Mapping SME Productivity Research: A Systematic Review of Empirical Evidence and Future Research Agenda

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Abstract

SMEs are the lifeblood of economies around the world. They play an important role in productivity growth, which is crucial for developed economies as they adjust to major trends such as the industrial revolution, an aging population, and changes in the nature of work. This study maps the SME productivity research landscape by way of a systematic literature review focusing on the direct, indirect, as well as mediating/moderating factors that enable or constrain productivity in SMEs. We review 109 empirical studies and highlight the fragmented nature of the extant research in this field. Our thematic analysis identifies six key themes, namely *organizational environment, organizational capabilities, investments, types of innovation*, *external knowledgebase* and *commercialization*. By taking stock of existing knowledge, we highlight critical gaps and methodological issues that limit our understanding of SME productivity. We propose a future research agenda to address current shortcomings and advance knowledge on this topic. Implications for policy are also discussed.

Keywords: SMEs, Productivity, Systematic literature review, SME policy

JEL Classifications: D24 L50 O40

1 Introduction

Productivity, defined simply as the total output (e.g. goods, services) that can be produced with given inputs (e.g. labour, capital, resources), is a key driver of economic growth, social prosperity, and living standards. However, differing patterns and causes of productivity slowdown at the firm level have led to growing inequality in productivity since the 2008-2009 financial crisis (OECD 2019). For example, using firm level data for OECD countries, Criscuolo (2018) finds that the gap in productivity levels between firms in the top and bottom deciles of the productivity distribution increased by 14% between 2001 and 2012. This gap is partly attributed to an increase in divergence between technological frontier and the non-frontier firms (Andrews et al. 2016). Similar patterns are found in the productivity distribution of large and small firms with, for example, manufacturing SMEs achieving persistently lower productivity levels (only 62% in the case of small firms and 75% for medium firms) than large firms (OECD 2018). It is therefore essential to capture the heterogeneity in productivity growth amongst different firm size groups in order to better inform future research as well as policies targeted at reducing barriers to, and capitalizing on, opportunities for productivity growth (OECD 2017a).

In this systematic literature review, we focus on factors affecting productivity in small and medium sized enterprises (SMEs) as opposed to larger firms. The rationale for this is threefold. First, SMEs are the backbone of national economies worldwide, contributing significantly to economic growth and job creation, while at the same time having the potential to facilitate inclusive growth as economies adapt to major trends in the economy (Blancher et al. 2019; Motta 2020). For example, micro enterprises alone account for about 70 to 95% of all enterprises in OECD economies, and are a major source of employment and economic growth (OECD 2017a). Second, SMEs have been disproportionately affected by the 2008-2009 financial crisis, which also marks the widening gap in productivity growth between SMEs and large firms (OECD 2017b). In fact, studies indicate that despite the opportunities to participate in the global economy that digital technologies and global value chains provide, SMEs still lag behind in the digital transition, and are more adversely affected by structural barriers (Cusmano et al. 2018). Third, SMEs face unique constraints which make growth and productivity gains more challenging than in larger firms. In particular, small firms are constrained by the 'liability of smallness', a concept coined by Aldrich and Auster (1986) to explain the set of constraints stemming from: the lack of or uncertainty over financial resources; the impossibility to attract skilled workforce compared to large firms; the difficulty in meeting high interest rate payments and/or administrative costs generated by compliance with government regulations. Furthermore, small firms tend to be owner-manager centric, which restricts their ability to develop and execute strategies (Borch and Madsen 2007). For example, decision-making processes are constrained by the owner-manager's time, resources, information, and managerial skills (Gherhes et al. 2016; Osiyevskyy and Dewald 2015). Their tendency to focus on short-term survival also limits performance and detracts from demands of longer-term growth planning and strategizing (Beaver and Prince 2004). All these aspects have key implications for SME performance, and highlight the need to understand the specific challenges faced by SMEs in achieving productivity growth.

While interest in SME research boomed in the 1990s, research on SME productivity in particular gained increased attention from the mid-2000s when many western economies began experiencing a decline in labour productivity growth (Bughin et al. 2018; Gibb 2000). Nevertheless, while numerous studies have been carried out in entrepreneurship and management fields on different aspects of SME productivity, this knowledge remains highly

fragmented. Previous systematic reviews on firm productivity have analysed the impact of Information Technology (Brynjolfsson and Yang 1996), work-family policy (Kossek and Ozeki 1999), manufacturing systems (Muthiah and Huang 2006), and structural change (Krüger 2008) on productivity. Those focused on SMEs have examined specific aspects related to productivity, such as the impact of performance management systems (Garengo et al. 2005), the relationship between innovation, exportation and growth (Love and Roper 2015), SME internationalization (Dabić et al. 2019; Paul et al. 2017), as well as the impact of cash holdings (La Rocca et al. 2019) and public investments (Dvouletý et al. 2020) on SME performance. While these reviews have advanced knowledge on the topic, they do not capture the broader landscape. As Cicea et al. (2019) note, the majority of empirical studies on SME performance - a key dimension of SME productivity - examine organisational factors in isolation, thereby overlooking the external environment in which SMEs operate and the interrelated factors which enable or constrain SME productivity. Moreover, factors influencing firm level productivity such as human capital, management practices, technology, fixed assets etc., are interdependent and cannot be understood in isolation (Prowle et al. 2017).

We therefore adopt a holistic approach to mapping SME productivity literature by carrying out an evidence-based systematic review of empirical studies that explicitly focus on SME productivity in western economies. The main aim of our study is to provide an integrated understanding of the main factors influencing SME productivity. In order to meaningfully explore the current landscape, we address the following research question: *What are the direct, indirect, as well as mediating/moderating factors that enable or constrain productivity in SMEs*? To the best of our knowledge, this is the first review that adopts such a holistic approach in attempting to map the fragmented SME productivity literature. Notably, the factors and mediators/moderators identified in this systematic review are neither specific to, nor restricted to SMEs, but rather provide a map of the current SME productivity research landscape that helps advance our understanding of the field by highlighting key gaps and areas for future research.

Through our systematic review of 109 empirical studies, we highlight the fragmented nature of SME productivity research landscape, and make the following contributions to the field. First, we thematically map empirical studies into six key themes organised around internal (*organizational environment, organizational capabilities, investments* and *types of innovation*) and external (*external knowledgebase*, *commercialization*) factors influencing SME productivity. Second, our descriptive and thematic analyses highlight critical gaps in existing knowledge, as well as methodological issues that currently restrict our understanding of how different factors such as technology, R&D, leadership skills, networks, and collaborations, interact to affect SME productivity. Third, we develop a research agenda and propose four main areas where future research could make useful contributions in advancing knowledge on SME productivity. These are the need for greater comparative analyses (i.e. within SMEs as well as between SMEs and large firms), the need to adopt a holistic approach to understanding human capital in SMEs, the importance of context, and methodological developments that would better enable the analysis of underlying factors affecting SME productivity.

The remainder of the paper is organised as follows: section 2 explains the systematic review methodology and summarises the results of the database search; section 3 presents a descriptive analysis followed by a thematic analysis where we unpack and discuss the findings; section 4 discusses the results, sets a future research agenda, and considers the limitations of our study; section 5 discusses policy implications; and section 6 concludes.

2 Method

In this section, we summarize the systematic review methodology employed in our study. Systematic reviews offer a more transparent, scientific, and reproducible procedure for carrying out literature searches and analyses than narrative reviews (Hu et al. 2015; Tranfield et al. 2003). An evidence-based systematic review is therefore appropriate for fulfilling the aim of our study, enabling us to review empirical studies that explicitly focus on SME productivity in western developed economies. Our review consequently includes studies focusing on Europe (excluding transition economies), the UK, USA, Canada, Australia, and New Zealand. As such, empirical studies focusing on transition or developing economies (Abor et al. 2014; De Loecker 2007; Kim and Ro 2017; Nyikos et al. 2020; Ur Rehman et al. 2019), or those primarily focused on other aspects like SMEs efficiency, performance or competitiveness (Hamilton and Asundi 2010; Hogan and Coote 2014; Ipinnaiye et al. 2017; Siqueira and Cosh 2008), are considered outside the scope of this review. While the focus on western economies restricts our understanding of SME productivity to this specific context, the exclusion of other geographical regions was deemed necessary to ensure greater homogeneity, and allow us to take into consideration the effects of macro-level factors on SME productivity (Ostapenko 2015; Rangamohan et al. 2007). The evidence-based approach also enabled us to provide an integrated understanding of factors influencing SME productivity that can better inform future research on the topic, as well as practitioners and policymakers' decisions with regard to improving productivity growth.

Similar to previous systematic reviews (Hu et al. 2015; Mallett et al. 2018; Thorpe et al. 2005), we follow Tranfield et al.'s (2003) rigorous systematic review methodology that includes three stages, namely planning, conducting and reporting. An overview of the systematic review process is presented in Figure 1 in Online Resource 1. In the planning stage, search strings were constructed in line with the aim of the review and based on a combination of key words related to SMEs and productivity (see Table 1 in Online Resource 1). In conducting the review, we identified and queried four databases, namely Scopus, ABI-Inform/ProQuest, Emerald and Science Direct. If a search generated less than 100 citations, the search string was amended to broaden the search scope. This initial search yielded a total of 1,530 citations. An initial analysis was then carried out to remove duplicates or articles that did not meet the inclusion criteria (see Table 2 in Online Resource 1). Further, in order to ensure scientific quality, only peer-reviewed articles published in academic journals were included (Jones et al. 2011; Liñán and Fayolle 2015). These analyses were carried out independently by two authors of this paper, resulting in a sample of 124 citations (81 articles were selected by both authors independently). Several discussions were then held to decide which of the 43 articles that had been uniquely selected by either one of the authors should be included in the final review. To ensure that the review was comprehensive and did not exclude any potentially relevant articles, a review update was carried out in addition to the systematic search to identify articles published after our initial search or that the review might have missed. This comprehensive approach involved narrative searches on Google Scholar, as well as further searches at a later stage based on recommendations received from the anonymous reviewers during the review stage, and as a result of consultations with productivity experts. The narrative searches yielded an additional 24 articles. In the next step, the articles were classified into three categories based on their relevance i.e. articles that were directly relevant to the scope of the review (i.e. focused on factors that directly influence SME productivity), articles that were partially relevant (i.e. focused on factors that indirectly influence SME productivity), and articles that were less relevant (i.e. SME productivity is not the main focus, but is rather mentioned incidentally). Our final sample includes articles from the first two categories, resulting in a total of 109 relevant articles.

The last stage included carrying out a descriptive and thematic analysis of the review articles. In order to facilitate the descriptive analyses, we created a spreadsheet to capture information based on a reading guide adapted from Henry et al.'s (2016) systematic review (see Table 3 in Online Resource 1). An abductive coding process was used to carry out the thematic analyses, which involved the use of NVivo coding software. First order codes were inductively identified from the review articles. During the next stage, an iterative process, which involved moving back and forth between the data and theoretical literature, was followed in order to generate the second order analytical themes (Kennedy 2018; Miles et al. 2014). This iterative process involved consultations amongst the authors to further refine initial themes identified. The six main themes identified through this iterative process, were further categorized into aggregate dimensions of internal and external factors influencing SME productivity. An overview of the analytical themes and aggregate dimensions is presented in Table 4 in Online Resource 1.

2.1 Defining SMEs and productivity measures

While there is no single agreed upon definition of SMEs, these are generally considered to be non-subsidiary independent firms that employ fewer than a given number of employees, with the upper limit varying between 250 employees (e.g. in the European Union) and 500 employees (e.g. in the United States) respectively (OECD 2005). In this study, we use the OECD definition of SMEs, namely enterprises with fewer than 250 employees that comprise: micro (fewer than 10 employees), small (10–49 employees), and medium-sized (50–249 employees) enterprises (OECD 2017a).

Additionally, productivity is broadly understood in relation to the two most commonly used productivity measures, namely labour and total factor productivity. Labour productivity is a key determinant of living standards (i.e. per capita income) and was considered the main productivity measure until the 1950s when works by Solow (1957) resulted in the prevalent use of the Cobb-Douglas function and total (multi) factor productivity (TFP) (Godin 2009). TFP measures help to disentangle the direct growth contributions of labour, capital, intermediate inputs, and technology; and is an important tool for reviewing growth patterns and assessing the potential for future economic growth. While the former measure is criticised for attributing all increases in efficiency to one factor (Linna et al. 2010), the latter presents a number of methodological issues that complicates the measurement of TFP (Van Beveren 2012). Despite these limitations, labour productivity and TFP are two of the most common productivity measures, and thus our systematic review includes empirical studies using either measure.

3 Results of the systematic review

This section presents the results of our systematic review in relation to the descriptive and thematic analyses carried out on the reviewed empirical studies. The descriptive analysis is presented first, followed by the thematic analysis.

3.1 Descriptive analysis

The 109 articles included in the review covered empirical studies published between 1994 to 2020 (inclusive), with the majority of studies (72%) being published within the last decade. The rising trend in number of articles highlights the traction gained by the concept of productivity, as well as the increased focus on SME productivity in both

academic and policy discourses in recent years. Critically, we also find that the productivity measures, SME definitions, sample types and sizes, research methods, and data analysis techniques used in the reviewed studies, vary considerably. We summarize below the results of the descriptive analyses, with a more detailed description being provided in Table 5 in Online Resource 1.

The majority of reviewed studies (88%) focus on a single country, and only 4 of those focused on multiple countries specifically carry out cross-country comparisons in their analyses (see Figure 2 in Online Resource 1). Similarly, studies examine a variety of sectors ranging from manufacturing, construction, automotive, agriculture to information technology, textiles, food sector etc., with only 2 studies (Black and Lynch 1996; Yazdanfar 2013) carrying out sector-specific comparisons, and another 4 studies comparing both firm size and sectors (Antonelli et al. 2015; Falk and Hagsten 2015a; Lejarraga and Oberhofer 2015; Parisi et al. 2006). We also find that reviewed studies carrying out comparisons based on firm size and/or related factors such as age, absorptive capacity or region, are most common (22%), followed by those analysing the impact of different interventions (8%) and type/level of technology (6%).

Furthermore, the majority of reviewed studies are quantitative (86%), with sample sizes ranging from one case study (Esan et al. 2013) to 1,897,288 observations from a panel dataset (Foreman-Peck and Nicholls 2013, 2015). Data sources are diverse and include independent surveys (via mail, web, or telephone), data from the national statistical offices, balance sheet data, unstructured/semi-structured interviews, and case studies. The data analysis methods utilized are equally varied and include regression analysis, CDM models, structural equation modelling, case study analysis and observations. In addition, only 31% of reviewed studies address the issue of endogeneity. These studies use a variety of methods, such as the use of longitudinal data, lagged or predicted variables, the Hausmann-Wu test, CDM framework, or the Generalised Method of Moments system estimator to control for it. Moreover, only 11% of the studies are longitudinal, and analyse the impact of factors such as process innovation, HRM practices, technology adoption, export participation or public subsidies on SME productivity.

Importantly, this variation in data sources and methods of analysis hinders the direct comparability of findings from reviewed studies. Nevertheless, while we acknowledge this as one of the limitations of the systematic review, our aim is to provide an integrated understanding of the main factors influencing SME productivity. We discuss these methodological challenges in section 4 where we also highlight areas for further consideration in future research.

3.2 Thematic analysis

Our thematic analyses identified six key themes which were further aggregated into two main groups, namely internal (*organizational environment; organizational capabilities; investments; type of innovation*) and external (*external knowledgebase; commercialization*) factors influencing SME productivity (see Table 4 in Online Resource 1). The categories and themes identified are not mutually exclusive, as majority of the reviewed studies (56%) are classified under more than one category/theme. Our analysis in this section therefore focuses on providing an integrated understanding of the different factors directly or indirectly influencing SME productivity. A mapping of the factors and related mediators/moderators directly influencing SME productivity, as well as a summary of key study findings, are presented in Figure 3 and Table 6 respectively in Online Resource 1.

Theme I - Organizational environment: this theme includes research focused on understanding how internal aspects such as workplace practices, ownership structure, industrial relations etc., affect a firm's operations. Reviewed studies analyse how the work environment and human resource (HR) policies impact a firm's labour productivity, with many studies indicating a positive effect of proactive HR planning and recruitment (Black and Lynch 1996; Koch and McGrath 1996; Lodefalk and Tang 2018; McGuinness et al. 2008). For example, Koch and McGrath (1996) find that proactively planning and recruiting the right people from the onset not only results in greater labour productivity, but also benefits the firm through the interaction effect between HR policies and capital intensity (i.e. ratio of assets to total employees). This effect exerts a more dominant influence upon productivity than capital intensity on its own (Koch and McGrath 1996). Hiring lead professionals from frontline firms, also results in knowledge transfers that contribute to the hiring firm's TFP, but only for firms with high absorptive capacity (Lodefalk and Tang 2018).

