, and optimizing buffer of time, inventory and production capacity.
- SC performance has been examined from limited perspectives (i.e. single firm/a dyad buyer-supplier relationship) in terms of cost, time and quality, which needs to be further extended to measure the productivity of the E2ESC.
- SC integration is positioned as the foundation to effective SCM as it 'synchronized' working, thinking and decision making between business functions, resulting in swift even flows in the chain. Prior studies suggest that having a high level of SC integration has positive impacts on the performance of individual firms, but less is known about how it impacts the productivity of the entire chain.

SC resilience is a critical capability for firms to respond to external disruptions (i.e Covid-19 & Brexit) and maintain operational continuity, which can be achieved through configurations of various SC practices (i.e. SC planning, buffer management, collaboration and so on) depending on the type of disruptions. However, the link between SC productivity and resilience

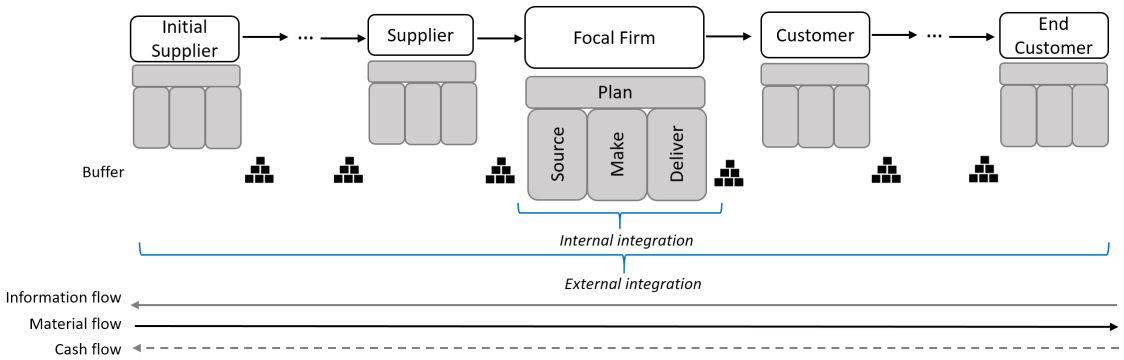
remains unexplored. It presents an opportunity for empirical investigation to understand how they are interrelated in the different context and how an overall improvement of both affect the productivity at the sector/national level.

9.2 What is supply chain productivity and how it can be measured?

A SC is a network that connects multiple entities in a business to turn raw materials into final products that are delivered to end customers (Beamon, 1999). Figure 7. depicts the scope of a supply chain, where each entity in the chain has to manage an internal SC process that consists of four functions – plan, source (procurement), make (production) and deliver. SCs are often complex due to the number of entities involved in the chain and the number of areas that need to be managed in each entity. The goal of SC is to deliver maximum value for end customers at the least possible costs (Mentzer et al., 2001), which distinguishes it from the global value chain (GVA) focusing on creating and adding value to the products through the configuration of activities within the global network (Cox, 1999). The aim of SCM (Christopher, 1998; Houlihan John, 1985; Stevens, 1989) is to minimize lead time, costs and quality defects by:

- Establishing and managing relationships across multiple functions and suppliers
- Integrating and coordinating the flow of material, information and finance
- Monitoring and optimizing buffers (inventory, production capacity and time) as a mechanism to balance the demand and supply.

Figure 8. The scope of the supply chain



Building on the understanding of SCM, SC productivity means '*delivering customer value at the lowest possible cost as a result of maximizing flows and right-sizing buffers'*. Adopting this view enables firms to take a collaborative approach to manage SC activities, from which the productivity of every single entity is considered and improved through joint commitments. To achieve this vision, it is important to understand how SC productivity can be measured from an E2E perspective. A recent study (Balfaqih et al., 2016) highlights that existing SC performance measures often focus on a portion of SC (i.e. a single firm or a dyad buyer-supplier relationship) around the process of source, make and deliver. Other elements like SC flows and buffers (see Figure 7) should be measured as they indicate the level of coordination between SC entities (Fleisch and Tellkamp, 2005). Moreover, not much has been done around how the performance of 'many to many' SCs can be measured due to their complexity (Maestrini et al., 2017), which is deemed to be a potential contributing factor to the disconnect between the levels. Building on these works, E2E SC productivity can be measured from multiple operational dimensions including:

- Overall cost of SC
- Quality of products/services delivered to end customers

- Delivery performance
- Flows (of material, information, financial) across SC
- SC response time
- Size of buffers (inventory, production capacity & lead time)

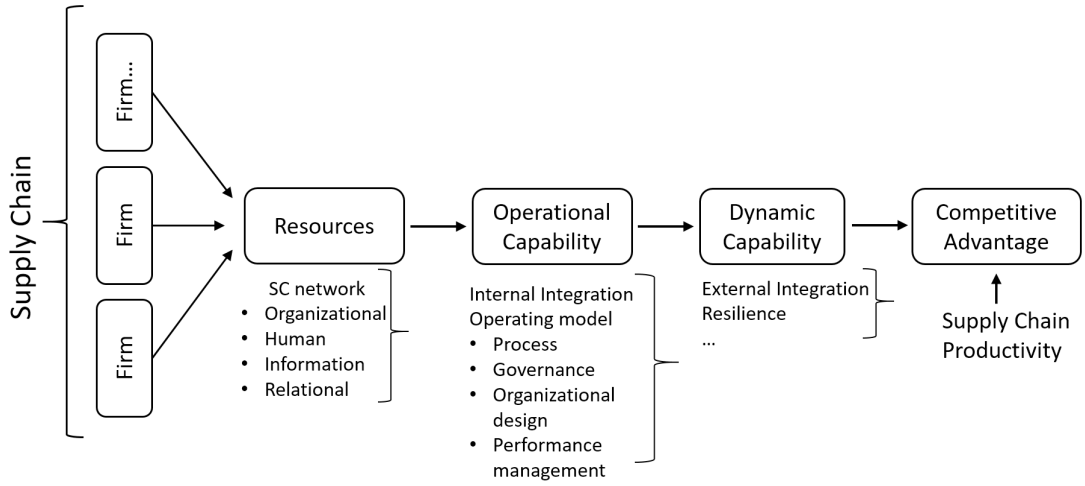
9.3 How to improve the productivity of the end-to-end supply chain?

9.3.1 Resource-based view (RBV) towards supply chain productivity

The RBV has been adopted in operations management to investigate how firms gain sustainable competitive advantage through the configuration of resources and capabilities (Barney, 1991; Teece et al., 1997; Wernerfelt, 1984). Resources refer to the tangible (i.e. labour, factory, warehouse) and intangible (i.e. knowledge, relationships) assets owned by a firm (Barney, 1991). Capabilities refer to the firm's ability of deploying the resource through an integrated process to achieve the desired outcome (competitive advantage) (Wernerfelt, 1984). Depending on the context, capabilities can be further categorised into operational and dynamic capability (Collis, 1994; Teece et al., 1997). Having operational capability allows firms to retain basic business functions to 'make a living', whilst dynamic capability enables firms to integrate and configure resources within and across firms to respond to rapidly changing markets.

Figure 8 illustrates how SC productivity can be investigated through the lens of RBV. Having improved SC productivity would enable firms to be more competitive than other rivals as productivity of each chain entity is improved, therefore lead to better customer satisfaction, minimum costs, low inventories and on-time delivery. To achieve this goal, firms have to be able to manage SC network (resources) through the operating model (operational capability) on a daily basis and address potential disruptions by leveraging resources and competences through the SC integration (operational & dynamic capability) and resilience (dynamic capability).

