Kent Academic Repository

Downloaded from

The version of record is available from

This document version

Author's Accepted Manuscript

DOI for this version

Licence for this version

Additional information

Versions of research works

Versions of Record

If this version is the version of record, it is the same as the published version available on the publisher's web site. Cite as the published version.

Author Accepted Manuscripts

If this document is identified as the Author Accepted Manuscript it is the version after peer review but before type setting, copy editing or publisher branding. Cite as Surname, Initial. (Year) 'Title of article'. To be published in *Title of Journal* , Volume and issue numbers [peer-reviewed accepted version]. Available at: DOI or URL (Accessed: date).

Enquiries

If you have questions about this document contact ResearchSupport@kent.ac.uk. Please include the URL of the record in KAR. If you believe that your, or a third party's rights have been compromised through this document please see our Take Down policy (available from https://www.kent.ac.uk/guides/kar-the-kent-academic-repository#policies).

SMEs' internationalisation: When does innovation matter?

George Saridakis

Business School, Kent University, UK

G.Saridakis@kent.ac.uk

Bochra Idris

Business School, Kent University, UK

bi35@kent.ac.uk

Jared M. Hansen

Belk College of Business

jared.hansen@uncc.edu

Leo Paul Dana

Montpellier Business School, France

professordana@gmail.com

Abstract

The objective of this research is threefold: first, to investigate the role of goods, service, and process innovation on SMEs' internationalisation (i.e., exporting); second, to investigate the association between innovation's degree of novelty (radical innovation vs. incremental innovation) and SMEs' internationalisation; and, third, to examine the combined effect of different types of innovation and the degrees of novelty of innovation on firms' internationalisation and compare the findings with their individual effects. Data from 12,823 SMEs in the United Kingdom support the concept that innovative SMEs are more likely to export than non-innovative SMEs; however, the link between innovation and internationalisation differs according to the type of innovation introduced and the degree of novelty of the innovation. Of importance to managerial practice, the combined effects of different types and degrees of novelty of innovation are greater than their individual effects, creating a synergy or amplified effect.

Keywords: Goods Innovation, Service Innovation, Process Innovation, SME Internationalisation, Entrepreneurship, Exporting

1. Introduction

Recognition of the role of innovation in the internationalisation process of small and medium-sized firms (SMEs) has begun to attract research attention over the last few years (see, e.g., Esteve-Pérez & Rodríguez, 2013; García & Calantone, 2002; Higón & Driffield, 2010; Love, Roper, & Zhou, 2016). For example, Kyläheiko, Jantunen, Puumalainen, Saarenketo, and Tuppura (2011) propose that innovation and business internationalisation are strategic activities that are highly connected, while Williams and Shaw (2011) argue that successful internationalisation requires innovation. Many scholars believe that innovation assists firms in crossing borders by means of exporting, because, through innovation, firms can produce new competitive products that enable them to overcome the barriers to penetrating a foreign market (Becker & Egger, 2013; Cassiman, Golovko & Martínez-Rose, 2010; Paul, Parthasarathy, & Gupta 2017; Rodríguez & Rodríguez, 2005).

However, previous empirical studies report mixed evidence about the relationship between innovation and internationalisation. Some research suggests that there is a positive relationship between innovation and internationalisation (e.g., Golovko & Valentini, 2011; Roper & Love, 2002; Xie & Li, 2013). On the other hand, other studies either find a negative relationship between the two factors (e.g., Wakelin, 1998) or report a statistically insignificant effect of innovation on internationalisation (e.g., Sterlacchini, 1999). One possible reason for the mixed findings could be that most empirical studies measure innovation in terms of R&D, patents, and technological innovation (see, e.g., Lachenmaier & Wößmann, 2006; Martínez-Román & Romero, 2013); larger firms are more likely to be engaged in these representations of innovation, whereas smaller firms are more likely to undertake a softer type of innovation (Kleinknecht, 1987). As a result, empirical studies based on firm-level analysis are not conclusive, especially if the researcher examines the innovation–internationalisation link within SMEs (Higón & Driffield, 2010).

Furthermore, published studies often tend to focus on one type of innovation, as noted by Azar and Ciabuschi (2017). However, adopting a single type of innovation may only allow a partial investigation of the potential positive influences of innovation on firm performance (Damanpour & Aravind, 2011). Still, Lewandowska, Szymura-Tyc, and Golębiowski (2016) argue that empirical studies suggest that there is potentially complementarity between goods and process innovation; see also Oke, Burke, and Myer (2007). Advancing insights on these concepts, this research explicitly argues that combined measures of innovation can shed more light on the innovation and small business performance link.

The purpose of this research is to examine theorised differential effects of innovation focus - goods, service, and process innovation - in relation to their potential individual and combined effects on SMEs' propensity to export as a proxy for internationalisation. Moreover, this research investigates those effects across the level of novelty of the innovation - comparing more radical/novel innovation and more incremental innovation - to determine the association between these types of innovation and SMEs' internationalisation. This research aims to provide new and possibly more refined evidence regarding the association between innovation and internationalisation after considering the possible combined effects of different types and degrees of novelty of innovation. To provide an overview of the results, this research finds empirical evidence that each type of innovation affects internationalisation differently; empirical studies and research should recognise that not all types of innovation are equal. Moreover, this research contributes to the previous literature by providing evidence regarding the effect of combining different types of innovation on internationalisation - a topic that is largely ignored in the existing literature (Chetty & Stangl, 2010; Higón & Driffield, 2010; Lewandowska et al., 2016). In addition, the results point towards the importance of introducing radical/novel innovation as an instrument to stimulate internationalisation and in turn firm performance.

The rest of the research is organised as follows. Section 2 discusses the existing literature regarding the relationship between innovation and SMEs' internationalisation and the logic behind the hypotheses presented. Section 3 describes the method, including the study design and measures, and the empirical results. Section 4 contains the discussion, limitations, and managerial and theoretical implications.

2. Conceptual background

2.1. Innovation and internationalisation

According to the Resource-Based View (RBV) theory, a firm is considered as a distinctive entity with a diverse bundle of intangible and tangible resources (Barney, 1991; Penrose, 1959). At the centre of the intangible resources, much emphasis is placed on firms' ability to innovate - explaining their internationalisation (Schoonhoven, Eisenhardt, & Lymman, 1990). Innovation, which is defined as "the implementation of a new or significantly improved product (goods or service), or process, a new marketing method, or a new organisational method in business practice" (OECD, 2005, p. 47), is considered as the tool that contributes to increasing firms' performance and competitive advantages (Castaño, Méndez, & Galindo, 2016). According to Onetti, Zucchella, Jones, and McDougall (2010), firms' success and survival in the global markets depend on the joint effect of innovation and internationalisation. The term internationalisation can be defined from different perspectives depending on the observed phenomena. For instance, Johanson and Vahlne (1977) imply that internationalisation is the process whereby a firm increases its international involvement in incremental stages (Paul et al., 2017). It is generally assumed that internationalisation and innovation are an alternative growth strategy that occurs in the case of innovation and incremental internationalisation (Johanson & Vahlne, 1977). On the other hand, Calof and

Beamish (1995, p. 116) define internationalisation as "the process of adapting firms' operations (strategy, structure, resources, etc.) to international environment."