The productivity of the firm's workforce is also contingent on factors such as work systems, business awards, industrial relations, and technological innovations (Antonioli et al. 2010; Fabling and Grimes 2014; Henriques and Catarino 2016; Jones et al. 2014; Mayer et al. 2017; Towers and McLoughlin 2005). High-performance and decentralized incentive-based work systems are generally positively related to labour productivity. (Datta et al. 2005; Guthrie 2001; Huselid 1995; Rasel 2016), yet it is still unclear whether high performance systems lead to increased productivity or vice versa (Datta et al. 2005). Moreover, the negative effect that small firm size can have on the combination of decentralized work systems and technological innovations points to the need to better understand how workplace systems interact with other internal factors to impact the labour productivity of different sized firms (Rasel 2016). Unlike large firms, which have more comprehensive work management, HR practices, and technology systems, SMEs tend to focus on organizational practices that increase revenues and optimise resources in order to improve their level of productivity (Bartel et al. 2007; Torrent-Sellens et al. 2016).

Given the increased adoption of technology by SMEs, examining how workplace practices might interact with technological innovations to influence firm productivity is another central focus of reviewed studies (Cohen, 2006; Colombo et al., 2013; Fabi et al., 2010; Raymond, 2005; Torre and Solari, 2011). These point to a complementary relationship, with extensive strategic and organizational changes required to accompany the adoption of technological innovations - and vice versa - in order to have a positive impact on productivity (Colombo et al. 2013; Torre and Solari 2011). Studies analysing the link between productivity, innovation strategies, and industrial relations, find that cooperative industrial relations positively impact training activities and organizational innovation, which in turn drive superior labour productivity (Antonioli et al. 2010). Additionally, Black and Lynch (1996) find that both industrial relations and recruitment processes focused on grades have a positive impact on the labour productivity of firms in the non-manufacturing sector.

Further, studies analysing firm ownership structure focused on understanding how the unique characteristics of family firms, such as family members involvement in the daily running of the firm or the desire to transfer ownership through succession, might influence a firm's productivity level (Barbera and Moores 2013; Cassia et al. 2012; Classen et al. 2014). While no major differences are found between family controlled firms and non-family firms in terms of investment in innovation or financial performance, the former tend to be disadvantaged in terms of workforce motivation and labour productivity (Cassia et al. 2012; Classen et al. 2014). However, these findings seem to be influenced by the productivity measure used. While the two previous studies focus on measuring the

labour productivity of firms in Italy and Germany respectively, a study by Barbera and Moores (2013) focuses on measuring the TFP of firms in Australia. This latter study finds that family-controlled firms' labour output (capital output) contributions are significantly higher (lower) than that for non-family firms. Subsequently, they conclude that when heterogeneity of output contributions are considered, no differences exist between family controlled and non-family firms' productivity levels (Barbera and Moores 2013).

Although numerous studies have been carried out on understanding the impact of a firm's internal organizational environment on productivity, there is still scope for future research to analyse the interrelationship between ownership structure and factors like technological innovations, R&D, and HR systems. Studies examining a wider range of workplace practices, and those considering the intensity of technology usage, as opposed to mere adoption, could also provide a more in-depth understanding of the conditions under which these relationships are magnified (Colombo et al. 2013). Moreover, the absence of longitudinal studies in this area limits our knowledge of the cumulative impact that HR practices or training schemes might have on SME productivity.

Theme II – Organizational capabilities: the studies under this theme focused on understanding how a firm's ability to manage its human resource impacts its level of productivity. Studies analysed a variety of factors including staff employability, training, wellbeing, leadership, and owner-managers' demographics (Arocena et al. 2007; Cocker et al. 2013; Henriques and Catarino 2016; Li et al. 2016; McGuirk et al. 2015; Middleton and Byus 2011; Ribeiro Soriano and Castrogiovanni 2012; Savery and Alan Luks 2004). In general, training seems to have a positive effect on labour productivity (Georgiadis and Pitelis 2012; Mancinelli and Mazzanti 2009). However, a more in-depth analysis reveals that the impact of training activities is dependent on other factors. Training programmes focused on employees have a larger positive impact on firm productivity than those focused on managerial staff or HRM (Georgiadis and Pitelis 2012). Further, Black and Lynch (1996) find that the average education level of firm employees has a significant positive effect on labour productivity for both the manufacturing and non-manufacturing sectors. Moreover, they also find that while a greater proportion of formal off-the-job training resulted in higher labour productivity (after adjusting for costs of introducing new skills) for firms in the manufacturing sector, the content of training programs was more important for those in the non-manufacturing sector (Black and Lynch 1996; Koch and McGrath 1996). The need to match employees' skill levels to the firm's level of technological change is also highlighted by Sandulli et al. (2013) who find that, contrary to common belief, having a younger workforce could result in reduced efficiency for firms with high-levels of technology change. Highly skilled employees are also found to be as equally important as R&D for the innovation output of knowledge-intensive service micro-firms (Audretsch et al. 2020).

Additionally, the slow adoption of information and communication technologies (ICTs) by SMEs has been shown to constrain productivity growth (Martínez-Caro and Cegarra-Navarro 2010). A number of studies analyse the relationship between SME owner-managers' socio-demographic characteristics (e.g. gender, ethnicity, race, education, experience) and their adoption of ICTs (Middleton and Byus, 2011; Middleton and Chambers, 2010). Whereas no significant effect is found for the owner-managers' gender, education, or experience, on their intention to adopt or use Wi-Fi technology, this is not the case when ethnicity is considered (Middleton and Chambers, 2010). Examining SMEs located in renewal communities - areas specifically targeted for growth and development by the federal government in the USA - Middleton and Byus (2011) find a continuing digital divide between Hispanic and non-Hispanic SME-owners, which undermines the very policies designed to enhance business operations in these

relatively disadvantaged urban areas. In general, non-Hispanic SME-owners are more likely to adopt ICTs for both administrative and analytical purposes (Middleton and Byus, 2011). Interestingly, another study analysing the impact of a workforce's cultural diversity on patent applications in various German regions, finds that cultural diversity has an innovation-enhancing effect due to its positive influence on the knowledge creation process (Niebuhr 2010).

Further, only a handful of studies focus on leadership and employee wellbeing, even though these factors play a key role in influencing productivity. For example, Ribeiro Soriano and Castrogiovanni (2012) find that the CEO's entrepreneurial human capital, in the form of industry specific knowledge prior to start up, and general business knowledge post-start-up, are both positively related to the firm's labour productivity. Furthermore, Li et al. (2016), who focus on the impact of e-leadership, find that SME leaders play an important role in improving firm productivity by ensuring optimal utilization of existing/new technologies. SME owner-managers' wellbeing also has an important impact on labour productivity, with experiences of high levels of psychological distress resulting in substantial productivity loss (Cocker et al. 2013). However, as these two topics remain relatively underexplored, future studies examining the interrelationship between employee wellbeing, leadership styles, and SME productivity can make significant contributions to current knowledge. Moreover, there is need for a better understanding of the type of training that is most appropriate for increasing labour productivity; especially when factors such as the level of education/experience of the workforce, or the sector/region within which the firm operates, are taken into consideration.

Theme III – Investments: the studies classified under this theme analysed the impact of investments in R&D and technology on firm productivity. While the relationship between technology and productivity has been a source of debate historically (Brynjolfsson and Yang 1996), recent studies point to the positive impact intensive use of information technology has on productivity. This is attributed to the increased collaboration capabilities (Ruivo et al. 2015), as well as the decreased market research and coordination costs that exporting firms incur (Sandulli et al., 2012). Despite the fact that investment in technology is shown to be relevant for SMEs, both in terms of productivity and firm survival in competitive markets (Niaki and Nonino 2017; Ruivo et al. 2015; Scuotto et al. 2017), SMEs are still slow in adopting ICTs (Martínez-Caro and Cegarra-Navarro, 2010; Mole et al., 2004). Two of the studies in our sample analyse how owner-managers' perceptions might influence SMEs' adoption of new technologies (Nunes et al. 2006; Wielicki and Arendt 2010). Nunes et al (2006), for example, find that while owner-managers are cognizant of the positive impact of knowledge management on productivity, they are still reluctant to invest in long-term goals for which they cannot establish added value. Thus, knowledge management activities within SMEs happen in an informal manner, and are rarely supported by ICT systems (Nunes et al., 2006).

Moreover, an SME's ability to assimilate technological innovations, rather than simple adoption, is a crucial factor in determining whether it experiences a positive or negative impact on its productivity levels (Raymond and St-Pierre 2005). R&D is crucial to facilitating a firm's absorption capacity of new technology, and through innovation, boosts productivity growth (Ballestar et al. 2020; Parisi et al. 2006). Internal R&D and knowledge spillovers are also complementary for labour productivity; with knowledge spillovers being more important for productivity, and R&D being important for both innovation and productivity (Audretsch and Belitski 2020). Knowledge spillovers also have an impact on the intensity of R&D investment, which subsequently results in increased labour productivity growth (Audretsch and Belitski 2020). Analysing robotic tool adoption in Spanish

manufacturing SMEs, Ballestar et al. (2020) also find that while knowledge spillover effects relate to capitalization and exports in the case of robotized SMEs, they relate to human capital for non-robotized SMEs.

Studies also focus on understanding how public support might influence the likelihood of a firm's engagement in R&D and the subsequent impact on productivity, but with inconclusive results. On the one hand, some studies find that public subsidies have a positive impact on a firm's investments in R&D (Griffith et al. 2006; Hottenrott and Lopes-Bento 2014). In this case, increased R&D efforts per employee leads to a higher probability of the firm having at least one process or product innovation; with both types of innovation being associated with higher firm productivity (Griffith et al. 2006). Publicly induced R&D investments also positively impact sales from market novelties, especially for international collaborators, suggesting that knowledge spillovers from partner firms contribute substantially to a firm's success when introducing radical innovations (Hottenrott and Lopes-Bento 2014). On the other hand, other studies find that R&D subsidies have no positive significant effect on labour productivity over the five-year period after a subsidy is granted (Karhunen and Huovari 2015). In effect, due to its negative impact on productivity, small firms tend to invest in R&D only when public support is available (Serban 2013).

While reviewed studies highlight the varied impact that investment in technology and R&D have on productivity based on factors such as firm size, age, and sector (Baumann and Kritikos 2016; Nunes et al. 2013; Struker and Gille 2010), there is still a limited understanding of the lagged effect of R&D spending, or the impact of the economic cycle, on SME productivity growth (Madrid-Guijarro et al., 2013; Mañez et al., 2013; Sandulli et al., 2013). Further longitudinal studies that are better able to capture the dynamic aspects of such factors would make valuable contributions to this knowledge gap. Future research should also consider the interrelationship between technology, R&D investments, organization culture, and management style (Falk and de Lemos, 2019; Nunes et al., 2006).

Theme IV – Types of innovation: the studies under this theme focused on understanding how a firm's participation in either process or product innovation, or a combination of the two, might influence productivity. Although the studies highlight that both types of innovation have a positive impact on firm productivity (Bagchi-Sen 2001; Dora et al. 2014; Hall et al. 2009; Higón and Driffield 2011; Maani et al. 1994; Raymond et al. 2013; Su and Tang 2016), a firm's decision to undertake either type of innovation is influenced by the firm characteristics (Calderini and Cantamessa 1997; Dora et al. 2013; Su and Tang 2016) and level of R&D spending (Baumann and Kritikos 2016; Griffith et al. 2006; Hall et al. 2009; Parisi et al. 2006).

Examining the link between R&D, innovation, and labour productivity for micro- and large SMEs in Germany, Baumann and Kritikos (2016) find that only product innovation has a sizable positive effect on labour productivity for both micro-firms and SMEs. Labour productivity also increases with firm age, and particularly in the case of micro-firms (Baumann and Kritikos 2016). Similarly, Su and Tang (2016) who analyse the factors influencing a firm's decision to pursue different business strategies in a post-crisis context, find that Canadian SMEs pursuing product innovation are more productive than those pursuing cost-cutting strategies. On the contrary, while investigating how and when innovation takes place, Hall et al. (2009) find that both product and process innovations (and especially process innovation) have a positive impact on the productivity of SMEs, and that larger and older firms seem to be, to a certain extent, less productive, ceteris paribus. Similarly, Audretsch et al. (2020) find that start-ups and young knowledge-intensive service micro-firms are more likely to engage in innovation activities than mature firms, and that such innovation activities lead to increased labour productivity.

The lagged effect that process innovations might have on TFP is also analysed in a study by Manez et al. (2013), who find that implementing a process innovation for the first time does not guarantee immediate productivity rewards. Instead, it allows the firm to gain experience which results in extra productivity growth in the subsequent period, and that this growth lasts for only one period (Mañez et al. 2013). A more holistic approach that incorporates organization-wide cultural changes is required in order for a firm to benefit from productivity gains over the long-term (Gunasekaran et al. 2000; Uwizeyemungu et al. 2015). Therefore, a more comprehensive understanding of the lagged effect of product and process innovations on SME productivity, as well as the dynamic relationship between innovation processes and IT systems integration (Raymond et al., 2013) is needed. Greater attention should also be paid to the type of firm innovation (i.e. incremental versus radical) and its impact on productivity (Hernandez-Espallardo and Delgado-Ballester 2009).

Theme V – External knowledgebase: this theme includes studies analysing the impact of alliances/collaborations, business advisors, takeovers or firm mobility, clusters and value chains on SME productivity. Most studies in this theme point to the positive impact that alliances/collaborations, value chains, and knowledge clusters have on SMEs' innovation capabilities and productivity (Antonelli et al. 2015; Bakhtiari 2015; Capello 1999; Hemert et al. 2013; Jones and Corral 2017; Noke and Hughes 2010; Tomlinson and Fai 2013). Specifically, the formation of alliances/collaborations is associated with increasing firms' new product capability (Noke and Hughes 2010), facilitating the ICT adoption process for micro firms (Gare and Melin 2011), and increasing technological capabilities (Barajas et al. 2016); all factors that are associated with improved labour productivity. Audretsch and Belitski (2020) also find that increased investment in R&D and knowledge spillovers impact the likelihood of an owner-manager implementing "make or ally" innovation strategies rather than "buy or imitate" new products developed by others.

Furthermore, participation in publicly supported international research joint ventures or knowledge transfer partnerships at local/international levels also allows SMEs to draw upon higher institutions' knowledge and human resources to strengthen their innovation capabilities and increase productivity (Barajas et al. 2016; Humphries 2005). Nevertheless, the positive impact of such collaborations is contingent upon firm specific factors. For example, Mancinelli and Mazzanti (2009) find that without accompanying investments in R&D and training, networking (and by implication the mere existence of local spillovers) plays a negligible role in stimulating labour productivity. In the same way, the impact of productivity centres on SMEs' process improvement capabilities are dependent on: firms' willingness to change, senior management support, establishment of key performance indicators, and availability of personnel (McGovern et al., 2017). SMEs therefore need to make internal organizational adjustments in order to reap the benefits of increased productivity resulting from participation in external collaborations and networks.

Other aspects examined by studies in this theme are the role of advisors, and the relationship between takeovers/firm mobility and productivity. Henley and Song (2019), for exmaple, find that using external advice, business networking, and having a formal business plan, are all associated with a significant increase in the likelihood that micro-firms will innovate. Studies focused on analysing interventions aimed at increasing SMEs' innovation capabilities also find that, while such interventions have a positive impact on goal setting, firm performance, and labour productivity, they have a detrimental effect on innovation activities (Oeij et al. 2015). For

example, Harris et al. (2016) find that SMEs that are located in peripheral regions and that adopt business improvement methods end up undertaking innovation-related activities but remain non-innovators.