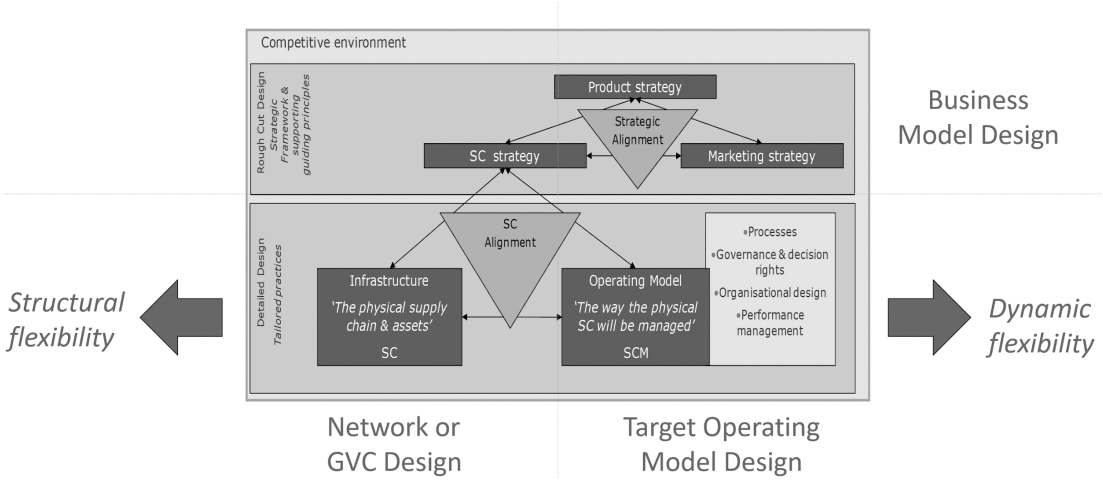
Figure 9. Examining SC productivity through the lens of RBV



9.3.2 Supply chain integration

Effective SC management relies on a greater level of alignment in terms of strategy, structure and process within and between firms in a SC (Wong et al., 2012). Figure 9 identifies different types of alignment within the scope of SC and three supporting design considerations (Godsell et al., 2010).

Figure 10. SC alignment and three supporting design considerations



Source Godsell et al., (2010), p. 11

Within the firm, SC strategy is positioned as an enabler to product and market strategy in turning value propositions into final products and services that can be delivered to end customers (Godsell, 2009). This informs the *business model design* that creates business

alignment between SC, product and marketing at the strategic level to provide guiding principles for day-to-day operations. At the SC level, the alignment between SC strategy, infrastructure (the physical SC and its assets) and operating model (the way that physical SC is managed) is critical to bring strategy to life.

To create and maintain SC alignment beyond the boundary of single firms, SC integration is positioned as a critical organisational capability as it enables firms to align and coordinate resources and processes within and across SC entities to smooth the flow of material, finance and information to deliver maximum value to end customers (Stevens and Johnson, 2016).

Early literature posited SC integration as a unidimensional concept (Armistead and Mapes, 1993), and more dimensions (i.e. process, information & material) were explored as the concept evolved over the past decades (Alfalla-Luque et al., 2012). The most common view is that SC integration can be divided into internal integration and external integration (Ataseven and Nair, 2017; Pagell, 2004; Stevens and Johnson, 2016; Wong et al., 2011) as illustrated in Figure 7. Internal integration focuses on creating alignment between strategies, processes and resources within the firm (Frohlich and Westbrook, 2001; Stevens and Johnson, 2016). This is clustered as operational capability, which if done effectively can break down the boundary between 'functional silos' to accelerate information flow and reduce overall operating costs (Wong et al., 2011). On the other hand, external integration consists of customer and supplier integration, which indicate the level of coordination between the firm and its SC partners (Frohlich and Westbrook, 2001). Supplier integration focuses on building strategic collaboration with key suppliers to share information, manage processes and optimise resources (particularly size of buffers) (Pagell, 2004; Stevens and Johnson, 2016). Similarly, customer integration is all about establishing a 'close tie' with customers to improve SC visibility, which allows firms to access accurate demand signals and respond faster to fulfil customer needs (Wong et al., 2011). A high level of external integration makes the SC more

flexible in responding to rapidly changing demands by leveraging buffers in the chain (Christopher and Holweg, 2017), which is categorised as a dynamic capability.

Overall, achieving internal and external SC integration enables chain members to operate towards the mutual objective – revenue growth, working/fixed capital efficiency and operating cost reduction (Christopher, 1998; Stevens and Johnson, 2016), which ultimately leads to a productive SC.

9.3.3 Supply chain resilience

SC resilience has become a crucial topic in operations management as it refers to a firm's ability to adapt to and respond to challenges caused by an external disruption (Ambulkar et al., 2015). Considering a productive SC is exhibited when products/services are delivered on time and at the lowest possible costs, SC resilience is a critical dynamic capability (as shown in Figure 8) to retain the continuity of operations and ultimately contribute to the improved SC productivity in the long term.