The term exporting, on the other hand, can be defined as the "outward international trade in goods and/or services, conducted either directly or through a third party" (Love & Roper, 2015, p. 29). According to Golovko and Valentini (2011), although different modes of internationalisation, such as foreign direct investment and exporting, are available to SMEs, exporting is still often their initial stage of internationalisation (Jones, 2001). Hence, this research uses exporting as a proxy for internationalisation. This research follows the previous literature in using export propensity as the operationalisation of internationalisation (e.g., Boehe, 2013; Ganotakis & Love, 2012; Idris & Saridakis, 2018) and defines export propensity as "whether a firm exports to foreign market" (Serra, Pointon, & Abdou, 2012, p. 2016).

The relationship between innovation and internationalisation is investigated in previous studies. For instance, Paul et al. (2017) imply that SMEs that have the ability to introduce product or service innovation will gain competitive advantages over their competitors and that these in turn will help their internationalisation process. In addition, it is indicated that globalisation and shorter product life cycles will lead entrepreneurs with new or innovative products and services to adopt internationalisation strategies despite being new firms (Castaño et al., 2016). Hence, for firms to compete internationally, they should have the ability to introduce innovative activities (Geldres-Weiss, Uribe-Bórquez, Coudounaris, & Monreal-Pérez, 2016). For instance, Autio, Sapienza, and Almeida (2000) suggest that innovative companies that use "cutting-edge" technology and internationalise their business can achieve higher performance. On the other hand, several researchers (e.g., Geldres-Weiss et al., 2016; Leonidou, Katsikeas, Palihawadana, & Spyropoulou, 2007; Pla-Barber & Alegre, 2007) emphasise the importance of adopting an innovation strategy for exporting firms. For

instance, Pla-Barber and Alegre (2007) stress the important role of innovation in foreign markets, discussing the possibility that a single market may not support firms' innovative activities. Hence, internationalisation may act as a destination where innovative firms can gain economic advantages.

On the other hand, the linkage between innovation and exporting is investigated in previous research at the macro and the micro level. At the macro level, Cassiman and Martínez-Ros (2004) show that innovation is considered as an important measure of growth in a country and that exporting demonstrates the competitive advantages of a nation. However, at the micro level, the empirical evidence is inconsistent (e.g., Hagen, Denicolai, & Zucchella, 2014; Nguyen, Pham, Nguyen, & Nguyen, 2008). This section outlines the research and logic that result in a series of hypotheses on the relationship between SME innovation and SME internationalisation represented in Figure 1.

<< Insert Figure 1 about here >>

To discuss the latter literature briefly, Harris and Li (2009) examine the relationship between R&D and exports for UK firms and find that this type of innovation plays an important role in firms' ability to overcome internationalisation barriers. While Golovko and Valentini (2011) find that innovation and exports affect each other positively in an effective circle, others report a negative relationship between innovation and exports. Wakelin (1998), for example, shows that innovative firms in the UK are less likely to undertake exporting activities than non-innovative firms. Moreover, some studies report a statistically insignificant relationship between innovation and exports (e.g., Sterlacchini, 1999). For example, Lefebvre, Lefebvre, and Bourgault (1998) find that there is no association between innovation, measured as investment in R&D, and exporting; however, it can be the case that

this statistically insignificant relationship can be attributed to the fact that many SMEs might under-report their R&D measures and their innovation activities. Rodil, Vence, and Sánchez (2016) discover a positive relationship between innovation and exporting. In a more recent study, Azar and Ciabuschi (2017) find that, at the general level, adopting innovation is beneficial for export performance. The previous literature indicates that innovation is considered as a growth strategy for firms that seek to internationalise (e.g., Gunday, Ulusoy, Kilic, & Alpkan, 2011; Wang, Lu, & Chen, 2008).

Limited empirical research in the export literature considers the possible endogeneity of innovation with respect to exporting (Dohse & Niebuhr, 2018; Higón & Driffield, 2010). An example is the study by Lachenmaier and Wößmann (2006), which uses the instrumental variable approach to account for the possible endogeneity between exporting and innovation. Additionally, Nguyen et al. (2008) suggest that previous research that fails to take potential endogeneity into account may produce biased estimates of the association between innovation and exporting activity. To this end, Higón and Driffield (2010), using SME data from the UK, find larger estimated coefficients for goods innovation than the ones reported ignoring endogeneity. Based on the collective results of the described literature, we believe that innovation permits global growth for SMEs, and thus we hypothesise that:

H$_1$: Innovative SMEs have a higher likelihood of internationalisation than non-innovative SMEs.

2.2. *Innovation types and internationalisation*

Vernon's (1966, 1971, 1979) Product Life Cycle (PLC) theory suggests that firms' internationalisation process follows a product life cycle. Firms first introduce new products into their domestic market to acquire knowledge regarding their performance and thereafter sell their products across borders in the form of exporting. According to Lecerf (2012), when

firms have the ability to develop and launch new products or services or implement new processes through innovation, they will be superior to their competitors. Therefore, small firms that have the ability to produce new products/services or implement new ways of production will gain competitive advantages, which will enhance their internationalisation process. The more firms innovate, the larger their exporting activities will be (Lachenmaier & Wößmann, 2006). According to Paul et al. (2017), firms can gain competitive advantages from innovation when the foreign market needs a specific type of service or product innovation.

Following Chetty and Stangl (2010), among others (e.g., Chiva, Ghauri, & Alegre, 2014; De Massis, Frattini, Pizzurno, & Cassia, 2015; Higón & Driffield, 2010; OECD, 2005, p. 48), product innovation[1] is defined in this research as the introduction of improved goods or services, for example to increase sales or improve customer service. In this research, process innovation is defined as the introduction of new methods of production that aim to decrease costs, increase quality, or improve services (Chetty & Stangl, 2010; Chiva et al., 2014; Higón & Driffield, 2010; OECD, 2005, p. 49).

A few studies begin to examine the different effects of various types of innovation on exports; according to Dohse and Niebuhr (2018), the results are still rather inconclusive. For instance, Higón and Driffield (2010) distinguish between product and process innovation activities. Their results imply that product and process innovation have equal effects on SMEs' internationalisation. However, once they control for product innovation effects, their results indicate no significant additional effect for process innovation. Likewise, Becker and Egger (2013) find that product innovation plays a more critical role in promoting firms' exporting activities than process innovation. Product innovation is viewed as a significant contributor to the propensity to export. On the one hand, Nguyen et al. (2008) find that

---

[1] The term product innovation is used to cover both goods and service innovation (OECD, 1997, p. 31).

product, process, and product modification innovations are significant in the internationalisation of SMEs in Vietnam. However, on the other hand, Damijan, Kostevc, and Polanec (2010) conclude that there is no association between product or process innovation and export propensity.