A number of studies also find a reciprocal relationship between SMEs takeover or mobility and the level of productivity, that is further influenced by geographic location (Foreman-Peck and Nicholls 2013, 2015). Unlike large firms, more productive small firms are at a greater risk of takeovers if they are centrally located (Foreman-Peck and Nicholls 2013). Such takeovers raise the productivity levels for SMEs located in both central and peripheral regions. Moreover, firm mobility is more prevalent amongst SMEs that are younger, more productive, relatively larger, and centrally located, than regionally immobile firms (Foreman-Peck and Nicholls, 2015). After moving, these fast-growing SMEs become even more productive and employ more workers; and through this market process the regional core supports peripheral regions (Foreman-Peck and Nicholls 2015).

Although the studies highlight the important role that the external knowledgebase plays in influencing SME productivity, a number of issues remain unresolved. For example, it is not clear whether cooperation leads to innovation or vice versa (Tomlinson and Fai 2013). The role of firm specific factors such as ownership structure, firm size or age, in influencing the formation of external collaborations, as well as the subsequent impact on innovation and productivity is equally unclear (Harris et al. 2016; Noke and Hughes 2010). Therefore, further in-depth analyses of these relationships would make valuable contributions in this area.

Theme VI – Commercialization: studies under this theme focus on analysing how global competition, export activities, and the external environment influence SME productivity (Guzman-Cuevas et al. 2009; St-Pierre and Raymond 2004). The strong positive relationship found between SMEs' productivity levels and export participation (Eliasson et al. 2012; Falk and de Lemos 2019; Falk and Hagsten 2015a, 2015b) has resulted in research focused on understanding the factors influencing an SME's intention to export. A number of studies show that factors such as innovation activity, firm size, workforce, and public incentives all influence a firm's propensity to export (Banno et al. 2014; Eliasson et al. 2012; Falk and de Lemos 2019; Higón and Driffield 2011; Onkelinx et al. 2016). Henley and Song (2019), however, find that there is no direct productivity benefit from innovation for micro-firms, but that the impact is as a result of exporting as an internationalisation strategy. Importantly, the intention to export also has a positive impact on a firm's productivity levels (Eliasson et al. 2012).

Further, investigating the export productivity premium of SMEs, Falk and Hagsten (2015b) find that the level of labour productivity of exporting SMEs is 13 percentage points higher than that of non-exporting firms in any given industry and country. Relative productivity levels are also higher for SMEs present in both EU and non-EU markets than those operating in only one of the two markets. A second study by Falk and de Lemos (2019) finds that SMEs' export participation and export share depend on their labour productivity level and R&D-sales ratio, with the impact being more pronounced for micro-, young, and born global firms. Firm labour productivity (Onkelinx et al. 2016) and industry sector (Lejarraga and Oberhofer 2015) also have an impact on SME internationalization and intention to export respectively, with productive ICT and professional service firms more likely to export to foreign markets (Lejarraga and Oberhofer 2015). Additionally, Lejarraga and Oberhofer (2015) show that TFP and firm size of SMEs in the manufacturing and services sector affect their probability to export, but not their relative engagement in foreign markets. Public financial support is also found to be effective in enhancing productivity growth, especially when targeted towards smaller, younger firms, and those with international experience (Banno et al. 2014).

Other studies examining the potential contribution of SMEs to rural economic development find that rural regions have a higher proportion of fast growing SMEs, which are more active in adapting to local market conditions (North and Smallbone, 1996). However, these SMEs lag behind their urban counterparts, both in terms of labour productivity, and orientation to national and international markets (North and Smallbone 1996). A more recent study analysing productivity transmissions between SMEs and large firms, confirms a positive spillover effect of SME labour productivity on large firm productivity in the long run (van Stel et al. 2019). Similar positive spillover effects on TFP are experienced between frontier and laggard firms (Romero-Jordan et al. 2019). Finally, labour productivity is an important determinant for growth and profitability of SMEs in various industry sectors, with smaller, younger firms benefitting more than larger, older firms (Guedes de Carvalho et al. 2013; Yazdanfar 2013).

Given the significant role that global competition and participation in exports play in enhancing SME productivity, future studies examining how related factors such as location of global markets, or human capital (e.g. level of education or international work experience) might influence a firm's export intentions (Kohr et al. 2017; Onkelinx et al. 2016) can provide further insights in this area.

4 Discussion and Future Research Agenda

SME productivity growth is important for developed economies as they adapt to major trends such as digitalisation, an ageing population, and changes in the nature of work. For example, the BEIS report on small businesses and productivity indicates that SMEs play an important role in contributing to productivity growth through their impact on wealth and employment creation (BEIS 2018b). Fostering productivity in SMEs as a way of ensuring their survival and growth has therefore been a major focus for both practitioners and policymakers (Mañez et al. 2013). The continuing decline in labour productivity growth that characterized many western economies since mid-2000, and especially after the financial crisis of 2008-2009, has similarly led to a sharp increase in SME productivity research. However, as underlined by our systematic review, which aimed to provide an integrated understanding of the main factors affecting SME productivity, this research field is highly fragmented. While the empirical studies provide useful insights into the direct, indirect, and mediating/moderating factors influencing SME productivity, there are important gaps in knowledge that need to be addressed by future research. Our discussion highlights four main areas, namely 1) the need for comparative analyses within SMEs, as well as between SME and large firms, 2) the need to adopt a holistic approach to understanding human capital in SMEs, 3) the importance of context, and 4) the methodological challenges and developments to be considered. In highlighting these gaps, we develop a research agenda to guide future research and help advance knowledge on SME productivity. We also consider the limitations of our study at the end of this section.

4.1 The need for comparative analyses

Our analysis emphasizes the effect of firm characteristics (e.g. size, age, sector) on productivity levels (Barbera and Moores, 2013; Eliasson et al., 2012; Falk and Hagsten, 2015a; Hall et al., 2009; Laforet, 2013; Mole et al., 2004; Raymond et al., 2013; Sandulli et al., 2012). Indeed, firm size can have a constraining effect on firm capacity both in terms of its human and financial resources, and influences the type of strategies SMEs adopt to improve productivity levels (Torrent-Sellens et al. 2016). Besides, a combination of firm size, age, and sector, influences a

firm's innovation capability and determines the effect that technological and R&D investments have on its productivity (Baumann and Kritikos, 2016; Hall et al., 2009; Nunes et al., 2013). Apart from having an impact on the internal firm factors influencing productivity, these firm specific characteristics can also act as enablers or inhibitors to external factors such as the types of alliances/networks formed, or level of participation in global markets (Harris et al. 2016; Noke and Hughes 2010). For example, network relationships with suppliers, customers, trade associations, and other intermediaries, are important factors affecting innovation and SME productivity (Pittaway et al. 2004).

A firm's sector will also influence the type of opportunities and restrictions impacting its growth and productivity level. For example, Hogan and Coote (2014) highlight that a culture of innovation in professional services firms in particular, supports innovative behaviours that can sustain organizations and foster organizational renewal. Even the type of training most appropriate for increasing SME labour productivity is influenced by the sector in which the SME operates (Black and Lynch 1996). Future studies therefore need to pay greater attention to changing trends in different sectors. The growing economic importance of the services sector is likely to result in R&D activities becoming more prevalent in order to support service innovations (Miles, 2007), with potential benefits for productivity enhancements.

Therefore, in line with Mallett et al. (2018), we find the homogenisation of different-sized businesses under the SME umbrella problematic, as it obscures differences that may be important for understanding firm operations, goals, and challenges. For example, in the case of micro-firms "the owner-manager is the company" (Lean, 1998:233), which not only imposes constraints on their growth capacity but also makes growth dependent on the owner-managers' skills, capabilities, and ambitions (Gherhes et al. 2016). In such firms, owner-managers have a more dominant role than might be the case for larger counterparts, which can have key implications for productivity. Future studies on SME productivity therefore need to consider firm size and the heterogeneity of firms are classified under this category, especially given that definitions of SMEs tend to vary across geographic regions (Koch and McGrath 1996; Raymond et al. 2013; Raymond and Bergeron 2008). This would allow for more in-depth analyses into the types of factors that are more relevant for specific firm categories, while providing greater insights for targeted interventions aimed at improving SME productivity.

Furthermore, there is a need for more comparisons between SMEs and large firms in order to better understand the type of factors that have a greater impact on the productivity of different sized firms. For example, exporting, like many other factors highlighted in this review is not restricted to SMEs, but affects firms of all sizes. While studies find an export premium, with export entrants becoming more productive once they start exporting (De Loecker 2007, 2013), key questions that remain unresolved include whether export premium varies with firm size. Future research could focus on both within-SMEs variation, as well as compare SMEs to large firms, in order to understand the benefits of exporting on productivity gains.

4.2 Human capital in SMEs

The studies in our review indicate that human capital is significant in determining an SME's level of productivity. However, this area remains relatively underexplored, with only a handful of studies looking at aspects such as leadership style, organizational culture, and employee wellbeing (Cocker et al. 2013; Li et al. 2016; Ribeiro Soriano

and Castrogiovanni 2012). Importantly, reports indicate that poor management practices can have a limiting effect on SME productivity and innovation (OECD 2017b). CEOs' managerial skills and human capital, especially in the case of SMEs, are important in promoting innovations within the organization (Custodio et al. 2017). The current gap in knowledge therefore presents opportunities for future studies in this area. Given that management practices account for 30% of TFP differences both within countries, and between countries across firms (Bloom et al. 2016), we encourage future studies to examine how the CEO's management and/or leadership style directly or indirectly influences SME productivity (Büschgens et al. 2013; Hogan and Coote 2014).

Moreover, a more holistic approach to analysing human resources in SMEs that focuses not only on skills and experience, but also on factors such as workforce diversity, wellbeing, and work-life balance, is necessary. Given the positive impact that ethnic and gender diversity has on firm innovation (Díaz-García et al. 2013; Nathan 2014), future studies analysing these and other types of diversity (e.g. neurodiversity, ability status, race) would provide insights on the relationship between diversity and productivity. Understanding how modern societal challenges, such as an ageing population and changes in the nature of work (e.g. more flexible and/or short-term contracts) might impact productivity also provides a fruitful avenue for future research.

Our knowledge on the impact of wellbeing and work-life balance on productivity, or vice versa, also remains limited. Work-life programmes, for example, have a positive impact on productivity in large firms (Konrad and Mangel 2000). However, given the different operational dynamics that SMEs are likely to face, future studies could examine how work-life balance is achieved within SMEs, and how this subsequently impacts productivity. Wellbeing has also been strongly associated with active engagement in entrepreneurial tasks (Shir et al. 2018). This research should be extended to determine whether similar positive relationships exist between wellbeing and SME productivity. We also argue that the different aspects of human capital should not be analysed in isolation. Instead, studies should focus on understanding how they interact with other internal firm-level factors, such as investment in R&D, technological innovations, workplace systems, as well as external firm factors like the external knowledgebase to influence productivity.

4.3 The importance of context

In management research, and for the purposes of this systematic review, context refers to the circumstances, conditions, situations, or environments that are external to the respective phenomenon and that enable or constrain it (Welter 2011). Critically, only one study in our sample focused on analysing the impact of socio-economic contexts on SME productivity, which was insufficient to warrant a separate theme. The study examined how spatial economic and socio-institutional factors might influence the productivity of SMEs located in the Northern and Southern provinces of Italy (Fazio and Piacentino 2010), with the socio-economic context being measured in terms of: level of employment, unemployment rates, crime levels, and net brain drain. They find that even though SMEs located in regions of greater social decay experience lower productivity, this relationship is dependent upon the firm's level of capital intensity. Hence, firms with higher capital intensity are less affected by external factors such as location or geography (Fazio and Piacentino 2010).

We therefore want to highlight the important role of the socio-economic context for SME productivity levels, especially in the context of broader calls for contextualizing entrepreneurship research (Autio et al. 2014; Smallbone

2016; Welter 2011). Scholars have shown that a firm's geographic location matters (Foreman-Peck and Nicholls, 2013; Foreman-Peck and Nicholls, 2015; Harris et al., 2016; North and Smallbone, 1996), with SME productivity being influenced by external factors at the national, regional and local levels. At the regional and local level, external factors such as the availability and cost of labour, market size, level of infrastructure, technology, as well as access to finance and knowledge centres, can impact SME productivity. At the national level, formal (legislations, regulation, property rights) and informal (social norms, cultures, customs, traditions) institutions, also referred to as the rules of the game (North, 1991) provide the incentive structure for economic activity. Institutions can therefore act as either enablers or inhibitors of entrepreneurial behaviour (Welter and Smallbone 2011), firm productivity (Ostapenko 2015), and innovation (Autio et al. 2014). However, studies focused on cross-country or regional level comparisons are scarce, thus limiting our understanding of the dynamics and uniqueness of different country and regional contexts (Autio et al. 2014; Smallbone 2016; Welter 2011), as well as the generalisability of current knowledge across different contexts. The lack of multi-country comparisons also provides opportunities for future research aimed at gaining a deeper understanding of the national/regional factors influencing SME productivity. We therefore call for future context-sensitive research to provide a better understanding of how different contextual factors enable or constrain SME productivity.

Further contributions can also be made by studies analysing the direct and indirect impact of informal institutions (i.e. culture, social norms, societal expectations) on SME productivity. For example, the intersection of gender and innovation leads to gendered innovation processes, and the gendering of innovation practices (Alsos et al. 2013). Socio-economic factors also tend to have a constraining influence, positioning female-led firms in gendered spaces (Carter et al. 2015), and impacting the recognition of opportunities for social innovations (Spiegler and Halberstadt 2018). Analyses of female SME owner-manager's innovation activities and the resulting impact on productivity, should therefore be embedded in understanding normative frames and structural factors at play (Alsos et al. 2013). Future research examining the relationship between factors such as culture, ethnicity, gender, race, and productivity can provide useful insights on the broader structural challenges that SME owner-managers belonging to under-represented groups encounter, and the strategies they employ to overcome them.

4.4 Methodological challenges and developments

As productivity measurement is strongly data-driven, access to and quality of firm-level data is particularly important. A key challenge that we identified in this systematic review is the variety and inconsistency of methodological approaches adopted, with a wide range of data sources, sampling methods, and data analysis techniques being employed to research SME productivity. As such, there is a need to consider the advantages and disadvantages of specific data. For example, self-conducted surveys of production values are likely to suffer from measurement errors and high rates of non-response. Balance sheet data is also generally not appropriate for analysing SME productivity, due to reporting thresholds that result in micro- and small firms not providing profit and loss accounts in many countries. Another important challenge is firm-level data representativeness; given that larger SMEs are often over-represented while micro firms are under-represented.

Main issues that require greater consideration by future research therefore includes the low response rates of individual surveys, unclear representativeness, gaining access to national statistics data, and linking data from

different surveys. For instance, while data from national statistical offices is of high quality, access and linking possibilities are country specific. Therefore, there is a need for multi-country studies using harmonised and internationally comparable data at firm level (Hagsten and Kotnik 2017). Moreover, the type of data available typically includes either administrative accounting data with little opportunity to link to contextual information, or surveys focused on contextual factors with no opportunity to link to value-added firm-level data. In the latter case, the answers to productivity questions could also depend on how respondents frame their understanding of productivity. Nevertheless, data linkage remains a key issue, which also presents the problem of connecting firm-level data to information on the characteristics and attributes of individuals, such as owner-manager teams rather than single individuals.

Furthermore, while studies use both labour productivity and TFP measures indiscriminately, we argue that greater attention needs to be paid to the type of measurement used, as this might influence study results (Barbera and Moores 2013; Cassia et al. 2012; Classen et al. 2014). For example, Linna et al. (2010) highlight the limitations of using single factor productivity measures, such as labour productivity, that attribute all increases of efficiency to one factor. Moreover, while TFP measures might be more appropriate in determining SME productivity given the changing trends in the work environment, future studies need to bear in mind the various challenges in estimating TFP (Van Beveren 2012).

The issue of endogeneity is another key concern for future econometric studies on SME productivity. Our systematic review indicates that only 31% of quantitative studies deal with this issue, and these employ various methods such as lagged or predicted variables, Hausmann-Wu test, CDM framework, or the Generalised Method of Moments system estimator. As most explanatory variables are correlated with the error term, and given the restrictiveness of OLS Gauss-Markov assumptions, coefficients may be biased and/or inconsistent if the issue of endogeneity is not adequately addressed. At the same time, given that 85% of the reviewed studies are quantitative, there is not only scope, but also need for more mixed-method research to untangle the complex nature of SME productivity.