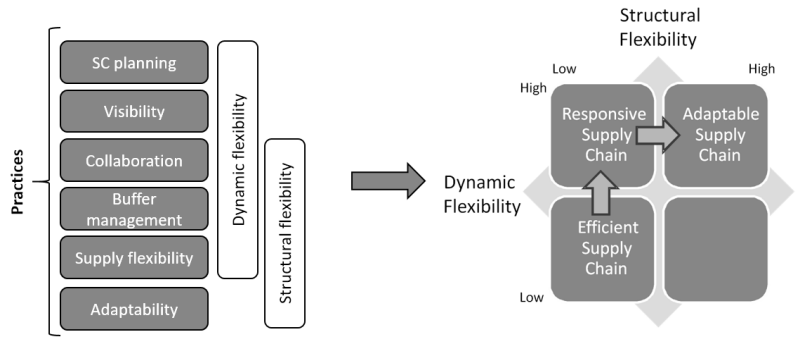
Covid-19 and Brexit tested the resilience of UK industrial SCs to the limit, during which firms have to deal with different types of SC challenges resulting from both disruptions. It is important that firms understand how SC resilience can be measured (Chowdhury and Quaddus, 2017) and how different strategies (proactive, reactive or both) and practices can be configured to address various disruptions (Ali et al., 2017). A recent study (Zhang et al., 2021) assessed the resilience level of UK manufacturing SC and how the following practices can be adapted to respond to Covid-19 and prepare for Brexit.

- **SC planning**: demand forecasting and contingency planning
- **Visibility**: having access to real time data
- **Collaboration**: working with SC partners to deliver customer value
- **Buffer management:** utilizing buffer of inventory, production and time to enable material flow

- **Supply flexibility**; establishing multiple sourcing options
- **Adaptability**: transforming SC design in responding to the dynamic business environment

The findings provided two insights. First, buffer management (optimizing inventory level, production capacity and lead time) plays a vital role in both situations. However, the impact of using buffers in a SC can be twofold (Christopher and Holweg, 2017; Pettit et al., 2010). Having buffers in the SC network enables firms to respond to changing demands effectively, but this always comes with expenses. On the other hand, firms who have taken out buffers may fail to deliver and hence expose their SC to risks. Therefore establishing SC integration would be a critical first step to enable firms to manage buffers collaboratively (Stevens, 1989). In this way, the 'size' of buffers can be optimized across the SC to reduce costs and lead time. Second, configuring the six practices creates two types of flexibility that can be adapted to respond to different types of disruptions (Christopher et al., 2011) (Figure 10). Structural flexibility is established when the SC network is reconfigured to build flexible options (Figure 9). This is often used when the supply base is being taken away and other sourcing options are needed to retain operations. Dynamic flexibility refers to the adoption of SC practices (i.e. buffer management, SC planning) in responding to changing demand without reconfiguring the existing network/GVC (Figure 9). This was proven to be an effective option in the retail sector during the Covid 19 outbreak as firms were able to buffer against uncertainties within the current network.

Figure 11. Different approaches to build SC resilience



Overall, building on the theory of RBV, SC integration and resilience can be potential antecedents to improve SC productivity. Given the limited empirical research, this remains an important gap in the literature that leads to the formulation of our research agenda for this work stream.

9.4 Research Agenda – What is the future research direction?

Tackling productivity issues from a SC perspective can align the interest of political decision-makers and industrial firms, therefore this work stream aims to conceptualise the notion of SC productivity and how it can be achieved in the real life context. In doing so, the following research questions are proposed to guide the research direction:

- How is end-to-end SC productivity defined? What does it mean to the UK (academics, industrial practitioners & policymakers)?
- How can it be measured using both operational and economic indicators? How can existing operational measurement be extended to cover the aspect of SC flows and the size of buffers?
- How does SC integration (internal and external) affect the SC productivity?
- Linking to the measures of SC productivity, how is the impact measured?
- Considering the different approaches (dynamic & structural flexibility), how does SC resilience affect SC productivity?

- The resilience study (Zhang et al., 2021) highlights that buffer management is proven to be an effective practice to build SC resilience, hence it is important to understand, what role does buffer management play in linking SC resilience and productivity?
- Linking to the measures of SC productivity, how is the impact measured?
- How does SC integration interplay with resilience for high SC productivity?