According to Cassiman et al. (2010), when firms are engaged in new product innovation, their export propensity may increase, because innovation can drive exports. Hence, product innovation enables owner-managers to take internationalisation decisions (Cassiman & Golovko, 2011). Lim, Sharkey, and Heinrichs (2006) suggest that the ability of a firm to introduce new products is a condition for firms to be involved in exporting, which enables them to reach international markets through differentiated products. In addition, it is noted that firms may combine product and process innovations to gain more competitive advantages (Lewandowska et al., 2016). For example, Martínez-Ros and Labeaga (2009) argue that manufacturing firms introduce new products when a new technological process is applied. In addition, firms that introduce new processes are more likely to introduce new products. Others argue that SMEs tend to focus their efforts more on product innovation than on process innovation to increase their profits and grow (e.g., Wolff & Pett, 2000). Product innovation is unquestionably the main determinant of the establishment of new firms (Drucker, 2014; Pedeliento, Bettinellim, Andreini, & Bergamaschi, 2018). However, it is argued that innovation should also be pursued beyond the product or the process itself, as described in the next paragraph.

Some researchers claim that process innovation that is based on new technological advancements is generally used to enhance product innovation (e.g., Martínez-Ros, 1999; Martínez-Ros & Labeaga, 2009; Lewandowska et al., 2016; Van Beers & Zand, 2014). Studies that take into account these complementarities between product and process innovation provide a useful insight but not a consistent picture. Di Maria and Ganau (2013),

for example, suggest that, although the propensity to export is influenced by new product innovation, the export intensity is influenced more by process innovation; moreover, the recent study by Lewandowska et al. (2016) shows that there is a strong relationship between firms that introduce a combination of product-process innovation and new product exporting. Given the diverse findings of the extant research, we believe that it is likely that different types of innovations might have different effects on or associations with the level of SME internationalisation. Hence, we hypothesise that:

H₂: The likelihood of SME internationalisation differs according to the type of innovation.

H₃: A combination of different types of innovation can have a stronger effect on the likelihood of SME internationalisation than a single type of innovation.

2.3.   *Degree of innovation novelty*

Innovations can be differentiated based on their degree of novelty: (i) radical innovation and (ii) incremental innovation (e.g., Chiva et al., 2014; Daft & Becker, 1978; Forés & Camisón, 2016; Foster, 1986; Kocak, Carsrud, & Oflazoglu, 2017; Pavitt, 1991; Sheng & Chien, 2016; Tellis, Prabhu, & Chandy, 2009). Generally, radical innovation is defined as advancements in knowledge because of the development of new products and processes that are new to the market/industry (e.g., Cosh & Hughes, 1998; Freel & Harrison, 2006; Love et al., 2016; Tether, 2002; Van Beers & Zand, 2014). Incremental innovation is defined as a continuous improvement to products, processes, or services that are new to the firm only (e.g., Freel & Harrison, 2006; Tidd, Pavitt, & Bessant, 2011; Van Beers & Zand, 2014). While Tellis et al. (2009) find that the commercialisation of radical innovations translates into financial performance across nations, Sheng and Chien (2016) find that, for entrepreneurial ventures, which relate more directly to the focus of the present research, superior capability in a particular area leads to a focus on incremental innovation. In addition, Forés and Camisón

(2016) find that the organisation size has a positive effect on incremental innovation performance but a negative non-significant effect on radical innovation performance. Given the combination of those findings, the specific relationship of SME innovation's novelty level and the extent of internationalisation needs further examination.

Regarding innovation novelty, the *Oslo manual* (OECD, 2005, p. 58) introduces a classification regarding a product's degree of novelty: novel product innovation occurs when a firm introduces for "the very first time a new or improved product." Even when products are not new globally, they could be new to the market in which the firm operates. This new to the market/industry innovation gives the firm a monopolistic power that is temporary, since new or improved products will not face immediate competition. On the other hand, incremental product innovation occurs when a firm implements a new or improved product or process that is new to the firm itself but has already been implemented in other firms. See also Blind, Petersen, and Riilloc (2017), Love et al. (2016), and Van Beers and Zand (2014).

Adopting radical innovation will improve a firm's competitive position by offering novel qualities and distinctive benefits for its customers. This in turn will result in increasing sales and an expanding market share (O'Connor & Rice, 2013; Sainio, Ritala, & Hurmelinna-Laukkanen, 2012; Tellis et al., 2009). While Bao et al. (2012) argue that radical innovation enhances firms' performance and reshapes their competitive advantages, a question might arise regarding the extent to which these relationships apply to SMEs.

The previous literature provides mixed results regarding the dominant type of innovation among SMEs. For instance, Oke et al. (2007) argue that the previous research shows that SMEs generally undertake radical innovation more than large firms and introduce new products that increase their growth and foster their performance. Radical innovation clearly produces competitive advantages in SMEs (Laforet, 2008). It is indicated that radical innovation is characterised by knowledge intensity and uncertainty. Hence, firms need to

adjust their strategies and make them more flexible in the development of this type of innovation. Simon, Elango, Houghton, and Savelli (2002) argue that SMEs tend to focus more on radical innovation than on incremental innovation, because this type of innovation generates high revenue for firms, which will enhance their performance.

In contrast, Oke et al. (2007) show that SMEs with "an ambitious to grow" tend to place more focus on incremental innovation than on radical innovation. Likewise, Martínez-Román and Romero (2013) imply that, since most small firms are engaged in a softer type of innovation than innovation based on R&D, small firms often introduce innovation that is incremental in nature rather than radical. Hence, these types of firms generally undertake small adjustments to their products or processes, which in some cases are only considered as an innovation to the firm itself. However, it can be argued that these types of innovations help small firms to compete in the marketplace and gain access to new international markets. Moreover, small firms have the ability to undertake radical innovation in their products, in some cases based on a new technology. Moreover, Tödtling and Kaufmann (2001) argue that incremental innovation is prevalent in small firms due to their limited resources. This type of innovation could be an important factor in fostering firms' growth in their own markets.

According to Forés and Camisón (2016), a firm's survival and generation of economic benefits can be explained by its ability to introduce both radical and incremental innovation. Previous empirical studies examine the relationship between these types of innovation and exporting. For instance, Love et al.'s (2016, p. 816) recent study shows that innovation positively affects SMEs' exporting, whereby radical innovation is more associated with "inter-regional" exports and incremental innovation is more related to "intra-regional" exporting. Their results suggest that incremental product innovation helps SMEs to export more nationally in their home region while radical product innovation helps them to export internationally. They suggest that this can be explained by the fact that novel innovation can

assist firms in overcoming the "liability of foreignness." According to Azar and Ciabuschi (2017), firms can increase their competitive advantages by developing radical innovation and by offering novel products to their customers. These, in turn, can affect their profitability, market share, and open foreign market opportunities. Zhou and Li (2012, p. 1090) suggest that "radical innovation reshapes the competitive landscape and creates new market opportunities." On the other hand, Chetty and Stangl (2010) propose that firms that introduce radical innovation are more likely to internationalise faster than firms that introduce incremental innovation.

A review of the extant literature reveals that radical and incremental innovations are considered as an important factor that fosters SMEs' internationalisation. However, the previous literature does not empirically test whether a combination of radical innovation and incremental innovation can have a stronger effect on SMEs' internationalisation. According to Khazanchi, Lewis, and Boyer (2007), process innovation often involves the creation of products or services that are new to the market. Firms often undertake "systems and reengineering activities to develop new products" (Oke et al., 2007, p. 738). For instance, to support the production of new radical or incremental products, firms' technologies and process should be modified, updated, or even replaced. We argue that a combination of radical and incremental innovation can have stronger effects on SMEs' internationalisation than undertaking a single radical innovation. Thus, we hypothesise that:

H_4: SMEs that introduce radical product/process innovation have a higher likelihood of internationalisation than SMEs that introduce incremental product/process innovation.