Finally, the analysis of issues mentioned in the previous sections also calls for research using a wide array of methodological approaches and data sets. For example, a more fine-grained analysis of the contextual factors influencing SME productivity might provide opportunities for studies using qualitative or mixed method approaches. Additionally, the lagged effect of R&D investments, the long-term cumulative effects of interventions such as training programmes, the adoption of technological innovations, and the changing work environment, all call for longitudinal studies that are better able to capture the changing dynamics of SME productivity growth. Experiments and randomised controlled trials—not widely used in the SME literature—would also allow studies to move beyond cross-sectional analyses to determine causal relationships between factors such as organizational culture, innovation, HRM capabilities and SME productivity growth (Baumann and Kritikos 2016; Fabi et al. 2010; Naranjo Valencia et al. 2010).

4.5 Limitations

We acknowledge a number of limitations to our systematic review. First, while the systematic review methodology is designed to be as objective as possible, by its nature, it relies on defined parameters, which means that certain

papers will be out of scope, but not irrelevant. Thus, the use of keywords, search strings, and specific databases may have limited the number of papers identified as relevant by the review, while the databases used may also exclude publications from specific journals, making it difficult to capture all relevant literature. Second, restricting database searches to titles and abstracts may also have restricted the number of articles found. However, such an approach is deemed appropriate when the body of knowledge is vast (Thorpe et al. 2005), which is the case of the SME productivity literature. Third, the high variation in data sources, research methods, and data analysis techniques in our sample of articles hinders the direct comparability of study findings. Nevertheless, our systematic review provides a useful map of the SME productivity literature, highlighting key methodological shortcomings and providing key directions for future research in this area.

Therefore, we acknowledge that certain key issues that are relevant to the SME productivity debate may not have been captured by our systematic review due to the nature of the review protocol. For example, the issue of knowledge spillover effects that have been shown to have an impact on innovation and productivity growth (Acs et al. 2009; Glaeser et al. 1992) is relatively underexplored by the reviewed studies. Specifically, only 14% of the reviewed studies address the issue of spillover effects, and examine, for example, the spillover effects of SME productivity to large firms (van Stel et al. 2019), spillover effects of TFP growth from frontier to laggard firms(Romero-Jordan et al. 2019), the relationship between internal R&D, knowledge spillovers and innovation strategies (Audretsch and Belitski 2020), and the link between knowledge flows, industrial robotics, and labour productivity (Ballestar et al. 2020). The remaining studies focus on analysing the impact of alliances, collaborations, recruitment practices, or workforce diversity on firm productivity (Hottenrott and Lopes-Bento 2014; Lodefalk and Tang 2018; Niebuhr 2010), and indicate possible knowledge spillover effects as part of their findings.

Similarly, access to capital has been shown to have major implications for SME productivity. A meta-analysis carried out by Kersten et al. (2017) on SMEs in low and middle income countries, finds a positive significant effect of SME finance on investments, firm performance, and employment. Although, the reviewed studies do acknowledge the particular challenges faced by SMEs in accessing finance, the issue of funding is primarily analysed in relation to the impact that public funding and subsidies for R&D investment, internationalization, or research joint ventures, have on SME productivity (Banno et al. 2014; Barajas et al. 2016; Griffith et al. 2006; Hottenrott and Lopes-Bento 2014; Karhunen and Huovari 2015). While our systematic review may not have captured a wide range of papers focused on these topics, there is scope for future reviews to provide additional insights in these and other areas, and thus to bring further clarity to this highly fragmented field.

5 Policy Implications

Our systematic review yields important implications for policy. Improving productivity as a means of ensuring long-term economic growth is a key concern for many governments, with SMEs being central to achieving this growth (van Stel et al. 2019). For example, the productivity lag in the UK has been attributed to the long tail of unproductive small business (BEIS 2018b). Gaining a better understanding of the main factors affecting productivity in SMEs is therefore crucial for researchers and policymakers alike (Mañez et al. 2013). As emphasised by the OECD, "upgrading productivity in a large population of small businesses, including in traditional segments and the informal economy, can help governments achieve both economic growth and social inclusion objectives, including escaping

from low productivity traps and improving the quality of jobs for low-skilled workers" (OECD 2017b, p.8). Implications for policymakers include the need to provide sustainable support to SMEs, which focuses on building skills and competencies that can assist them in implementing organizational/strategic changes needed to profit from sustained productivity gains as a result of R&D and technological investments (Gunasekaran et al. 2000). Targeted interventions such as training and/or advisory programmes should also consider the mode and type of training being offered, as well as firm specific factors such as size, age, sector, and location. Providing a platform that facilitates greater collaboration and networking opportunities between SMEs and local/international knowledge centres (e.g. universities, research institutes) should also have a positive effect in strengthening SMEs' innovation capabilities. Lastly, interventions that are focused on providing public subsidies as a way of countering the negative effects of R&D investment should also be sensitive to unintended consequences, such as the survival of less efficient firms (Karhunen and Huovari 2015), that could subsequently have a negative impact on overall productivity growth.

In this sense, the issues highlighted in our systematic review relate to the broader productivity puzzle debate. This refers to the unusually weak or declining productivity growth that has characterized many western economies since the financial crisis of 2007-2008 (OECD 2017c). While competing explanations have been proposed for this declining growth, such as the difficulty of measuring productivity, or the shortage of demand and investment opportunities that constrain productivity growth, economists have hitherto failed to reach a consensus. However, it is widely acknowledged that productivity remains the single most important economic factor (Prowle et al. 2017). As Paul Krugman's widely cited remark emphasizes: "Productivity isn't everything, but, in the long run, it is almost everything." A country's ability to improve its standard of living over time depends almost entirely on its ability to raise its output per worker. Importantly, SMEs make a critical contribution to economic growth and job creation in western economies, yet differences in productivity between large and small firms persist, with SMEs often characterised by lower productivity than their larger counterparts (OECD 2018). In highlighting methodological shortcomings and key gaps in our knowledge on SME productivity, our systematic review provides a useful map for future research to address these issues, and provide critical insights into SME productivity dimensions that can contribute towards solving the productivity puzzle.

6 Conclusion

Our systematic review of 109 empirical studies aims to provide an integrated understanding of the main factors affecting SME productivity in western economies. By thematically analysing studies, we provide a map of the current SME productivity research landscape, identifying direct, indirect, and mediating/moderating factors influencing SME productivity. Our systematic review highlights the fragmented nature of research in this field, and makes three key contributions. First, we thematically map existing empirical studies into six key themes organised around internal (*organizational environment, organizational capabilities, investments and types of innovation*) and external (*external knowledgebase, commercialization*) factors influencing SME productivity. Second, our descriptive and thematic analyses enable us to highlight critical gaps in existing knowledge, as well as methodological issues that restrict our understanding of how different factors such as technology, R&D, leadership skills, networks and collaborations etc., interact to affect SME productivity. Third, we develop a research agenda and propose four main areas where future research could make useful contributions in advancing knowledge on SME productivity. These include the need for greater comparative analyses (i.e. within SMEs as well as between

SMEs and large firms), the need to adopt a holistic approach to understanding human capital in SMEs, the importance of context, and methodological developments that would facilitate the analysis of underlying factors affecting productivity.

Future studies can build on our systematic review by focusing on SME productivity in emerging or developing economies, in order to provide a better understanding of the different macro-level factors driving firm productivity in these contexts (Rangamohan et al. 2007). Future reviews could also focus on countries with robust firm-level data such as Japan, South Korea, and China, that have been excluded from the current study due to the parameters of the systematic review. Moreover, there is scope and need for meta-analyses that draw on results from extant studies to provide better clarity on the influence of specific factors on SME productivity, especially in cases where results are inconclusive. These can also address the some of the methodological challenges highlighted in our discussion. Finally, given the importance of the topic for practitioners and policymakers, future reviews can contribute to SME productivity debates by focusing on grey literature as a way of building on academic focused reviews. These were beyond the scope of this review, but do provide important insights on SME productivity.

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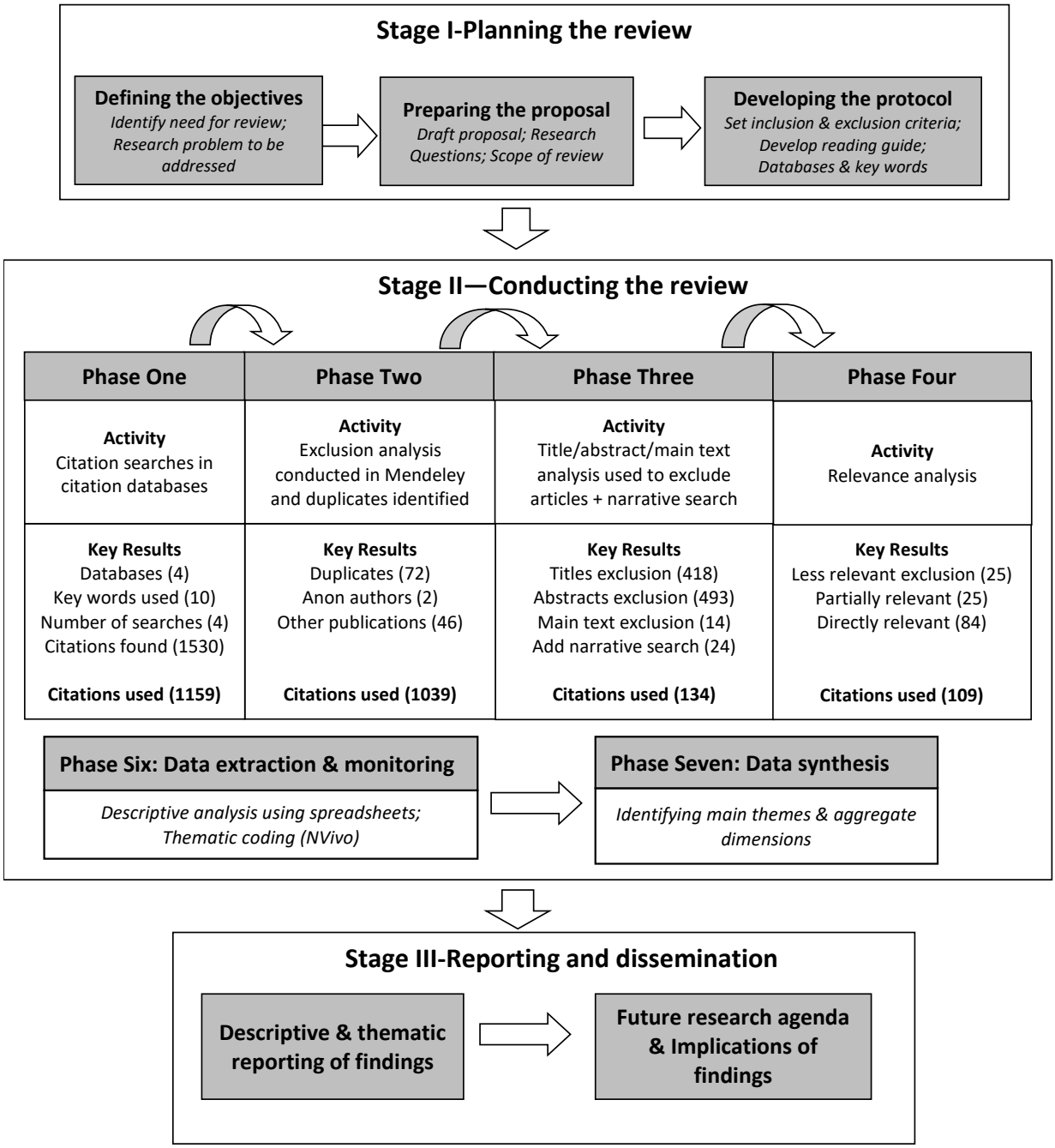
Online Resource 1

Fig. 1 Summary of the systematic review process



Source: *Adapted and modified from Thorpe et al. (2005) and Tranfield et al. (2003)*

Table 1 Key words and search strings used in the review

Key words list	Search strings
SME Small and medium enterprise Small and medium-sized enterprise Medium sized business Medium business Small business Micro business Micro-business Microbusiness Productivity	*Database: ABI-Inform/ProQuest* TI (SME* OR small and medium enterprise* OR medium sized business* OR medium business* OR small and medium-sized enterprise* small business* OR micro-business* OR micro business* OR microbusiness*) AND AB (productiv*) *Database: Emerald* (SME* OR small and medium enterprise* OR medium sized business* OR medium business* OR small and medium-sized enterprise* small business* OR micro-business* OR micro business* OR microbusiness*) AND (productiv*) *Database: Scopus* TITLE-ABS (SME* OR small AND medium AND enterprise* OR small AND medium-sized AND enterprise* AND small AND business* OR medium sized business* OR medium-sized business* OR medium business* OR micro-business* OR micro AND business* OR microbusiness*) AND ALL (productiv*) *Database: Science Direct.* ABS (SME* OR small and medium enterprise* OR medium sized business* OR medium-sized business* OR medium business* OR small and medium-sized enterprise* small business* OR micro-business* OR micro business* OR microbusiness*) AND ALL (productiv*) AND LIMIT-TO (contenttype, "JL,BS","Journal")

Table 2 Inclusion and exclusion criteria of the review

Criteria	Reasons
1. Inclusion criteria	
Peer-reviewed journal articles (post-1990) that are electronically accessible	To ensure high quality of reviewed studies
Papers written in English	Majority of leading academic journals are published in English
Papers focused on UK, Europe (excluding transition economies), USA, Canada, Australia or New Zealand contexts	The review is focused on SMEs located in the western economies context as it allows consideration of the effects of macro-level factors on productivity
Qualitative and quantitative empirical studies	In order to capture empirical evidence analyzed through different methods
Papers focused explicitly on SMEs productivity	The review is focused on SMEs productivity
2. Exclusion criteria	
Book chapters, articles in edited books, editorials, commentaries, working papers, workshop/conference proceedings	These were excluded due to the variability in their review process
Conceptual, technical papers, literature reviews	The review is focused on the systematic review of empirical studies

Table 3 Reading guide adapted for the review

Reading Guide
1. Article title
2. Author(s)
3. Year of publication
4. Journal
5. Research question/focus
6. Productivity focus/concepts
7. Methodological approach
a. Qualitative or quantitative?
b. Type
c. Measure
d. Data sources
8. Sample details
a. Unit
b. Sampling method
c. Size
d. Response rate
e. Country
f. Sector
g. Comparison?
h. Data analysis
9. Limitations
10. Main findings
11. Study implications

Source: *Adapted from Henry et al. (2016)*

Table 4 Thematic classification of reviewed studies

First order codes	Second order themes	Aggregate dimensions	
Workplace practices (28) HRM & work practices *[Fabling & Grimes (2014); Fabi et al. (2010); Rasel (2016); Kohr et al. (2017); Onkelinx et al. (2016); Bartel et al. (2007); Black & Lynch (1996); Huselid (1995); Guthrie (2001); Lodefalk & Tang (2018); McGuinness et al. (2008); Datta et al. (2005); Koch & McGrath (1996)]* organizational innovations *[Laforet (2013); Torre & Solari (2011); Torrent-Sellens et al. (2016) ; Oeij et al. (2015)]* knowledge management/goal setting *[Mayer et al. (2017); Nunes et al. (2006)]* e-business alignment *[Raymond & Bergeron (2008)];* quality management *[Towers & McLoughlin (2005)]* strategy/organizational changes *[Colombo et al. (2013); Raymond (2005); Esan et al. (2013)]* organizational culture *[Naranjo Valencia et al. (2010); McGuirk et al. (2015)];* energy management *[Henriques & Catarino (2016)];* business awards *[Jones et al. (2014)]* level of trust *[Chalker & Loosemore (2016)]*	Organizational environment (34)		
Ownership structure (4) family vs non family controlled *[Barbera & Moores (2013); Cassia et al. (2012); Classen et al. (2014)]* family owned vs foreign firms *[Harris et al. (2016)]*			
Industrial relations (2) union driven innovations *[Antonioli et al. (2010)];* unionization effect on productivity *[Black & Lynch (1996)]*			
Training (11) training programs *[Antonioli et al. (2010); Black & Lynch (1996); McGuirk et al. (2015); Georgiadis & Pitelis (2016); Mancinelli & Mazzanti (2009); Savery & Alan Luks (2004); Henriques & Catarino (2016); Koch & McGrath (1996)]* employees age/education & skill level *[(Sandulli et al. (2013); Audretsch et al.* (2020)*]* employability *[Arocena et al. (2007)]*		Internal factors influencing productivity	SME
Culture/ethnicity (4) owner's socio-demographics *[Middleton & Byus (2011); Middleton & Chambers (2010); Naranjo Valencia et al. (2010)];* cultural diversity *[Niebuhr (2010)]*	Organizational capabilities (18)		
Leadership (2) leadership style *[Li et al. (2016)];* CEO human capital *[Ribeiro Soriano & Castrogiovanni (2012)]*			
Wellbeing (1) psychological distress/absenteeism *[Cocker et al. (2013)]*			
Technology (29) AMT capabilities *[Fabi et al. (2010); Raymond (2005); Uwizeyemungu et al. (2015); Esan et al. (2013); Niaki & Nonino (2017)];* e-business/digital technologies *[Li et al. (2016); Raymond & Bergeron (2008); Scuotto et al. (2017)]* ICT adoption/capabilities *[Colombo et al. (2013); Martinez-Caro & Cegarra-Navarro (2010); Mole et al. (2004); Rasel (2016); Raymond et al. (2013); Sandulli et al. (2012); Torrent-Sellens et al. (2016); Barajas et al. (2016); Gare & Melin (2011); Nunes et al. (2006); Struker & Gille (2010); Li et al. (2009); Ballestar et al.* (2020)*]* information security *[Mayer et al. (2017)];* digital divide *[Middleton & Byus (2011); Wielicki & Arendt (2010); Middleton & Chambers (2010)];* ERP capabilities *[Ruivo et al. (2015)];* firm technology level *[Sandulli et al. (2013)]*	Investments (44)		