To answer the above questions, we propose two research projects.

The first project (ESRC funded 'From Productivity to Prosperity') focuses on exploring ways of improving SC productivity in the West Midlands region. Through this study, the notion of SC was conceptualised building on the theoretical foundation of SC integration (the critical antecedent to the SC productivity). A theoretical model was then development to explore the relationship between SC productivity, integration and planning practices through a two-stage research design. First, an online survey has been conducted on four industries (manufacturing, professional services, retail & hospitality) in the UK to understand the current level of SC productivity in each industry and explore the hypothetical relationships. Second, two in-depth case studies are conducted at the regional level (i.e. Midlands region) and firm level respectively to form a more rounded view on the topic. In addition, an economic model for measuring E2E SC productivity was developed using some financial data from Bloomberg.

The second project aims to explore the effect of supply chain linkages on (1) productivity, (2) resilience and (3) the relationship between productivity, resilience and spillovers. It will build on some data that are currently being constructed under the first project. We will apply a novel two-stage (random parameter) empirical strategy, which firstly estimates the average effect of vertical linkages on productivity spillovers across chains (and firms), and secondly estimates individual-specific coefficients of our variable of interest (i.e. supply chain linkages) to investigate the characteristics driving heterogenous returns across chains (and firms). The estimation issues are well understood, and we will not go into them here, but they include

standard panel data issues (e.g. endogeneity of the relationship between supply chain formation and productivity). Finally, a counterfactual analysis will be performed to further test the robustness of our findings.

10. Conclusion and Research Agenda

The central theme of this programme of work is the need for greater understanding of heterogeneity, in terms of the drivers of productivity, the types of firms and their particular role in the productivity puzzle. Taking the view that there are only three ways to improve the productivity of a stock of activity in a given location; to attract more productive firms in (inward investment); to encourage the development of the existing stock (through innovation, exporting and increased collaboration), and encouraging innovative start-ups (by understanding the nature of the ecosystem), this theme proceeds along those lines, recognising the importance that for example governance structures, and the organisation of activities and collaboration through supply chains play key roles.

We therefore start with an understanding of the nature of the "productivity puzzle" across different types of firms, and how the interventions across the different aspects of productivity growth can impact of productivity across those firms, linking to other aspects of the institute such as the problems of measurement, but also skills and the importance of geography.

Our previous work highlights a disconnect between policy and practice in terms of understanding what the word "productivity" means and therefore one aim of this theme, working with our (and other) regional productivity forum, is to bridge this gap.

The international aspects of this theme, focussing on exports and FDI, have at their heart notions of international knowledge transfer and learning, linking to innovation, and understanding of the importance of where international firms choose to locate different activities (and in turn what locations can do to influence this, or to at least understand the process and seek to maximise the benefits for their stakeholders. This in part links to the

geography theme, and contributes to our understanding of the nature of the productivity distribution. Continuing the theme of heterogeneity, we also highlight the heterogeneity in the benefits of exporting, and also the productivity gains through attracting FDI.

We also highlight heterogeneity in firm governance, and in supply chains configuration and competitiveness. Behavioural theory of the firm for example highlights the strategic reference points that stakeholders take, leading to different organisational goals (only one of which is productivity growth). As such it is important to understand competing forces. The well known example of this is the supposed short-termism in the UK, leading to suboptimal levels of innovation and investment, but there are also others.

One can therefore see the problem of innovation in a similar light, and we highlight the importance of business dynamism and entrepreneurial ecosystems. These highlight the importance of the nature of the resources that are present in the system, identifying the distinction between good and poorly performing ones, and exploring the nature of these complex relationships.

We see supply chain productivity in a similar vein. In the search for "efficiency" firms may demand more of their suppliers, in terms of reduced lead times, greater flexibility in quantities delivered, and different specifications. On the one hand, one could argue that this makes the focal firm more "productive" but too many varying signals simply pass the problem onto others, who may be less well resourced and able to address the problem. Theoretically this may be linked to the hold-up problems sometimes discussed in the global value chain literature, and it is somewhat surprising that more is not known about this.

Taken together therefore, we set out an agenda that sees much commonality between these themes, and highlights the additionality of exploring these issues together, rather than as disparate strands of very different literatures, as has been the case hitherto.

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