H_5: Combining radical and incremental innovation can have a stronger effect on the likelihood of SME internationalisation than a single radical innovation.

A summary of the hypotheses examined in this research is presented in Table 1.[2]

<< Insert Table 1 about here >>

3. Empirical analysis

3.1. Data and sample

We obtained data on 12,823 SMEs (out of approximately 15,500 contacted) from the 2015 UK Longitudinal Small Business Survey's first wave (Department for Business, Innovation and Skills (BIS), 2016a) - the most recent available survey of SME owner-managers in the United Kingdom. The telephone-based survey sample was constructed using a stratified sample of owner-managers of firms with up to 249 employees across the 4 nations in the UK: England, Scotland, Wales, and Northern Ireland. The stratified survey sample targets were set according to the size of the firm and, within these groups, according to the sector (SIC, 2007). In addition, for registered businesses with between 0 and 4 employees, an additional stratum was set based on the legal status of the firm. Detailed information regarding the survey methods, response rate, and instruments can be found in the Small Business Survey report (Department for Business, Innovation and Skills (BIS), 2016b). As discussed in BIS (2016a), the sample is sufficiently large to allow reporting on the findings with a high degree of statistical reliability.

Overall, the survey provides a wide range of information regarding firms' characteristics, such as the size of the firm (including firms with zero employees), legal status, sector, age of the firm, ownership of the firm, and perceived obstacles to achieving the firm's objectives. Regarding the key variables used in this study - exporting and innovation - the survey provides data on whether a firm exports goods and/or services outside the UK and whether a

---

[2] We thank one of the anonymous reviewers for the suggestion to insert a summary hypothesis table.

firm has introduced a significantly new or improved goods, service, or process innovation. Therefore, the survey provides rich information from a large representative sample of UK firms (Department for Business, Innovation and Skills (BIS), 2016a, 2016b) that allows us to explore empirically the relationship between innovation and internationalisation.

3.2. Measurements

3.2.1. Dependent variable: Export propensity

In this study, similar to prior research, "export propensity" is the operationalisation of internationalisation (Boehe, 2013; Ganotakis & Love, 2012; Higón & Driffield, 2010; Idris & Saridakis, 2018; Nguyen et al., 2008). Export propensity is defined as whether a firm exports to a foreign market (Serra et al., 2012, p. 2016). The scale used to measure export propensity in the survey asks SME owner-managers: *"In the past 12 months, did your business export any goods and/or services outside the UK?"* The scale uses a binary format, taking the value of one if the firm sells outside the UK and zero if not. We note that 23 per cent of SMEs indicated that they do export. Most of the exporters are medium-sized firms (32 per cent) followed by small firms (27 per cent). Only a small proportion of micro firms, however, are found to export (17 per cent).[3] We test whether the differences in proportions are statistically significantly different from each other. The results show that, for micro, small, and medium-sized firms, the differences in proportions are statistically significantly different from each other.

---

[3] In this research, micro firms are defined as those firms with 0 to 9 employees, small firms are those with 10 to 49 employees, and medium-sized firms are those with 50 to 249 employees.

3.2.2. Independent variables: Types of innovation and degree of novelty

Type of innovation. Consistent with the related prior studies, innovation is measured here as the introduction of new goods, services, and processes as a proxy for a firm's innovation activities (Higón, 2011; Higón & Driffield, 2010; Nguyen et al., 2008; Rogers, 2004; Tether, 2002; Van Beers & Zand, 2014). The survey posed questions on each of the three forms, as described below.

"Goods innovation"[4] is measured through the dichotomous scale question: *"Has your business introduced any new or significantly improved goods in the last three years?"* Answers take the value of one if the firm has introduced goods innovation or zero otherwise. Regarding the descriptive statistics, we note that variance exists in the sample: 22 per cent of the sample SMEs in the UK have introduced goods innovation during the past three years. In more detail, about 25 per cent of small firms have introduced new goods in the last three years, followed by medium-sized firms (24 per cent) and micro firms (20 per cent, including firms with zero employees). We also test whether these differences are statistically significant. The results show that the difference between small and medium-sized firms is not statistically significant (prob. = 0.351).

"Service innovation"[4] is measured through the dichotomous scale question: *"Has your business introduced any new or significantly improved services in the last three years?"* Answers take the value of one if the firm has introduced service innovation or zero otherwise. We again note that variation exists in the sample: 36 per cent of the sample SMEs in the UK have introduced service innovation during the past three years. Disaggregating by firm size, we find that 41 per cent of medium-sized firms in the UK have introduced service innovation in the past three years, followed by 39 per cent of small firms and 33 per cent of

---

[4] Goods and service innovation are referred to as product innovation by the OECD (1997, p. 31), which can be defined as the "introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses" (OECD, 2005, p. 48).

micro firms. We test whether these differences are statistically significant different from each other; the results show that the difference in proportions for all firms are statistically different from each other.

"Processes innovation"[5] is measured through the dichotomous scale question: *"Has your business introduced any new or significantly improved processes for producing or supplying goods or services in the last three years?"* Answers take the value of one if the firm has introduced process innovation or zero otherwise. The data related to process innovation show that medium-sized firms recorded the highest percentage, 37 per cent, followed by small and micro firms (32 per cent and 21 per cent, respectively). We test whether these differences are statistically significant different from each other, and the results show that the difference in proportions for all firms are statistically different from each other.

Degree of novelty of innovation. Consistent with the interest in differentiating between radical and incremental innovations (e.g., Blind et al., 2017; Love et al., 2016; Van Beers & Zand, 2014), the survey measures the degree of novelty of innovation by asking owner-managers the following question: *"Were any of these new or significantly improved goods/services/process innovations new to the market, or were they just new to your business?"* We create an index variable to capture whether the innovation was radical, incremental, or not innovative. Two index variables are created to indicate the degree of novelty for product innovation (i.e., goods/service) and the degree of novelty for process innovation. The survey here does not distinguish between goods and service innovation; therefore, we follow the OECD (1997, p. 31) in its reference to goods/service innovation as product innovation. The data show that 6 per cent of SMEs in the UK have introduced novel process innovation in the last three years. We check whether the differences are statistically

---

[5] Process innovation can be defined as "the implementation of a new or significantly improved production or delivery method" (OECD, 2005, p. 49).

significant, the results showing that all the coefficients are statistically significantly different from each other. As regards the descriptive statistics, 17 per cent of medium-sized firms introduced radical product innovation that was new to the market, while 13 per cent of micro firms' product innovation was also new to the market. We test whether these differences are statistically significantly different from each other, and the results show that incremental product innovation is not statistically significantly different between small and medium-sized firms (prob. = 0.552).