First order codes	Second order themes	Aggregate dimensions
technology investments *[Torre & Solari (2011); Bartel et al. (2007); Ballestar et al.* (2020)*]*		
R&D (15) R&D intensity *[Hall et al. (2009); Raymond, & St-Pierre (2004); Falk & de Lemos (2019); Griffith et al. (2006); Nunes et al. (2013)];*R&D subsidies *[Karhunen & Huovari (2015); Hottenrott & Lopes-Bento (2014)]* R&D spending *[Manez et al. (2013); Serban (2013); Baumann & Kritikos (2016); Niebuhr (2010); Ballestar et al.* (2020)*; Parisi et al.* (2006)*; Audretsch & Belitski* (2020)*; Audretsch et al.* (2020) *]*		
Product & process innovation (10) firm size/R&D activities *[Hall et al. (2009); Baumann & Kritikos (2016); Griffith et al. (2006); Parisi et al.* (2006) *]* economic cycle *[Madrid-Guijarro et al. (2013)];*IT integration *[Raymond et al. (2013)];* cooperative ties *[Tomlinson & Fai (2013)];* manufacturing technology/organization context *[Uwizeyemungu et al. (2015);Niaki & Nonino (2017)];* export activity *[Henley & Song* (2019)*]*		
Process innovation (6) lean manufacturing *[Dora et al. (2013); Dora et al. (2014)];*process improvement *[Gunasekaran et al. (2000)];* quality improvement *[Maani et al. (1994)];* R&D activities *[Manez et al. (2013)];* technology integration *[Esan et al. (2013)]*	Types of innovation (21)	
Product innovation (5) product development innovation *[Bagchi-Sen (2001); Calderini & Cantamessa (1997)]* business strategy *[Su & Tang (2016)];* IT investment/capability *[Bartel et al. (2007); Li et al. (2009)]* competitive environment *[Hernandez-Espallardo & Delgado-Ballester, (2009)]*		
Collaborations (15) alliances & networking *[Gunasekaran et al. (1996); Hemert et al. (2013); Mancinelli & Mazzanti (2009); Noke & Hughes (2010); Ruivo et al. (2015); Scuotto et al. (2017); Tomlinson & Fai (2013); Gare & Melin (2011); Hottenrott & Lopes-Bento (2014); Bakhtiari (2015); Henley & Song* (2019)*]* knowledge transfers/spillover *[Humphries (2005); Jones & Corral (2017); Audretsch & Belitski* (2020)*]* research joint ventures *[Barajas et al. (2016)]*		
Advisors (6) workplace interventions *[Oeij et al. (2015); Harris et al. (2016); McGovern et al. (2017); Mole et al. (2014)]* external advisors *[Ribeiro Soriano & Castrogiovanni (2012); Henley & Song* (2019)*]*	External knowledgebase (26)	External factors influencing SME productivity
Takeovers/mobility (2) takeovers *[Foreman-Peck & Nicholls (2013)];* regional mobility *[Foreman-Peck & Nicholls (2015)]*		
Clusters (1) collective learning *[Capello (1999)]*		
Value chain (2) repositioning value chain *[Noke & Hughes (2010); Antonelli et al.*(2015) *]*		
Global competition/exports (16) exports/exporters *[Eliasson et al. (2012); Falk & Hagsten (2015a); Falk & Hagsten (2015b); Higón & Driffield (2011); Sandulli et al. (2012); Savery & Alan Luks (2004); Serban (2013); Falk & de Lemos (2019); Kohr et al. (2017); Lejarraga & Oberhofer (2015)]*	Commercialization (34)	

First order codes	Second order themes	Aggregate dimensions
internationalization/global competition *[Hall et al. (2009); Banno et al. (2014); Baumann & Kritikos (2016); North & Smallbone (1996);Onkelinx et al. (2016); Henley & Song* (2019)*]*		
Environment (18)		
regional differences *[Foreman-Peck & Nicholls (2013); Guzman-Cuevas et al. (2009); McGuirk et al. (2015); Niebuhr (2010); North & Smallbone (1996); Antonelli et al.*(2015)*]*		
national level *[McGovern et al. (2017); Wielicki & Arendt (2010); Lejarraga & Oberhofer (2015)]*		
spillover effects [*Romero-Jordan et al. (2019); van Stel et al. (2019)]*		
external firm environment *[Towers & McLoughlin (2005); Guedes de Carvalho et al. (2013); Hernandez-Espallardo & Delgado-Ballester (2009); St-Pierre & Raymond (2004)]*		
type of industry *[Datta et al. (2005); Nunes et al. (2013); Yazdanfar (2013)]*		

Note: *The number of articles under each code/theme is indicated in brackets. Articles can be classified under more than one category.*

Table 5 Detailed breakdown of descriptive analysis results

Issue	Percentage of studies
Productivity measures used (most studies used one or more measures of productivity)	
Labor productivity	41%
TFP measures	15%
Did not specify productivity measure employed	18%
Product & process innovation measures	12%
Product innovation measures	9%
Process innovation measures	5%
SME categories included in sample	
SMEs with 10 or more employees	43%
Micro enterprises	30%
Sources of data	
Survey data	39%
Databases	30%
Panel datasets	12%
Case studies	10%
Interviews or a combination of sources	9%
Sampling methods	
Random sampling	27%
Purposive sampling	17%
Stratified sampling	14%
Representative sampling	4%
A combination of random and purposive sampling	2%
Weighted sampling	2%
Convenience sampling	1%
Did not specify the sampling method used	35%
Data analysis techniques	
Regression analysis (including multilevel, multivariate)	61%
Qualitative analysis (case studies, interviews)	16%
Structural equation modelling	10%
Cobb-Douglas production function	6%
CDM model	5%
Non-parametric	2%

Fig. 2 Geographic focus of reviewed studies

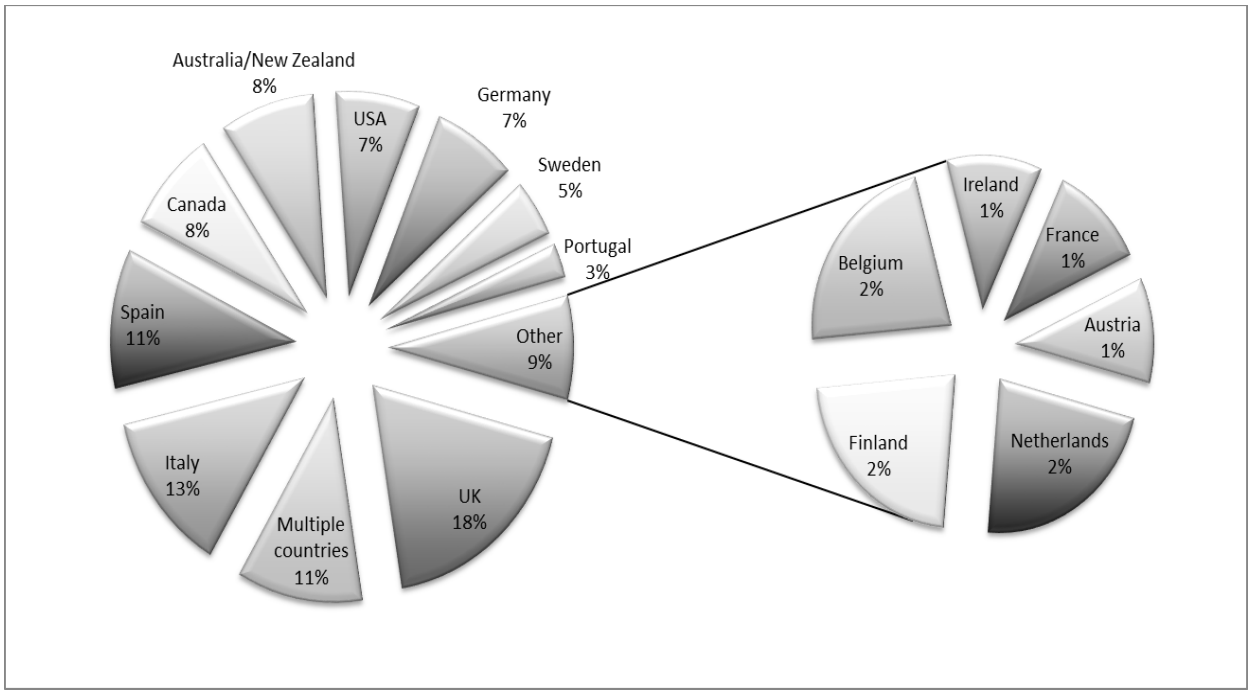


Fig. 3 Mapping of factors/variables directly influencing

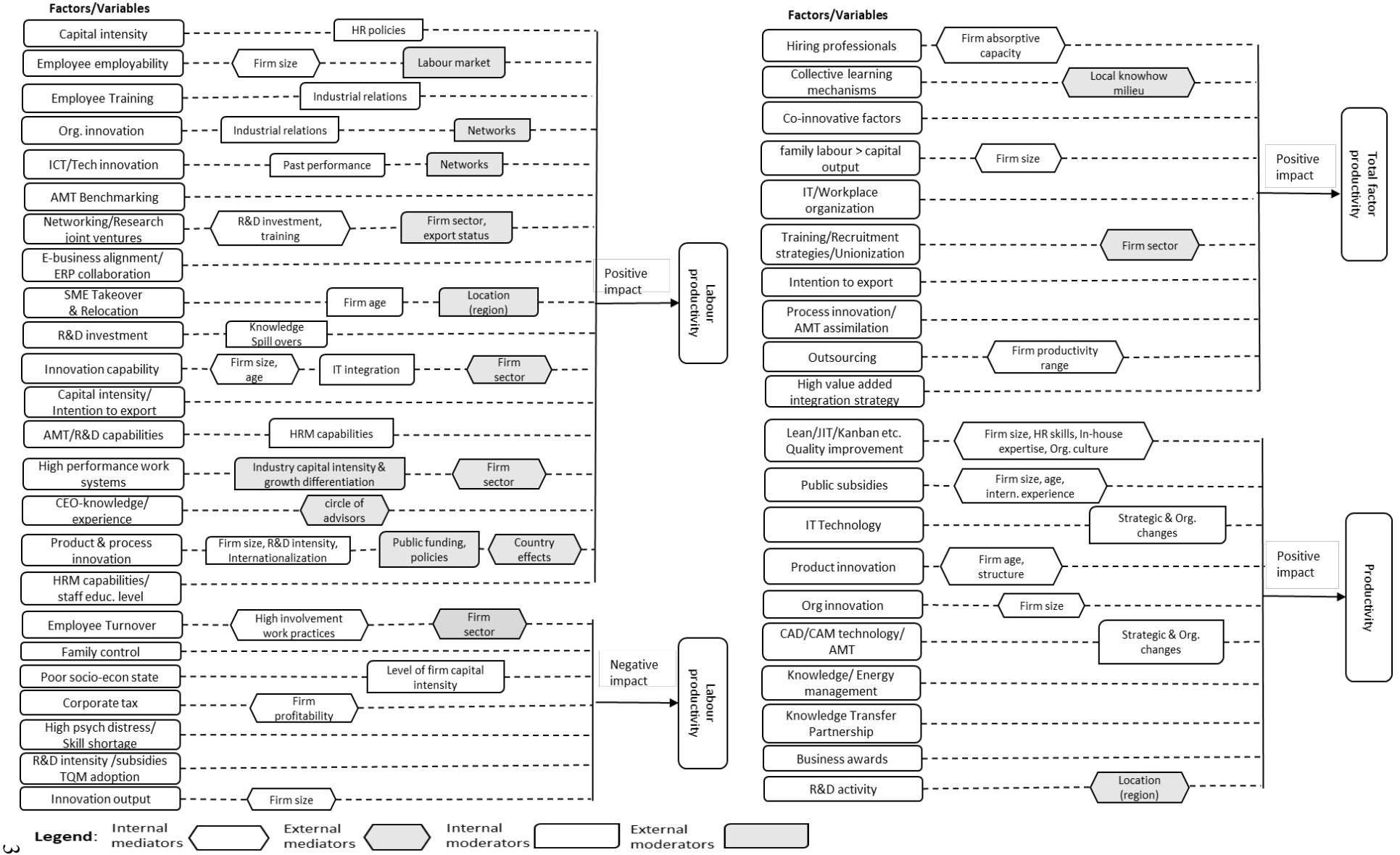


Table 6 Key findings from reviewed studies

a) Direct and indirect influence on productivity

Articles	Article focus	Indirect influence on productivity	Direct influence on productivity	Themes
Antonelli, C., Crespi, F & Scellato, G. (2015)	• Investigates the dynamics of productivity focusing on the determinants of firm-level persistence in time of high TFP growth rates relative to the corresponding sectoral distributions		• Firms with reduced vertical integration on average had a significantly higher likelihood of being among the best performers in terms of TFP growth rates. • This confirms that specialization strategies in high value added enhances the possibility of obtaining long-lasting outperformance in productivity growth. • Firms in High R&D regions seem to be more capable of sustaining persistently higher levels of productivity growth. • Persistency patterns can be independent of size and not only large corporations are capable of sustaining higher productivity performances in time.	V, VI
Antonioli, D., Mazzanti, M., & Pini, P. (2010)	• Provide insight on nexus between innovation (training, technology, organizational, ICT) and labour productivity • Role of industrial relations system and labour flexibility in the propensity to innovate by firm's management.	• Cooperative industrial relations are positively linked to training and organizational innovations • Past performance influences ICT and technology	• Innovations can be ranked in terms of their significant positive influence on labour productivity as follows: training activities; technological innovation; organizational innovation; ICT	I, II
Arocena, P., Nunez, I., & Villanueva, M. (2007)	• Analysed the effect of promoting workers' employability on labour productivity.	• Provision of employability is more profitable for SMEs than for large firms	• Facilitating workers' employability increases labour productivity • Higher job uncertainty, the higher the productivity gains	II
Audretsch, D. & Belitski, M. (2020)	• Investigates the relationship between investments in R&D, knowledge spillovers and three innovation strategies (make, buy, ally) as well as their effects on labour productivity in UK firms during 2002–2014.	• An increase in investment in R&D and knowledge spillover makes it more likely for a manager to choose "make" or "ally" versus "buy imitate" new products developed by others. • Firms who aim to buy or imitate innovation will invest less in R&D in regions / industries where knowledge spillovers are high.	• Internal R&D investment and knowledge spillovers are complementary for labour productivity. • R&D is important for both innovation and productivity, while knowledge spillovers are more important than R&D for firm productivity. • Knowledge spillovers increases the intensity of investing in internal R&D because this strategy leads to higher labour productivity growth and relative labour productivity	III, V
Audretsch, D., Kritikos, A. & Schiersch, A. (2020)	• Analyses whether the link between the three aspects involving innovative activities—R&D, innovative output, and productivity—hold for	• KIS firms of all age and size classes are able to turn innovative input (R&D activities) into innovation output (new product or service), with highly skilled employees being similarly important compared to R&D for creating innovation output in micro-firms.	• KIS firms benefit from innovation activities through increased labour productivity. This newly produced knowledge causally increases productivity	II, III