3.2.3. Control variables

We control for several variables that affect SMEs' internationalisation according to the previous studies. First, we control for the size of the firm - measured by the natural logarithm of the number of employees - as previous empirical studies find a positive relationship between exporting and firm size (Roper & Love, 2002). Second, we control for the age of the firm - measured by the number of years for which the business has been in operation. Mixed results are reported by previous studies regarding the effect of firms' age on their internationalisation. For instance, Baldwin and Rafiquzzaman (1998) report a positive relationship between exporting and firms' age, while Higón and Driffield (2010) find a negative relationship between firms' age and exporting. Their results imply that firms that have been trading for less than four years are 16 per cent less likely to export.

Third, we control for the number of sites on which the firm operates. As suggested by Roper and Love (2002), firms with more than one site are more likely to export, since multiple sites can enable firms to overcome their limited resources, which are required for exporting. Fourth, we also control for the legal status of the firm, since it is found in previous studies to affect business decisions such as internationalisation (Higón & Driffield, 2010). Fifth, we control for firms' productivity, which previous studies show to affect firms'

internationalisation, and we follow Love et al. (2016) in controlling for productivity as measured by firms' turnover reported in bands.

Seventh, we control for the surrounding business environment - captured by the competition in the marketplace and obstacles to obtaining finance. The previous research finds that firms' exporting behaviour might be affected by the conditions in the domestic markets. For instance, Rammer and Schmiele (2009) find that competition in the domestic market is considered as one of the obstacles to firms' internationalisation process. Eighth, the model considers ICT use, which is also found to be an important identifying variable in terms of impacts on innovation (Higón & Driffield, 2010). Ninth, following Kingsley and Malecki (2004) and Rogers (2004), we control for whether the business has sought external advice/information. Tenth, we control for whether the firm is a family business. Last, we include sectoral and regional dummies.

More details on the variables' definition and measurements used in this study can be found in Table A1 in the Appendix. Table A2 in the Appendix contains the corresponding descriptive statistics and Table A3 contains the corresponding correlation matrix. Given the usage of single-item measurement of variables in the probit regression models, the composite reliability is 1.0 and the convergent reliability (average variance extracted) is also 1.0. Confirmatory factor analysis of the substantive variable items demonstrates discriminant validity. We attempt both to minimise the common method variance (CMV) up front and examine the potential for it afterwards following the guidelines of Hulland, Baumgartner and Smith (2018) and Podsakoff, MacKenzie, Lee and Podsakoff (2003, 2012). Research design elements that reduce the CMV were included, and statistical design elements to identify potential CM (i.e., Harmon's single-factor test) do not produce evidence of CMV.

3.3.   Methods and results

We conduct probit regression to examine the potential relationships between export propensity and innovation. Since the variable that we want to examine takes only two possible values (i.e., 1 if the firm exports and 0 otherwise), probit is an appropriate econometric technique that deals with problems associated with the linear probability model (for a discussion, please see Gujarati, 1995, pp. 552–570).[6] First, a latent variable that represents the propensity of a firm to export goods and/or services is defined (E_j^*). We cannot observe (E_j^*), but we can observe whether firm *j* exports through the following measurement equation:

$$E_j = \begin{cases} 0 & \text{if} \quad E_j^* \leq 0 \\ 1 & \text{if} \quad E_j^* > 0 \end{cases} \tag{1}$$

$$E_j^* = X_j b_j + I_j \delta + e_j \, , \ \ e \sim N(0, \sigma^2) \tag{2}$$

where *I* is the indicator variable for whether the firm has introduced innovation (goods/service and process). *X* is the vector of firm characteristics for firm *j*. *b* and δ are the parameters to be estimated. The model is estimated by the maximum likelihood technique (Stock & Watson, 2012), and Table 2 shows the association between innovation and export propensity, while Table 3 presents the association between the degree of novelty and export propensity. In both tables, we report marginal effects (ME) at the sample mean values of the regressors.

---

[6] As a robustness check following a different modelling approach, we use the logit model. The logit model is another commonly used model whenever the dependent variable is binary. More specifically, logit uses the cumulative standard logistic distribution, whereas probit uses the cumulative standard distribution. However, the results from the logit analysis are similar to those reported from the probit model and therefore are not reported here.

In Table 2, we find that firms that introduced goods, service, or process innovation have a higher likelihood of exporting outside their home country. The results show that being an innovative SME increases the likelihood of internationalisation by 8.6 percentage points compared with being a non-innovative SME. To address the potential endogeneity between exporting and innovation, we also estimate the average treatment effect on the treated (ATT) by using the nearest-neighbour estimator. The results suggest that, for innovative firms, innovation causes the probability of exporting to be 15.4 percentage points higher than it would have been otherwise. The results show that innovation is positively and significantly related to SMEs' internationalisation, supporting *H1*, which states that innovative SMEs have a higher likelihood of internationalisation than non-innovative SMEs.

Moreover, when differentiating between different types of innovation, the results show that the coefficients of goods, service, and process innovations are all positive and statistically significant in the internationalisation equation. In models (2)-(4) in Table 2, we include one of the types of innovation at a time. Specifically, we find that goods innovation introduced by SMEs increases their probability of exporting by 12 percentage points compared with SMEs that have not introduced goods innovation in the last 3 years. We also find that both service and process innovation increase the likelihood of internationalisation but that the magnitude of the effect is nearly half that of goods innovation.

According to the results, goods innovation has a stronger effect on SMEs' internationalisation than service and process innovation. Similarly, when all three types of innovation are included in the model simultaneously, we still find that goods innovation has a stronger association with internationalisation (see model 5, Table 2). In this model, the service innovation coefficient loses its statistical significance, and the coefficient of process innovation decreases significantly in magnitude. Overall, the results support *H2*, which states that the likelihood of SME internationalisation differs according to the type of innovation.

In model (6), Table 2, we examine the association of combining different types of innovation and SMEs' internationalisation. The results suggest that SMEs that introduce a combination of goods and process innovation and service and process innovation are 2.6 per cent and 7.9 per cent more likely to export than non-innovative SMEs, respectively. The results also show that SMEs that introduce a combination of goods and service innovation are 9.8 per cent more likely to export than non-innovative SMEs. Moreover, the results show that introducing all three types of innovation (i.e., goods, service, and process) increases SMEs' likelihood of internationalisation by 15.3 per cent. The MEs of these combined innovation measures are generally higher than those from a single type of innovation, with the exception of goods innovation only. Using the Wald test (see Judge, Griffiths, Hill, Lütkepohl, & Lee, 1985), we test whether these coefficients are statistically different from each other; the results show that the coefficients of goods innovation and all types of innovation ($x^2(1) = 1.90$, prob. $= 0.167$), service, and process innovation ($x^2(1) = 1.19$, prob. $= 0.275$) are not different from each other. Similarly, the coefficients of the combined goods and service innovation and the combined service and process innovation are not different from each other ($x^2(1) = 0.80$, prob. $= 0.371$). Overall, the results tend to support *H3*, which proposes that introducing a combination of innovation types has a stronger effect on internationalisation. We also estimate a model that allows multiple nominal-level treatments; the results are consistent with the results presented in model 6 of Table 2. However, the coefficients are found to be smaller in magnitude, with the coefficient of service innovation halved and becoming statistically significant at the 10 per cent level.

We also examine the association of combining different types of innovation and SMEs' internationalisation compared with introducing process innovation by restricting the sample to innovative SMEs (see model 7, Table 2). The results show that innovative SMEs that introduce a combination of goods and process innovation and goods and service innovation

are 25.5 per cent and 7.5 per cent more likely to export than innovative SMEs that undertake only process innovation, respectively. The results also show that introducing all types of innovation (i.e., goods, service, and process) or introducing goods innovation alone is strongly associated with SMEs' internationalisation compared with introducing process innovation (14 per cent and 18 per cent, respectively). We test whether these coefficients are statistically significantly different from each other; the results from the Wald test show that the coefficients of goods innovation and all types of innovation are not statistically significantly different from each other ($x^2(1) = 2.68$, prob. $= 0.101$). Likewise, the coefficients of the combined products and service innovation and the combined service and process innovation are not different from each other ($x^2(1) = 1.25$, prob. $= 0.263$).

<< Insert Table 2 about here >>

Table 3 presents the association between the degree of novelty of innovation and the export propensity. Specifically, the results show that introducing radical product (i.e., goods/service) innovation increases SMEs' export propensity by 18 per cent compared with SMEs that did not introduce product innovation. In addition, the results show that incremental product innovation that is new to the business only increases SMEs' internationalisation by 6.5 per cent. Similar conclusions can be obtained for radical process and incremental process innovation (13 per cent and 4.3 per cent, respectively) (model 2, Table 3). Similarly, when all four types of the degree of novelty of innovation are included in the model simultaneously (model 3, Table 3), we still find that radical product innovation has the stronger association with internationalisation (see model 3). Hence, *H4*, which implies that there is a positive and significant relationship between radical innovation and SMEs' internationalisation, is supported. In model (3, Table 3), we also test if these variables are statistically significantly different from each other using the Wald test. The results show that

incremental product and radical process innovation are not statistically different from each other ($x^2(1) = 0.27$, prob. $= 0.600$).

We also test for the association of the combination between radical innovation and incremental innovation on SMEs' internationalisation. The results in Table 3, in model (4), show that SMEs that introduce radical innovation are 24 per cent more likely to export than non-innovative SMEs. In addition, the results imply that SMEs that introduce a combination of radical product and incremental process innovation are 19.6 per cent more likely to export than non-innovative SMEs. In addition, SMEs that introduce only radical product innovation are 17.3 per cent more likely to export than non-innovative SMEs. When radical and incremental innovations are combined, the magnitude of the ME varies from 0.113 to 0.196. The magnitudes of these effects are found to be large but generally do not suggest that combining radical and incremental innovation has a stronger effect on internationalisation than introducing radical innovation only. We carry out a test of equality of the degree of novelty coefficients. The results from the Wald test suggest that the coefficients of radical innovation and the combined radical product and incremental process innovations are not statistically significantly different from each other ($x^2(1) = 1.35$, prob. $= 0.244$). Hence, *H5* is rejected.

Moreover, when restricting the sample to only innovative SMEs (model 5, Table 3), the results show that SMEs that introduced radical innovation are 14 per cent more likely to export than those that introduced only incremental innovation. Similar results are obtained for combining radical product and incremental process innovation (10.4 per cent). The results also show that, compared with incremental innovation, introducing radical product innovation increases SMEs' likelihood of internationalisation by 8.4 per cent. We also perform the Wald test on the equality of these coefficients. The results show that the coefficients of radical innovation and the combined radical product and incremental process innovations are not

statistically significantly different from each other ($x^2(1) = 1.32$, prob. $= 2.50$). Moreover, we find that the coefficients of the combined radical product and incremental process innovation and radical goods/service innovation are not statistically significantly different from each other ($x^2(1) = 0.41$, prob. $= 0.524$). The multiple nominal-level treatment model also supports the findings reported in model 5 of Table 3.

<< Insert Table 3 about here >>

4. Discussion, limitations, and implications

This article contributes important insights into (1) the individual role of goods, service, and process innovations on SMEs internationalisation and (2) the relationship between the degree of novelty of innovation and SMEs internationalisation. In detail, this research compares the internationalisation of SMEs focused on a singular source of innovation (of goods, services, or process innovations) with SMEs that combine together two or three different types of innovation and degrees of novelty of innovation. The empirical analysis of 12,823 SMEs in the UK shows that while innovative SMEs are more likely to internationalise (i.e., export) than non-innovative SMEs, the association between innovation and internationalisation differs according to the type of innovation introduced and the degree of novelty of innovation. In this section, we discuss the contribution of the finding to the literature, limitations, policy implications, and directions for future research.

Our findings contribute to the existing IB literature (e.g., Cassiman & Golovko, 2011; Castaño et al., 2016; Di Maria & Ganau, 2013; Golovko & Valentini, 2011; Hagen et al., 2014; Higón & Driffield, 2010; Lewandowska et al., 2016; Love et al., 2016) and small business literature (e.g., De Massis, Audretsch, Uhlaner, & Kammerlander, 2018; Higón & Driffield, 2010; Lachenmaier & Wößmann, 2006) regarding the role of innovation in SMEs'

internationalisation. Most of the literature, as noted earlier (e.g., Golovko & Valentini, 2011; Higón & Driffield, 2010; Roper & Love, 2002; Xie & Li, 2013), suggests a positive association between innovation and internationalisation. However, the previous literature fails to recognise the effect of each type of innovation on SMEs' internationalisation (Azar & Ciabuschi, 2017). Using data from the first wave of the UKLSBS (2015), this article extends the current literature by providing empirical evidence regarding the role of each type of innovation undertaken by SMEs in their exporting. In addition, this research takes into consideration the effect of combining different types of innovation on internationalisation. This article also adds to the previous literature by providing empirical evidence regarding the role of radical innovation in SMEs' internationalisation. In sum, the first objective of this research was to provide new empirical evidence regarding the role of goods, service, and process innovation in SMEs' exporting. The study exceeded this objective by examining the combined effect of these types of innovation on firms' export propensity. The second objective was to provide empirical evidence on the association between innovations' degree of novelty and SMEs' internationalisation. Similarly, it examined the combined effects of different degrees of novelty of innovation and compared the findings with their individual effects.

Consistent with the previous literature (e.g., Cassiman & Golovko, 2011; Harris & Li, 2009; Higón & Driffield, 2010; Roper & Love, 2002), the results show that innovative SMEs are more likely to export than non-innovative SMEs. In addition, the findings reveal that goods innovation is more strongly associated with the propensity to export than service innovation or process innovation. When differentiating between different degrees of novelty, the results show that SMEs that introduce radical innovation that is new to the market/industry are more likely to export than non-innovative SMEs. Moreover, the results show that combining radical and incremental innovation increases the likelihood of SMEs

26

exporting. In addition, the results suggest that SMEs that introduce incremental innovation are more likely to export than non-innovative SMEs; however, the magnitudes of the effects of radical innovation and the combined radical and incremental innovation are larger than that of incremental innovation alone.