Articles	Article focus	Indirect influence on productivity	Direct influence on productivity	Themes
	knowledge-intensive services (KIS) micro-firms	• Start-ups and young firms are more likely to engage in innovation activities and, are more likely to successfully turn innovation input into a product or service innovation than mature firms.	• Innovation activities enhance firm labour productivity and ultimately economic growth through knowledge-intensive services.	
Bakhtiari, S. (2015)	• Studies the relationship between total factor productivity and outsourcing accounting for the possibility of inefficient firms self-selecting into exit instead of outsourcing to domestic suppliers.		• Immediate total factor productivity improvement after outsourcing but only for firms in the lower median of productivity range. • In the short run, the most productive firms forfeit a portion of their productivity with outsourcing in return for longer-term improvements in competitiveness.	V
Ballestar, M., Díaz-Chao, A., Sainz, J. & Torrent-Sellens, J. (2020)	• Provide new insights into the link among knowledge, industrial robotics and labour productivity of Spanish manufacturing (SMEs) in 2008 and 2015		• Robotic-tool adoption by SMEs induced an increase in labour productivity • Knowledge flows (captured through the activities of R&D, innovation and ICT) exerted a clearly positive total effect on SME labour productivity in 2015	III
Banno, M., Piscitello, L., & Amorim varum, C. (2014)	• Evaluates the impact of public financial support to the internationalization of small and medium enterprises.		• Incentives are effective in enhancing firms' performance in terms of domestic turnover and productivity growth, especially when targeted at smaller and younger firms and those with international experience • Higher international experience leads to higher turnover growth but lower productivity growth in home country	VI
Barajas, A., Huergo, E., & Moreno, L. (2016)	• Analyses the impact of public support for international research joint ventures (RJVs) on SME performance considering two dimensions: technological and economic results.	• Previous experience in Framework Programme (FP) proposals, exporters & firms with higher ratio of intangible fixed assets to employee are more likely to apply • Probability of being supported increases when the project belongs to the Bio-health area, is led by a foreign firm and includes core EU members	• Involvement in supported RJV has a positive impact on EBITDA per employee & labour productivity by increasing SMEs technological capabilities	III, V
Barbera, F., & Moores, K. (2013)	• Does family involvement have a positive or negative impact on firm productivity?		• Family firm labour contributes significantly more to total output than benchmark non-family firm labour • Family capital output contributes significantly less to total output than benchmark non-family firm labour	I

Articles	Article focus	Indirect influence on productivity	Direct influence on productivity	Themes
Bartel, A., Ichniowski, C., & Shaw, K. (2007)	• Better understand the relationship between investments in IT and productivity growth	• Investment in new IT-enhanced equipment improves all stages of the production process which allows a shift to producing more customized products. • Adoption of new computer-based IT also coincides with increases in the skill requirements and adoption of new human resource practices		I, III, IV
Baumann, J., & Kritikos, A. S. (2016)	• Analyses whether micro firms make R&D investments to become more innovative • Whether the link between R&D, innovation and productivity is the same for micro firms as for larger SMEs	• For firms that engage in innovative activities, R&D intensity is larger the smaller firms are. • Regardless of firm-size, R&D intensity has a positive effect on the probability of reporting an innovation, with a larger effect for product than for process innovation. • Firm age has positive effect on product innovation only for large SMEs	• Only product innovation has a sizeable effect on firm's labour productivity regardless of size	III, IV, VI
Black, S. E., & Lynch, L. M. (1996)	• The impact of human-capital investments, such as education and employer provided training, on productivity		• Average education level (no of years) has significant positive effect on productivity in both non & manufacturing sectors • For manufacturing, the greater the proportion of time spent in formal off-the-job training, the higher the productivity • For nonmanufacturing, the content of the training programs; recruitment strategies and unionization have a positive impact on productivity • High labour turnover has a negative impact on productivity especially for nonmanufacturing	I, II
Calderini, M., & Cantamessa, M. (1997)	• A micro-level analysis of the impact of innovation in product development processes on SMEs	• Innovation process in SME manufacturers pivots on the companies' ability to integrate flexibly with customers & partners in the product design and development phase • Decision to innovate product development influenced by internationalisation of company ownership, pressure from customers and the competitive base • Organizational innovation driven by significant path-dependent phenomena limiting the role of managers		IV

Articles	Article focus	Indirect influence on productivity	Direct influence on productivity	Themes
Capello, R. (1999)	• Is capital productivity in firms located in the milieu dependent on know-how accumulated over time in the milieu? • Is labour productivity in firms located in the milieu influenced by labour market stability and dynamic synergy effects in the labour market of the milieu?		• Collective learning provides local firms with positive external effects on factor productivity. • Collective learning mechanisms, increase labour productivity. • Knowledge accumulated outside the milieu does not lead to a higher productivity than local knowledge.	V
Cassia, L., Massis, A. D., & Kotlar, J. (2012)	• Effect of family control on the characteristics of SMEs i.e. demographic characteristics, cost and productivity of labour, financial ratios, and performance	• Family controlled firms are significantly smaller in terms of revenues and are significantly older than their nonfamily counterparts.	• Family controlled firms outperformed their nonfamily counterparts in terms of return on sales, ROE and ROA, but show significantly lower revenues per capita and workforce productivity	I
Chalker, M., & Loosemore, M. (2016)	• Explores the association between trust and productivity from a subcontractor perspective	• High levels of trust have positive influence on productivity by enabling greater collaboration, better communication and greater flexibility, agility and informality in project relationships		I
Classen, N., Carree, M., Gils, A., & Peters, B. (2014)	• Analysis of differences between family and non-family firms in innovation investment, product and process innovation outcomes, and labour productivity.	• Family SMEs have a higher propensity to invest in innovation, but do so less intensively than non-family counterparts. • Family SMEs tend to outperform non-family SMEs in terms of process innovation outcomes when controlling for innovation investment.	• Family SMEs underperform regarding labour productivity in comparison to non-family SMEs.	I
Cocker, F., Martin, A., Scott, J., Venn, A., & Sanderson, K. (2013)	• Investigate prevalence of high/very high psychological distress, past-month sickness absenteeism and presenteeism days in SME owner/managers; and associated, self-reported lost productivity	• SME owner/managers, don't rely on colleagues or employees to compensate for lost productivity due to their sickness absence. • Work related wellbeing factors, higher educational attainment, treatment and neuroticism were correlated with higher absenteeism days.	• However, those owner/managers who continued to work whilst experiencing high/very high psychological distress reported substantially reduced productivity.	II
Colombo, M. G., Croce, A., & Grilli, L. (2013)	• Analyse the impact of the adoption of broadband Internet technology on the productivity performance on SMEs		• SMEs experience positive effect on productivity when adopting advanced broadband applications depending on: (i) their industry of operations; (ii) the relevance of the specific broadband software applications (iii) the undertaking of complementary strategic and organisational changes.	I, III
Dora, M., Kumar, M., Goubergen, D. V., Molnar, A., & Gellynck, X. (2013)	• Analyses the application of lean manufacturing, its impact on operational performance and critical success factors in the food processing SMEs.	• Majority of food SMEs focus on quality assurance in comparison to quality improvement methods such as lean manufacturing. • Skill of workforce, in-house expertise and organizational culture are critical factors for successful implementation of lean	• Respondents indicated improvement in operational performance, especially with overall productivity from the application of lean manufacturing.	IV

Articles	Article focus	Indirect influence on productivity	Direct influence on productivity	Themes
Datta, D. K., Guthrie, J. P., & Wright, P. M. (2005)	• Examining how industry characteristics moderated the effectiveness of high-performance work systems and the relationship with labour productivity.		• There are general positive effects of high-performance work system practices on labour productivity. • The relationship is stronger as industry capital intensity diminishes; in circumstances of high industry growth; and under conditions of high industry differentiation.	I, VI
Dora, M., Dirk, V. G., Kumar, M., Molnar, A., & Gellynck, X. (2014)	• Analyses the status of the lean manufacturing practices and their benefits and barriers among European food processing SMEs.	• Lean manufacturing practice deployment is generally low in SMEs and still evolving. • Key barriers encountered by food SMEs are characteristics of the food sector as well as lack of knowledge and resources. • Hungarian compared to German and Belgium companies were more successful in reducing cost of production through lean manufacturing practices.	• The most important benefits of lean manufacturing practices are: reduced costs of production, increased profitability, increased productivity and reduced customer complaints. • Small-sized companies profit more than the micro-sized companies with respect to cost reduction and increased productivity.	IV
Esan, A. O., Khan, M. K., Hong, S. Q., & Naylor, C. (2013)	• Describe an integrated manufacturing strategy for the deployment of a CAD/CAM system in a small, medium manufacturing enterprise (SMME).	• The CAD/CAM system permits the firm to speed their responses to market needs and frees users to focus on creativity, innovation and production at minimum possible cost.	• CAD/CAM integration as part of lean manufacturing increased knowledge of CAD/CAM technology, productivity, and flexibility whilst reducing throughput times. • CAD/CAM integration required a change of management framework and company culture	I, III, IV
Eliasson, K., Hansson, P., & Lindvert, M. (2012)	• Distinguishing between learning by exporting and learning to export among new export-entrants		• Observe a labour productivity increase among export entrants relative to non-entrants before export entry. • Productivity gap between export entrants and non-entrants does not continue to grow after export entry suggesting learning to export occurs but learning by export does not.	VI
Fabi, B., Lacoursire, R., Raymond, L., & St-Pierre, J. (2010)	• To what extent do managerial choices made in (HRM, R&D, AMT) affect the performance of SMEs? • To what extent do the interactions of HRM capabilities with R&D and AMT capabilities also affect the performance of these enterprises?	• Manufacturing SMEs' R&D capabilities are enhanced when the employees involved are well informed of both operational activities and key strategic and economic aspects	• HRM capabilities have the most influence on the labour productivity of SMEs. • Associating certain HRM practices to R&D processes and AMT use renders these processes more dynamic and increases their impact on productivity	I, III
Fabling, R., & Grimes, A. (2014)	• Examine how the adoption of HRM practices affects firm performance.		• Adopting a general suite of high-performance work practices leads to higher growth in (multi-factor and labour) productivity for each sector apart from the low-professional services group.	I

Articles	Article focus	Indirect influence on productivity	Direct influence on productivity	Themes
Fazio, G., & Piacentino, D. (2010)	• Perform a multilevel analysis of productivity to estimate how much of the observed firm-level heterogeneity is due to firm-specific factors as opposed to spatial economic and socio-institutional differences	• Northern provinces have on average greater productivity than Southern ones due to greater slopes of capital intensity.	• Worse territorial socio-economic conditions do lower firm-level productivity. This effect is larger on firms with smaller than higher capital intensity.	n/a[1]
Foreman-Peck, J., & Nicholls, T. (2013)	• Investigate the contribution that SME takeovers may make to spatial variations in productivity.		• Takeovers raise labour productivity after acquisition in all regions but by less for the most productive SMEs. Age effects generally indicate higher chances of older SMEs being taken over.	V, VI
Foreman-Peck, J., & Nicholls, T. (2015)	• Examine the relocation of SMEs to assess whether the process reinforces core– periphery disparities, as in many new economic geography models, or ameliorates them in neoclassical style.		• Fast-growing SMEs become even more productive and employ even more workers after moving than regionally immobile SMEs.	V
Georgiadis, A., & Pitelis, C. N. (2016)	• Investigates relationship between employees' and managers' training and firm performance using a policy intervention that randomly assigned training support to SMEs		• Employees' training had a stronger positive impact on firms' labour productivity and profitability than managers' training	II
Gunasekaran, A., Okko, P., Martikainen, T., & Yli-Olli, P. (1996)	• Explain importance of the new production concepts and technologies for SMEs, how they can be used for improving productivity and quality, as well as facilitating suitable alliances and networking of firms.	• Alliances and networking influence the type of strategies that the SMEs select for improving their productivity and quality • Limited assistance is received from larger companies		V
Gunasekaran, A., Forker, L., & Kobu, B. (2000)	• Improve productivity in two cells of the company, namely the Honda/Rover cell and the headlamp cleaning cell. • Identify potential areas for cost savings resulting from productivity gains.		• Manufacturing concepts and technologies associated with large firms (e.g. JIT/Kanban/Hoshin etc) can be applied to small firms for productivity and quality improvements. • Changes must become a company-wide cultural change for gains to last.	IV

[1] As the only study focused on the impact of socio-economic context on SME productivity, it is not included in the themes, but discussed under future research agenda.

Articles	Article focus	Indirect influence on productivity	Direct influence on productivity	Themes
Gare, K., & Melin, U. (2011)	• To investigate conditions in the context of sense-making for ICT adoption and use among SMEs.	• ICT infrastructure can be viewed as constituted by needs identified among SMEs, in sense-making, sense-giving, and service infrastructures. • There is a need, especially among micro firms for support in technical matters as well as applications and integration in work processes. Micro firms have to rely on external partners and suppliers, corresponding to a need for cooperation.		III, V
Griffith, R., Huergo, E., Mairesse, J., & Peters, B. (2006)	• The role innovation plays in productivity across four European countries, France, Germany, Spain, and UK	• Government funding increases the probability firm engages in R&D continuously, but has little impact on intensity of R&D. • Larger firms, those operating in international markets and those in industries where greater use is made of formal or strategic methods to protect innovations are more likely to engage/invest in R&D. • Suppliers are an important source of information for process innovation, while customers are significant in stimulating product innovation	• Process innovation is associated with higher productivity only in France while product innovation is associated with higher productivity in France, Spain, and the UK	III, IV
Guthrie, J. P. (2001)	• Examined the relationship between firms' use of high-involvement work practices and employee retention and productivity.		• Employee turnover is associated with decreased (increased) labour productivity when investments in high-involvement work practices are relatively high (low).	I
Hall, B. H., Lotti, F., & Mairesse, J. (2009)	• Investigates how and when innovation takes place in SMEs and whether—and how—innovation outcomes impact SME firms' productivity.	• Firm size, R&D intensity, and investment in equipment, enhances likelihood of having both process and product innovation. • Firm size is negatively associated with intensity of R&D, but positively with the likelihood of having product or process innovation • International competition fosters R&D intensity, especially in high-tech firms.	• Both product and process innovations have a positive impact on firm's productivity, especially process innovation.	III, IV, VI
Harris, R., McAdam, R., & Reid, R. (2016)	• Tests whether commonly used business improvement methods (BIM) foster or inhibit innovation SMEs in peripheral regions.	• Adopting BIM results in firms undertaking innovation-related activities while remaining non-innovators. • Those using product design as their competitive edge, selling in export markets and being foreign owned increased probability of being successful innovators.		I, V

Articles	Article focus	Indirect influence on productivity	Direct influence on productivity	Themes
Hemert, P., Nijkamp, P., & Masurel, E (2013)	• Explores the innovation strategy of innovative Dutch SMEs by means of their sources of innovation (SI), innovation capabilities (IC), innovation performance (IP) and commercialization sources (CS)	• Knowledge-intensive business services play bridging function in facilitating the utilization of sources of innovation for technological innovation capabilities enhancement. • A combination of local university knowledge and international contacts significantly strengthens SMEs' innovation capabilities. • Active connections with competitors are positively linked to innovation performance.		V
Henley, A. & Song, M. (2019)	• Analyses how the production of innovation in turn contributes to improved performance, in terms of exporting activity and productivity for microbusinesses.	• Microbusinesses with innovation have around 11% higher likelihood of exporting than those without any innovation. • There are no direct benefits of innovation on productivity, but the effect comes from exporting as an internationalisation strategy. • Using external advice or information, business networking and having a formal business plan are all associated with a significant increase in the likelihood that microbusinesses will innovate. • In non-service sectors, it is only product innovation that leads to export, whereas across the full sample of businesses, service and process innovation also contributes to exporting decisions and intensity. • In both non-service and service sectors, it is more radical (i.e. new to the market) innovation that contributes in particular to microbusiness exporting.	• Labour productivity is 11% higher in exporting businesses relative to matched comparators, although, because this estimate is only significant at just below the 5% level, the confidence interval is relatively wide.	IV, V, VI
Higón, D.A. & Driffield, N. (2011)	• Investigate the link between the innovation activities (distinguishing product from process innovation) and export performance amongst UK SMEs.	• Both product and process innovation independently have a positive impact on the decision to export. • Considering their interdependence there is no evidence that process innovation increases the probability to export beyond product innovation.		VI
Humphries, D. (2005)	• Inform businesses about the best practice in getting the most out of the government-funded Knowledge Transfer Partnerships	• KTPs are an excellent aid to business, both in short term completion of projects, and also in long term profitability.	• Knowledge Transfer Partnerships significantly improve productivity and profitability in most businesses	V