4.1. Limitations

A limitation of this study is that the data are self-reported and thus potential inflation bias may be problematic, as firms may misinterpret what innovation or a new product or process is. While there do not appear to have been significant issues in overestimating innovation in the sample, the design of future innovation surveys should also include objective measures whereby any potential differences between subjective and objective measures can be investigated and controlled for in the model. Furthermore, the analysis did not distinguish among the constituent countries of the United Kingdom. Future research might focus on each constituent individually, namely England, Scotland, Wales, and Northern Ireland. This would be in line with Janger, Schubert, Andries, Rammer, and Hoskens (2017), who proposed the measurement of innovation on the country level. Future research could also be of a comparative nature, contrasting the situation in England, Scotland, Wales, and Northern Ireland. It might also compare innovation in the British Isles with that in Germany - globally recognised for innovation (De Massis et al., 2018) - and elsewhere on the European continent and beyond.

Future research might also investigate the impact of human capital on innovation and determine whether a primary motivation to innovate is the desire to internationalise - perhaps adapting concepts from Huggins, Prokop, and Thompson (2017), who examine human capital and growth motivation - or it might focus on the impact of marketing innovation (see Gupta,

Malhotra, Czinkota, & Foroudi, 2016; Windahl, 2017) on internationalisation. Finally, future research might contribute to a capability theory, as pioneered by Teece (2017).

4.2.   Managerial, policy, and theoretical implications

The results have clear implications for owner-managers of small firms and decision making. For example, goods innovation can be viewed as an enabler and facilitator of internationalisation. In addition, by introducing a combination of different types of innovation rather than most single types of innovation, owner-managers can improve the likelihood of internationalisation. However, if owner-managers introduce a single type of innovation strategy, then goods innovation is likely to be more strongly associated with internationalisation. Moreover, the findings show the importance of introducing radical innovation that is new to the market for internationalisation.

Furthermore, the findings translate into important policy implications. Given that we find innovative SMEs to be more likely to export than non-innovative SMEs, it can be argued that innovations are in the national interest in that they contribute to a country's balance of payments. However, it is important to note that not all innovation is equal. The findings indicate that goods innovation is more strongly associated with the propensity to export than other types of innovation, such as process innovation or service innovation. In this case, governments should be lobbied to promote goods innovation rather than all innovation. It is also valuable to know that SMEs that introduce radical innovation are more likely to export than non-innovative SMEs. Given this finding, the government policy should not be spending to promote product innovation across the board. Rather, a better use of public funds would be to focus on encouraging radical innovation.

Moreover, considering that combining radical and incremental innovation increases the likelihood of SMEs exporting and that the magnitudes of the effects of radical innovation and

combined radical and incremental innovation are higher than that of incremental innovation alone, the public policy might consider match making firms with complementary skills. Synergy may yield better results.

Finally, in terms of theory, the results imply that future research should not limit its examination and investigation to a single type of innovation (e.g., Alegre, Pla-Barber, Chiva, & Villar, 2012; Cassiman & Golovko, 2011; D'Angelo, Majocchi, Zucchella, & Buck, 2013, for product innovation; and Golovko & Valentini, 2011; Monreal-Pérez, Aragón-Sánchez, & Sánchez-Marín, 2012, for process innovation). However, information on different types of innovation and their effect on SMEs will yield different results. Scholars and researchers should recognise the potential effect of each type of innovation and its degree of novelty (i.e., goods, service, and process) when measuring innovation.

References

Alegre, J., Pla-Barber, J., Chiva, R., & Villar, C. (2012). Organisational learning capability, product innovation performance and export intensity. *Technology Analysis and Strategic Management*, *24*(5), 511–526.

Autio, E., Sapienza, H. J., & Almeida, J. G. (2000). Effects of age at entry, knowledge intensity, and imitability on international growth. *Academy of Management Journal*, *43*(5), 909–924.

Azar, G., & Ciabuschi, F. (2017). Organizational innovation, technological innovation, and export performance: The effect of innovation radicalness and extensiveness. *International Business Review*, *26*, 324–336.

Baldwin, J. R., & Rafiquzzaman, M. (1998). The effect of technology and trade on wage differentials between non-production and production workers in Canadian manufacturing. Research Paper No. 98. Ottawa, Ontario: Analytical Studies Branch, Statistics Canada.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17*, 99–120.

Bao, Y., Chen, X., & Zhou, K. Z. (2012). External learning, market dynamics, and radical innovation: Evidence from China's high-tech firms. *Journal of Business Research*, *65*, 1226–1233.

Becker, S. O., & Egger, P. H. (2013). Endogenous product versus process innovation and a firm's propensity to export. *Empirical Economics*, *44*(1), 329–354.

Blind, K., Petersen, S. S., & Riilloc, C. A. F. (2017). The impact of standards and regulation on innovation in uncertain markets. *Research Policy*, *46*, 249–264.

Boehe, D. (2013). Collaborate at home to win abroad: How does access to local network resources influence export behaviour? *Journal of Small Business Management*, *51*(2), 167–182.

Calof, J. L., & Beamish, P. W. (1995). Adapting to foreign markets: Explaining internationalization. *International Business Review*, *4*(2), 115–131.

Cassiman, B., & Golovko, E. (2011). Innovation and internationalization through exports. *Journal of International Business Studies*, *42*, 56–75.

Cassiman, B., Golovko, E., & Martínez-Ros, E. (2010). Innovation, export and productivity. *International Journal of Industrial Organization*, *28*(4), 372–376.

Cassiman, B., & Martínez-Ros, E. (2004). Innovation and exports: Evidence from Spanish manufacturing. Mimeo, IESE Business School, SPSP Research Center.

Castaño, M.-S., Méndez, M.-T., & Galindo, M.-A. (2016). Innovation, internationalization and business-growth expectations among entrepreneurs in the service sector. *Journal of Business Research*, *69*, 1690–1695.

Chetty, S. K., & Stangl, L. M. (2010). Internationalization and innovation in a network relationship context. *European Journal of Marketing*, *44*(11/12), 1725–1743.

Chiva, R., Ghauri, P., & Alegre, J. (2014). Organizational learning, innovation and internationalization: A complex system model. *British Academy of Management*, *25*, 687–705.

Cosh, A. D., & Hughes, A. (1998). *Enterprise Britain: Growth, innovation and public policy in the small and medium sized enterprise sector 1994–1997*. Cambridge: University of Cambridge ESRC Centre for Business Research.

Daft, R. L., & Becker, S. W. (1978). *Innovation in organizations: Innovation adoption in school organization*. New York: Elsevier.

Damanpour, F., & Aravind, D. (2011). Managerial innovation: Conceptions, processes, and antecedents. *Management and Organization Review*, *8*, 423–454.

Damijan, J., Kostevc, Č., & Polanec, S. (2010). From innovation to exporting or vice versa? The *World Economics*, *33*, 374–398.

D'Angelo, A., Majocchi, A., Zucchella, A., & Buck, T. (2013). Geographical pathways for SME internationalization: Insights from an Italian sample. *International Marketing Review*, *30*(2), 80–105.

De Massis, A., Audretsch, D., Uhlaner, L., & Kammerlander, N. (2018). Innovation with limited resources: Management lessons from the German Mittelstand. *The Journal of Product Innovation Management*, *35*(1), 125–146.

De Massis, A., Frattini, F., Pizzurno, E., & Cassia, L. (2015). Product innovation in family versus nonfamily firms: An exploratory analysis. *Journal of Small Business Management*, *53*(1), 1–36.