Articles	Article focus	Indirect influence on productivity	Direct influence on productivity	Themes
Henriques, J., & Catarino, J. (2016)	• Identify the main barriers which impede deployment of energy efficiency in the industrial sector.	• The responsible actor for energy management in most of the firms are administrative and management staff and as a result, energy management focuses on invoices' analysis and contracts rather than aspects that could contribute to energy efficiency improvements. • For small firms the main barriers are lack of information, limited access to capital, and low priority on energy issues.	• Together with cost savings, energy efficiency delivers other benefits that help firms grow and develop e.g. by improving productivity, profitability and competitiveness and product quality.	I, II
Hernandez-Espallardo, M., & Delgado-Ballester, E. (2009)	• Study whether the effectiveness of innovation in improving a firm's performance varies in different competitive situations	• Product innovation is found to be effective in influencing performance in small firms with higher pressure from the five competitive forces. • SMEs leverage their innovation on market orientation in both contexts		IV, VI
Hottenrott, H., & Lopes-Bento, C. (2014)	• Analyses the impact and effectiveness of targeted public support for R&D investment at the firm level.	• Targeted public subsidies trigger R&D spending, especially in internationally collaborating SMEs. • Publicly induced R&D is productive as it translates into marketable product innovations.		III, V
Huselid, M. A. (1995)	• Evaluated the links between systems of High Performance Work Practices and firm performance		• Investment in high performance work practices are associated with lower employee turnover and greater productivity and corporate financial performance.	I
Jones, J., & Corral, d. Z. (2017)	• Examining the contribution of knowledge flows from HEIs and related research institutes to the innovation output and firm performance on sustainability-oriented innovation (SOI) in SMEs.	• Developing human resource transfer via employing new graduates, providing further education and vocational training generates performance benefits in the form of innovation outcomes, which in turn indirectly leads to productivity and sales growth		V
Jones, P., Scherle, J., Pickernell, D., Packham, G., Skinner, H., & Peisl, T. (2014)	• Explores the value and impact that SMEs derive from winning business awards.	• In the short term, enterprises benefited in terms of enhanced brand identity in their network and community which resulted in enhanced turnover and enterprise profile.	• Internally, winning an award acted as a motivator for enterprise employees, enhancing their productivity.	I
Karhunen, H., & Huovari, J. (2015)	• Investigates how R&D subsidies affect firms' employment, value added and employee education levels	• Firms with high share of workers with tertiary education and foreign trade have a higher likelihood of obtaining an R&D subsidy. Foreign ownership decreases this probability. • Subsidy effect on survival rates is positive and significant three to five years later.	• A negative effect on SMEs' annual productivity growth one to two years after the subsidy year.	III

Articles	Article focus	Indirect influence on productivity	Direct influence on productivity	Themes
Koch, M. J., & McGrath, R. G. (1996)	• Examine connections between HRM practices and firm-level performance outcomes.		• Investments in human resource planning and investments in hiring practices are associated positively with labour productivity • Interaction effect between human resource policies and capital intensity that exerts a dominant influence upon productivity, rather than capital intensity on its own • Firms that systematically train and develop their workers are more likely to enjoy the rewards of a more productive workforce	I, II
Laforet, S. (2013)	• Examine the impact of positive and negative outcomes of Organizational Innovation (OI) in SMEs in relation to company size, age, and business sector.	• OI has a greater positive impact on small firms in terms of profit margin, competitiveness, market leadership, and improvement of product design and process.	• OI results in an increase in productivity, profit margin, market share, market leadership, improved working environment, and operating outside core competency. • OI leads to an increase in productivity in medium size firms implying that small firms are more innovative.	I
Lejarraga, I., & Oberhofer, H. (2015)	• Investigate the trade behaviour of SMEs, exploring any differences between manufacturing and services sectors.	• The probability of engaging in any export activities is an increasing function of firm size, with the smallest firms being least likely to export. • Firm size exhibits a positive impact on firms operating in financial industries, ICT and professional services but not for travel services providers.		VI
Li, J., Merenda, M., & Venkatachalam, A. R. (2009)	• Examines the relationship between the extensiveness of business process digitalization (BPD) and new product development (NPD)	• NPD is positively related to the extensive use of business process digitalization • Moderating effect of firm age on the relationship between BPD and NPD is positive and significant, suggesting an indirect impact of firm age on SME innovation.		III, IV
Li, W., Liu, K., Belitski, M., Ghobadian, A., & O'Regan, N. (2016)	• Develop and empirically test an e-leadership conceptual model focusing on how leadership in SMEs leverages business and digital technology	• Agile leadership (agile culture, strategy and pro-activeness) is particularly important for SMEs to quickly execute business strategy linked with digital technologies	• SME leaders need to drive IT professionals to be business savvy in order to maximize the potential of existing and new technologies to improve company competitiveness, customer service, efficiency, productivity and innovation	II, III
Lodefalk, M., & Tang, A. (2018)	• Examine the heterogeneous productivity impacts of hiring top workers on SMEs	• A firm's absorptive capacity, measured in terms of educational level, and its interaction with the technology gap is more important for laggard firms' productivity.	• Hiring professionals is associated with within-firm TFP growth but mainly in SMEs with higher absorptive capacity.	I

Articles	Article focus	Indirect influence on productivity	Direct influence on productivity	Themes
Madrid-Guijarro, A., García-Pérez-de-Lema, D., & Van Auken, H. (2013)	• Examines product, process and management innovation among Spanish SMEs during the current economic downturn (2009) and previous upswing (2005)	• In economic expansion process innovation is more important than product or management innovation • During recession, there was no significant difference between process and product innovation, but process innovation declined more.		IV
Maani, K. E., Putterill, M. S., & Sluti, D. G. (1994)	• Focuses on direct and indirect relationships between quality, productivity and manufacturing performance.	• Strong support for an overall link between quality improvements and enhanced manufacturing performance.	• Quality improvement positively enhances operational performance and productivity.	IV
Mancinelli, S., & Mazzanti, M. (2009)	• Focus on the complementarity links between firms' internal R&D activities and networking activities.	• The intensity of training activities matters more than mere training introduction • Process innovation is where effective substitutability is more frequent, compared to product innovation that witnesses some strong complementarity evidence.	• Expenditures per employee in R&D and formal training emerge as main significant factors impacting labour productivity. • Networking alone cannot play a role in stimulating innovation and, even harder, labour productivity. It has to be linked to investments in R&D and training.	II, V
Manez, J.A., Rochina-Barrachina, M.E., Sanchis, A. & Sanchis, J. A. (2013)	• Explore in depth, the effect of process innovations on total factor productivity growth for SMEs, taking into account the potential endogeneity problem that may be caused by self-selection into these activities.	• R&D activities play a role in enhancing SMEs "absorptive capacity" in terms of favouring the adoption of new technologies through the introduction of process innovations.	• Introduction of process innovations yields an extra productivity growth that lasts for only one period. • As productivity improvement fades, the path of TFP growth both for process innovators and non-innovators converges.	III, IV
Martinez-Caro, E. & Cegarra-Navarro, J. G. (2010)	• To provide evidence of the influence of different e-business technologies on capital productivity (CP).		• For e-business systems to impact CP, managers need to provide and support a context with two dimensions: groupware applications and collective systems	III
McGovern, T., Small, A., & Hicks, C. (2017)	• Evaluate the European Regions for Innovative Productivity project that established Innovative Productivity Centres (IPCs) to assist SMEs in the North Sea Region of Europe to develop a process improvement capability.	• Successful process improvement interventions were dependent on: a recognized need for change; senior management support; establishment of KPIs; tailoring intervention to meet firm requirements; availability of personnel; time to engage with the process improvement practice; and suitable composition of the team. • Developing a process improvement capability depended upon the availability of company resources, establishing KPIs and change agent support.		V, VI
McGuinness, S., Bennett, J., & McCausland, G. (2008)	• Assess the nature and extent of labour market shortages arising from a lack of basic skills among the 16–25-year-old workforce.	• Hard-to-fill vacancies were found to be more prevalent in firms employing lower proportions of females, those who were less aware of existing qualification bodies and those in the hotel and restaurant sector.	• In instances where skill shortages were due to a lack of basic literacy/numeracy skills they exerted a negative impact on productivity performance.	I

Articles	Article focus	Indirect influence on productivity	Direct influence on productivity	Themes
McGuirk, H., Lenihan, H., & Hart, M. (2015)	• Does Innovative Human Capital (IHC) contribute to firm-level innovation, and does IHC have differing outcomes in small and larger-sized firms?	• Managers in small firms who avail of training provided have a significantly positive impact on the probability of engaging in all three types of innovation. • The willingness of the manager to accept change is found to be positively significant for service innovation and stronger for product innovation. • The location of the firm, has a more significant effect for larger-sized firms than small firms.		I, II, VI
Middleton, K. L., & Chambers, V. (2010)	• Examine whether the intention to adopt and use wifi technology by SMEs reduces the digital divide among users who exhibit differences in gender, race, age, education, and experience.	• Access to the internet via high-speed Wi-Fi has the potential to reduce and/or eliminate the digital divide among and between diverse populations of SMEs • While both Hispanics and Whites indicated a positive intent to adopt the new Wi-Fi technology, only White SME owners indicated a significant and positive use of the technology.		II, III
Middleton, K. L., & Byus, K. (2011)	• Examine the influence of Hispanic ethnicity on the adoption and use of ICT tools by SMEs in a south-western renewal community	• Results point to a continuing digital divide among Hispanic and non-Hispanic SME owners • Non-Hispanic SME owners found to be much more likely to adopt a wider range of ICTs and to use them for both administrative and long term strategic analytical purposes.		II, III
Mole, K. F., Ghobadian, A., O'Regan, N., & Liu, J. (2004)	• Assesses the adoption of different soft process technologies in British engineering and electronics SMEs	• Firm specific factors make a larger difference to the adoption of process technologies than competitive factors. • Benchmarking, suggestions schemes, problem solving techniques and ISO 9000 adoption was unrelated to firm size, which holds out the prospect of soft process technologies as an alternative.		III
Mole, K. F., Hart, M., & Roper, S. (2014)	• Evaluate whether changes to delivery mechanisms affect the type of advice received.	• SMEs sought word-of mouth referrals before taking internal, capability-enhancing advice. • Only when firms took advice that used extant capabilities (e.g. marketing or sales) did they rely on the Internet. • When Internet is privileged over face-to-face advice the changes made by each recipient of advice are likely to diminish causing less impact from advice within the economy.		V

Articles	Article focus	Indirect influence on productivity	Direct influence on productivity	Themes
Naranjo Valencia, J. C., Sanz Valle, R., & Jiménez Jiménez, D. (2010)	• Study empirically the relationships among organizational culture and product innovation.	• Ad hocratic cultures have a positive and significant effect on product innovation. • Organizational cultures that empathise internal and control orientations will inhibit the generation of product and services innovations.		I, II
Niaki, M. K., & Nonino, F. (2017)	• Identify the impacts of additive manufacturing (AM) in manufacturing, business strategies and business performance	• An increasing competitiveness of the early adopter SMEs using Rapid Manufacturing. • AM brought not only a process innovation but also product innovation		III, IV
Niebuhr, A. (2010)	• Analyse the effect of cultural diversity of the labour force on patent applications for a cross-section of German regions.	• Significant impact of R&D expenditure, relative size of industrial sector, as well as type of sector (manufacturing) on innovation output • Innovation-enhancing effect of cultural diversity of the workforce irrespective of applied diversity measure.	• Areas that are less densely populated with small firms, especially rural areas, tend to be marked ceteris paribus by lower productivity of R&D activity.	II, III, VI
North, D., & Smallbone, D. (1996)	• Contribute to the debate about the potential contribution of SMEs to rural economic development.	• In terms of the degree of adaptation to local market conditions and employment performance, it was the rural SMEs that tended to be more active. • Rural firms still lag behind their counterparts in terms of their orientation to national and international markets.	• Remote rural firms not only had much lower labour productivity levels than their urban counterparts, but the rate of productivity change during the 1980s was also inferior.	VI
Nunes, M. B., Annansingh, F., Eaglestone, B., & Wakefield, R. (2006)	• Study of knowledge management understanding and usage in small and medium knowledge-intensive enterprises.	• Knowledge management activities within SMEs tend to happen in an informal way, rarely supported by purposely designed ICT systems. • Reveals lack of understanding of the value of knowledge in competition, innovation and even survival by both managers and employees.	• All SMEs, including knowledge intensive ones, acknowledge that adequately capturing, storing, sharing and disseminating knowledge can lead to greater innovation and productivity	I, III
Nunes, P. M., Goncalves, M., & Serrasqueiro, Z. (2013)	• Investigate whether age is a fundamental characteristic of the relationships between determinants and growth.	• R&D intensity in situations of financial deficit is of greater relative importance for diminished growth in young SMEs, but only in context of high-tech SMEs		III, VI
Noke, H., & Hughes, M. (2010)	• Examine strategies used by firms to reposition through creating a new product development (NPD) capabilities	• Four strategic approaches (strategic alliances, licensing key technologies/ideas, outsourcing and deploying internal development process) to enable the creation of a NPD capability are found. The strategies are not mutually exclusive. • The strategies enabled value chain repositioning not just in terms of higher value to the current product range, but also created wholly new value chains as firms created starkly different new product outcomes		V

Articles	Article focus	Indirect influence on productivity	Direct influence on productivity	Themes
Onkelinx, J., Manolova, T. S., & Edelman, L. F. (2016)	• Explore the effect of investments in employee human capital on labour productivity, and the role of labour productivity in SME internationalization.	• Human capital of the entire organization matters for SME internationalization, not just the human capital of the owner/founder.	• Investments in employee human capital lead to greater labour productivity in the following year, which in turn, leads to a higher degree of internationalization.	I, VI
Oeij, P., de Vroome, E., Bolland, A., Gründemann, R., & van Teeffelen, L. (2014)	• Does the innovation project 'My Enterprise 2.0' strengthen the innovation capability of SMEs	• The increase in "workplace innovativeness" found in firms implementing a "workplace innovation intervention" is significantly different from the decrease in firms that did not • Only three types of interventions applied: the areas of strategy, design of primary process, and deployment of personnel led to a significant improvement in the "workplace innovativeness" as a whole."	• Firms also reported positive effects of workplace innovation intervention on company performance, achieving company goals and improving labour productivity.	I, V
Parisi, M., Schiantarelli, F. & Sembenelli, A. (2006)	• Presents evidence on the effect of process and product innovations on productivity, as well as on the role played by R&D and fixed capital investment in enhancing the likelihood of introducing innovations at the firm level	• R&D spending is strongly positively associated with the probability of introducing a new product, whereas fixed capital spending increases the likelihood of introducing a process innovation • The effect of fixed investment is magnified by R&D spending internal to the firm implying that R&D can affect productivity growth by facilitating the absorption of new technologies. • The introduction of innovations is significantly related to cash flow and this is persistent only for product innovation.	• Process innovation has a larger impact on total factor productivity than product innovation.	III, IV
Rasel, F. (2016)	• Examines whether information technology (IT) and decentralized and incentive-based workplace organization are complementary only for large firms or also for smaller firms.	• SMEs with decentralized and incentive-based work practices tend to use IT more intensively.	• IT and workplace organization are individually associated with higher productivity, but the combination of IT and decentralization does not yield a productivity premium. • Combining IT and decentralized workplace organization seems a successful strategy for only larger firms.	I, III
Raymond, L. (2005)	• Focuses on the performance outcomes of alignment between the assimilation of AMT and the CSFs (critical success factors) associated with operations and production management in manufacturing SMEs.	• Increased uncertainty in the SMEs' environment leads to increased CSF levels but not to increased assimilation of AMT • The more "soft" aspects of AMT, linked to the effective implementation and use of manufacturing resources management applications are more problematic for SMEs.	• While increased CSF and AMT assimilation levels directly impact operational performance in terms of increased productivity, cost reductions, flexibility, quality, and integration, a mismatch between the two significantly reduces performance	I, III

Articles	Article focus	Indirect influence on productivity	Direct influence on productivity	Themes
Raymond, L., & St-Pierre, J. (2004)	• Explore the actual relationship between customer dependency, R&D, and the business performance of small manufacturers.	• The more commercially dependent the SME, the greater proportion of its financial and human resources allocated to product R&D. • R&D activities could allow manufacturing SMEs to counter the influence of major customers, by reversing commercial dependency	• Implied relationship between R&D and performance i.e. more intense R&D activities associated with lower productivity but with higher profitability	III
Raymond, L., & Bergeron, F. (2008)	• Understanding the performance outcomes of the alignment between the e-business capabilities of manufacturing SMEs and their business strategy	• Results indicate that the ideal e-business profiles vary in relation to the firms' strategic orientation	• E-business alignment has positive performance outcomes in terms of growth, productivity and financial performance • For defender type firms, greater alignment of their e-business activities is associated to stronger growth and greater profitability but not to greater productivity. • Whereas for the prospector type, alignment is associated only to productivity.	I, III
Raymond, L., Bergeron, F., & Croteau, A. (2013)	• Identify the enabling effect of IT integration on the innovation capability of manufacturing SMEs—in terms of growth and productivity outcomes—and to verify if this effect is subject to industry influences.	• The positive effect of innovation capabilities on growth is significantly greater in the high-IT integration SMEs than low-IT integration ones. However, this does not remain true when controlling for sector, size and age of the firm. • Integrative IT such as ERP systems can indeed be counterproductive, and "seamless integration" can induce rigidities running counter to process innovation aims.	• Firm's innovation capability was found to be positively related to the growth and productivity of manufacturing SMEs. • While IT integration was not seen to enable the innovation capability of manufacturing SMEs in terms of growth, it was seen to have a disabling effect on this same capability with regard to productivity.	III, IV
Ribeiro Soriano, D., & Castrogiovanni, G. J. (2012)	• Investigate the effects of entrepreneurial human capital on SME performance within the European Union.	• There is a link between performance and inclusion of other CEO-owners in the founder's inner circle of advisors. • Relationship is positive when the advisor's venture has experienced failure and negative when the advisor's venture has been successful.	• Both profitability and productivity are positively related to industry-specific knowledge possessed by the CEO-owner prior to starting up and the general business knowledge acquired post start-up. • Experience as a result of having previously worked in a firm in the same industry pre-start-up was related to productivity only	II, V
Ruivo, P., Oliveira, T., & Neto, M. (2015)	• What are the antecedents of commercial-packaged ERP (Enterprise resource planning) value in European SMEs? • What are the differences and similarities of commercial-packaged ERP value?	• SMEs are not only using ERPs as transaction processing systems, but also as systems to facilitate firms' collaboration and analytics capabilities.	• While collaborating with colleagues, system, suppliers, partners, and customers increases productivity, analytics provides greater business insight for better decision making processes.	III, V

Articles	Article focus	Indirect influence on productivity	Direct influence on productivity	Themes
Romero-Jordan, D., Sanz-Labrador, I., & Sanz-Sanz, J. F. (2019)	• Analyses whether corporation tax penalises the productivity growth of smaller enterprises (SEs)	• For SEs, corporation tax has a negative effect only upon the decision to invest in productive fixed assets • MLEs corporation tax negatively affects both the decision to invest and project size.	• Corporation tax has a negative effect upon productivity growth in companies with the greatest profitability, whether large or small.	VI
Sandulli, F., Fernández-Menéndez, J., Rodríguez-Duarte, A., & López-Sánchez, J.I. (2012)	• Examines the effects of information technology (IT) adoption on the productivity of multimarket SMEs	• Positive relationship between IT adoption and exporting firms' performance. • IT adoption contributes to the efficiency of SMEs facing higher complexity. • Multimarket SMEs should favour the deployment of operations-oriented IT in micro firms, or supporting financial processes with IT in larger firms.	• Intensive use of IT in operations processes is found to be associated with substantial increases in productivity of firms following both related and unrelated diversification	III, VI
Sandulli, F. D., Baker, P. M. A., & López-Sánchez, J.I. (2013)	• Explore the interactions between cognitive and technical skills and IT-led technological change in SMEs.	• Firms with lower levels of technological change are less likely to adopt organizational innovations and will not fully benefit from highly educated workers. • Experience and accumulation of human capital have a significant impact on a firm's efficiency when technological change is deep.		II, III
Savery, L. K., & Alan Luks, J. (2004)	• Consider the role of education and training in the success of organizations.	• Employing managers with tertiary qualifications in business management, commerce or administration will lead to an intention to significantly increase production.		II, VI
Scuotto, V., Del Giudice, M., & Obi Omeihe, K. (2017)	• Explore mass collaborative knowledge management (MCKM) and its implications for SMEs.	• Using (social media networks) SMNs results in a daily, digital communication strategy aimed at employees and customers, and the co-customer-centred approach in the innovation process and entrepreneurial challenges • SMEs can use the internet to integrate their organizational innovation processes within functional departments and supply chain members via e-collaboration tools.		III, V
Serban, S. (2013)	• Understand why and to which extent firms decide to invest in innovation, what drives the innovation output and what are the impacts of the innovation output on productivity of firms.	• Firms decide to invest in R&D mainly because of public support or exports • If firms decide to invest both in physical and knowledge capital they will invest more in innovation if they have more public support. • Exports also positively impact innovation input intensity. • R&D continuity positively affects all types of firms regarding their innovation output.	• For small firms unlike medium or large firms, innovation output has a negative impact on their productivity	III, VI

Articles	Article focus	Indirect influence on productivity	Direct influence on productivity	Themes
St-Pierre, J., & Raymond, L. (2004)	• Tests a model of the relationship between benchmarking, the adoption of advanced manufacturing systems, and the performance of SMEs.	• Benchmarking leads manufacturing SMEs to adopt new business practices such as flexible manufacturing systems (FMS), computer-based inventory management, bar-coding and maintenance management and ERP systems.	• In the short term, benchmarking is directly associated with the adoption of new production practices in the form of Advanced manufacturing systems, with a higher level of capital and labour productivity, and with a lower level of production effectiveness.	VI
Struker, J., & Gille, D. (2010)	• Determining firm-size specific characteristics of Radio frequency identification (RFID)	• Smaller enterprise size makes RFID adoption and exploitation of the productivity potential easier. • SMEs using RFID have significantly less-extensive IT-equipment than large RFID users. • SMEs more frequently seek to optimize the coordination of processes and applications than LEs.		III
Su, Z., & Tang, J. (2016)	• Study the factors that may be important for firms' decision in pursuing these two different business strategies.	• Age of firms, the single-establishment structure of the business and being multinationals are useful predictors for firms to undertake product innovation.	• Firms focusing on product innovation are more productive than firms focusing on cost-cutting strategies.	IV
Tomlinson, P. R., & Fai, F. M. (2013)	• Explore the SME innovation–cooperation relationship by designing and utilising measures that capture both the multi-scalar (strength) and multi-dimensional (variety) nature of co-operation and innovation.	• The strength of cooperative ties across a range of productive activities within the value chain are important facilitators for SME innovative capability; true for both product and process innovation.		IV, V
Torre, E. D., & Solari, L. (2011)	• Is there a relationship between the adoption of organisational innovations and a firm's economic results in SMEs?	• With lower technological levels, a high degree of organisational innovation may have counter-productive effects by worsening the business results.	• SMEs which achieved the largest labour productivity increases are those which combined investments in the new organisation of work with advanced technologies and embeddedness in stable relational networks with other firms.	I, III
Torrent-Sellens, J., Ficapal-Cusi, P., Boada-Grau, J., & Vigil-Colet, A. (2016)	• Provide empirical evidence and a practical tool to measure new co-innovative sources of perceived productivity in tourism SMEs.	• The co-innovative factors in SMEs reside in specific practices mainly orientated towards increasing income and/or optimizing of costs or production factors.	• In radical innovation-oriented tourism SMEs, co-innovative factors including promoting Internet uses and organizational practices that increase income and optimize resources could be a clear strategic choice to improve productivity.	I, III
Towers, N., & McLoughlin, J. (2005)	• Examine how widespread TQM has been implemented within the UK textile manufacturing sector that is characterised by a high proportion of SMEs managing unpredictable and volatile demand.	• External environment in which SMEs operate predominantly requires the adoption of TQM as a driver towards customer orientation by the business.	• The adoption of TQM had produced a limited effect on employee-related issues as only minor improvements had been reported in labour turnover and productivity. In fact the last attribute had been the widest range of responses with no major improvement or even deterioration being reported.	I, VI

Articles	Article focus	Indirect influence on productivity	Direct influence on productivity	Themes
Uwizeyemungu, S., Poba-Nzaou, P., & St-Pierre, J. (2015)	• Analyses the relationship between AMT proficiency levels in manufacturing SMEs and product innovation performance.	• The organizational and environmental context of SMEs are more determinant for product innovation performance than AMT assimilation patterns.		III, IV
Wielicki, T., & Arendt, L. (2010)	• Examined the perceptions of ICT implementation barriers by SMEs' owners and managers across different cultures and countries.	• USA is more ready to take advantage of new technologies and knowledge-based economy than Spain, Portugal and Poland • The more knowledge-driven a given economy is, the more likely it is that managers/owners of SMEs will shift their attention from short-term ICT barriers, like lack of funds, to more long-term barriers, like lack of knowledge and an information system plan.		III, VI

b) Impact of productivity

Articles	Article focus	Impact of productivity	Themes
Antonelli, C., Crespi, F & Scellato, G. (2015)	• Investigates the dynamics of productivity in a large sample of Italian manufacturing firms, focusing on the determinants of firm-level persistence in time of high TFP growth rates relative to the corresponding sectoral distributions	• Being in the top 15 % of the distribution of TFP growth rates in year t - 1 has a positive and largely significant impact on the likelihood of the firm still being in the top 15 % in year t. These dynamics are not influenced by the past but are path dependent • Firms which have been able to improve the general efficiency of their production process at time t are more likely to sustain above-average performance in the subsequent periods of time.	V, VI
Bagchi-Sen, S. (2001)	• Examines similarities and differences between SMEs with different levels of reported product innovation.	• Pursuing product innovation results in better performance in terms of total and export sales • SMEs with higher levels of product innovation value expansion of R&D efforts, incremental innovation, new product development, and new export market development • SMEs with lower levels of product innovation emphasize the importance of cost-based pricing and market development within the local market.	IV
Bakhtiari, S. (2015)	• Studies the relationship between total factor productivity and outsourcing accounting for the possibility of inefficient firms self-selecting into exit instead of outsourcing to domestic suppliers.	• Productivity is the principal determinant of outsourcing. • Low productivity significantly raises the likelihood of the outsourcing decision as well as the decision to exit.	V
Eliasson, K., Hansson, P., & Lindvert, M. (2012)	• Distinguishing between learning by exporting and learning to export among new export-entrants	• Future exporters have higher productivity than do non-entrants only before entry into international markets indicating self-selection into exports and learning to export. • Positive effect of pre-export labour productivity valid for micro or small firms but not medium or large ones.	VI

Articles	Article focus	Impact of productivity	Themes
Falk, M., & de Lemos, F. F. (2019)	• Investigates the link between export behaviour, labour productivity and R&D activities in SMEs.	• A combination of high labour productivity and high R&D intensity are particularly favourable for export activities. • The importance of labour productivity is more pronounced for micro enterprises, young firms and born global firms than for old firms. • R&D activities are only relevant if the gap in labour productivity between SMEs and large firms in a given industry is not too wide. Below a certain threshold of the relative labour productivity level, higher R&D expenditures do not pay off in extended export activities.	III, VI
Falk, M., & Hagsten, E. (2015a)	• Investigates the exporter productivity premium of SMEs relative to large firms	• The level of labour productivity of exporting SMEs is higher than that of non-exporting ones in a given industry and country. • Relative productivity level is highest for SMEs present in both markets than for those only present in one of the two • Exporter productivity premium is highest in manufacturing, and professional and technical services.	VI
Falk, M., & Hagsten, E. (2015b)	• Analyses the determinants of the export participation of Swedish SMEs in the computer and other business service industries with particular emphasis on micro firms (0–9 employees).	• A high productivity level in the previous year is most important in determining decisions to export. • The impact of labour productivity on exporting in computer services does not differ between micro firms and other SMEs. • In business services, the relationship between export probability, labour productivity and skill intensity is significant only for micro enterprises.	VI
Foreman-Peck, J., & Nicholls, T. (2013)	• Investigate the contribution that SME takeovers may make to spatial variations in productivity.	• Contrary to big firms, more productive small businesses are more subject to takeover—although effect is weaker if they are located in peripheral regions.	V, VI
Foreman-Peck, J., & Nicholls, T. (2015)	• Examine the relocation of SMEs to assess whether the process reinforces core– periphery disparities, as in many new economic geography models, or ameliorates them in neoclassical style.	• SMEs that relocate are more productive, relatively larger and younger, as well as more probably initially located core locations (e.g. London).	V
Guedes de Carvalho, P., Nunes, P., & Serrasqueiro, Z. (2013)	• The growth determinants of fitness SMEs in Portugal using the two-step estimation method.	• Internal finance, external finance and labour productivity are important determinants to increase growth of fitness SMEs	VI
Guzman-Cuevas, J., Caceres-Carrasco, R., & Soriano, D. R. (2009)	• Analyses both the firm characteristics that make up a particular productive structure and its relation to the level of economic development	• While economic growth depends on a number of variables of different nature such as productivity, technology, human capital, investment, economic policy etc. within a structural economic framework, entrepreneurial tissue represents a key factor that has a great influence on the economic behaviour of a specific territory.	VI
Karhunen, H., & Huovari, J. (2015)	• Investigates how R&D subsidies affect firms' employment, value added and employee education levels	• Productivity growth before the subsidy year is also higher in subsidised firms	III
Kohr, C. K., Malorgio, G., & Aragrande, M. (2017)	• Explore the determinants of internationalisation among late starters in the wine sector.	• Productivity measures and unit revenue indicators are correlated with the export intensity of a business.	I, VI

Articles	Article focus	Impact of productivity	Themes
Lejarraga, I., & Oberhofer, H. (2015)	• Investigate the trade behaviour of SMEs, exploring any differences between manufacturing and services sectors.	• Firm size and (total factor) productivity only affect a firm's export probability but (conditional on being an exporting firm) not its relative engagement in foreign market activities. • More productive ICT and professional services firms are more likely to export to foreign markets, while productivity matters less for financial or travel services providers.	VI
Mayer, P., Gerber, N., McDermott, R., Volkamer, M., & Vogt, J. (2017)	• Understanding of goal setting in organizations, especially regarding the mitigation of conflicting productivity and security goals.	• The presence of rewards for productivity goal achievement is strongly associated with a decrease in security compliance.	I, III
Nunes, P. M., Goncalves, M., & Serrasqueiro, Z. (2013)	• Investigate whether age is a fundamental characteristic of the relationships between determinants and growth.	• R&D intensity and labour productivity are of greater relative importance for increased growth in old SMEs than for young SMEs.	III, VI
Onkelinx, J., Manolova, T. S., & Edelman, L. F. (2016)	• Explore the effect of investments in employee human capital on labour productivity, and the role of labour productivity in SME internationalization.	• The effect of labour productivity on degree of internationalization is contingent on SMEs' internationalization strategy i.e. only for accelerated internationalizers	I, VI
Romero-Jordan, D., Sanz-Labrador, I., & Sanz-Sanz, J. F. (2019)	• Analyses whether corporation tax penalises the productivity growth of smaller enterprises (SEs)	• In the Spanish case productivity a 1% increase in TFP growth for frontier firms leads to an average increase in the TFP growth of 0.85% in laggard firms although the effect is much weaker in the SEs.	VI
Savery, L. K., & Alan Luks, J. (2004)	• Consider the role of education and training in the success of organizations.	• Firms that wish to improve their productivity and/or profitability are more likely to train their staff.	II, VI
van Stel, A., Lokshin, B., & de Vries, N. (2019)	• Focuses on productivity transmissions between SMEs and large firms.	• A one percent increase in productivity of SMEs increases productivity of large firms in the long run. • Impact of SME labour productivity increases on labour productivity increases of large firms primarily reflects an effect of medium-sized and small firm productivity increases • The long-run elasticity with respect to changes in productivity of SMEs is larger in countries with bigger size of the SME sector	VI
Yazdanfar, D. (2013)	• Examining the profitability determinants of Swedish micro firms at the firm level.	• Productivity is the most significant determinant of profitability. These results are fairly robust across the various industry sectors • Larger and younger firms with high productivity and growth are more likely to be profitable. • There are profitability heterogeneities at the industry level.	VI