Department for Business, Innovation and Skills (BIS). (2016a). *Small business survey 2015: Businesses with employees*. BIS Research Paper, Number 289. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/522364/bis-16-227-sme-employer-report.pdf (Accessed 11 March 2017).

Department for Business, Innovation and Skills (BIS). (2016b). *Small business survey 2015: Technical appendix*. BIS Research Paper, Number 291. https://www.gov.uk/government/publications/small-business-survey-2015-businesses-with-employees (Accessed 20 August 2016).

Di Maria, E., & Ganau, R. (2013). *Driving firms' export propensity and export intensity: The role of experience, innovation and international marketing strategy*. Paper presented at the European International Business Academy (EIBA) 39th Annual Conference, Bremen, Germany.

Dohse, D., & Niebuhr, A. (2018). How different kinds of innovation affect exporting. *Economics Letters*, *163*, 182–185.

Drucker, P. (2014). *Innovation and entrepreneurship*. London and New York: Routledge.

Esteve-Pérez, S., & Rodríguez, D. (2013). The dynamic of exports and R&D in SMEs. *Small Business Economics*, *41*(1), 219–240.

Forés, B., & Camisón, C. (2016). Does incremental and radical innovation performance depend on different types of knowledge accumulation capabilities and organizational size? *Journal of Business Research*, *69*, 831–848.

Foster, R. N. (1986). *Innovation: The attacker's advantage*. New York: Summit Books.

Freel, M. S., & Harrison, R. T. (2006). Innovation and cooperation in the small firm sector: Evidence from 'Northern Britain'. *Regional Studies*, *40*(4), 289–305.

Ganotakis, P., & Love, J. H. (2012). Export propensity, export intensity and firm performance: The role of the entrepreneurial founding team. *Journal of International Business Studies*, *43*(8), 693–718.

García, R., & Calantone, R. (2002). A critical look at technological innovation typology and innovativeness terminology: A literature review. *The Journal of Product Innovation Management*, *19*(2), 110–132.

Geldres-Weiss, V. V., Uribe-Bórquez, C. T., Coudounaris, D. N., & Monreal-Pérez, J. (2016). Innovation and experiential knowledge in firm exports: Applying the initial U-model. *Journal of Business Research*, *69*, 5076–5081.

Golovko, E., & Valentini, G. (2011). Exploring the complementarity between innovation and export for SMEs growth. *Journal of International Business Studies*, *42*(3), 362–280.

Gujarati, D. N. (1995). *Basic econometrics* (3rd ed.). Singapore: McGraw-Hill International Editions.

Gunday, G., Ulusoy, G., Kilic, K., & Alpkan, L. (2011). Effects of innovation types on firm performance. *International Journal of Production Economics*, *133*, 662–676.

Gupta, S., Malhotra, N. K., Czinkota, M., & Foroudi, P. (2016). Marketing innovation: A consequence of competitiveness. *Journal of Business Research*, *69*(12), 5671–5681.

Hagen, B., Denicolai, S., & Zucchella, A. (2014). International entrepreneurship at the crossroads between innovation and internationalization. *Journal of International Entrepreneurship*, *12*, 111–114.

Harris, R. I. D., & Li, Q. C. (2009). Exporting, R&D, and absorptive capacity in UK establishments. *Oxford Economic Papers*, *61*, 74–103.

Higón, D. A. (2011). The impact of ICT on innovation activities: Evidence for UK SMEs. *International Small Business Journal*, *30*(6), 684–699.

Higón, D. A., & Driffield, N. (2010). Exporting and innovation performance: Analysis of the annual Small Business Survey in the UK. *International Small Business Journal*, *29*(1), 4–24.

Huggins, R., Prokop, D., & Thompson, P. (2017). Entrepreneurship and the determinants of firm survival within regions: Human capital, growth motivation and locational conditions. *Entrepreneurship & Regional Development*, *29*(3–4), 357–389.

Hulland, J., Baumgartner, H., & Smith, K. M. (2018). Marketing survey research best practices: evidence and recommendations from a review of JAMS articles. *Journal of the Academy of Marketing Science*, *46*(1), 92-108.

Idris, B., & Saridakis, G. (2018). Local formal interpersonal networks and SMEs internationalisation: Empirical evidence from the UK. *International Business Review*, *27*(3), 610–624.

Janger, J., Schubert, T., Andries, P., Rammer, C., & Hoskens, M. (2017). The EU 2020 innovation indicator: A step forward in measuring innovation outputs and outcomes? *Research Policy*, *46*(1), 30–42.

Johanson, J., & Vahlne, J.-E. (1977). The internationalization process of the firm – A model of knowledge development and increasing foreign market commitments. *Journal of International Business Studies*, *8*(1), 23–32.

Jones, M. V. (2001). First steps in internationalisation: Concepts and evidence from a sample of small high technology firms. *Journal of International Management*, *7*(3), 191–210.

Judge, G. G., Griffiths, W. E., Hill, C., Lütkepohl, H., & Lee, T.-C. (1985). *The theory and practice of econometrics* (2nd ed.). New York: John Wiley.

Khazanchi, S., Lewis, M. W., & Boyer, K. (2007). Innovation-supportive culture: The impact of organizational values on process innovation. *Journal of Operations Management*, *25*(4), 871–884.

Kingsley, G., & Malecki, E. J. (2004). Networking for competitiveness. *Small Business Economics*, *23*, 71–84.

Kleinknecht, A. (1987). Measuring R&D in small firms: How much are we missing? *Journal of Industrial Economics*, *36*, 253–256.

Kocak, A., Carsrud, A., & Oflazoglu, S. (2017). Market, entrepreneurial, and technology orientations: Impact on innovation and firm performance. *Management Decision*, *55*(2), 248–270.

Kyläheiko, K., Jantunen, A., Puumalainen, K., Saarenketo, S., & Tuppura, A. (2011). Innovation and internationalization as growth strategies: The role of technological capabilities and appropriability. *International Business Review*, *20*, 508–520.

Lachenmaier, S., & Wößmann, L. (2006). Does innovation cause exports? Evidence from exogenous innovation impulses and obstacles using German micro data. *Oxford Economic Papers*, *58*, 317–350.

Laforet, S. (2008). Size, strategic and market orientation affects on innovation. *Journal of Business Research*, *61*(7), 753–764.

Lecerf, M. A. (2012). Internationalization and innovation: The effects of a strategy mix on the economic performance of French SMEs. *International Business Research*, *5*(6), 2–13.

Lefebvre, E., Lefebvre, L. A., & Bourgault, M. (1998). R&D-related capabilities as determinants of export performance. *Small Business Economics*, *10*, 365–377.

Leonidou, L. C., Katsikeas, C. S., Palihawadana, D., & Spyropoulou, S. (2007). An analytical review of the factors stimulating smaller firms to export: Implications for policy makers. *International Marketing Review*, *24*(6), 735–770.

Lewandowska, M. S., Szymura-Tyc, M., & Gołębiowski, T. (2016). Innovation complementarity, cooperation partners, and new product export: Evidence from Poland. *Journal of Business Research*, *69*, 3673–3681.

Lim, J. S., Sharkey, T. W., & Heinrichs, J. H. (2006). Strategic impact of new product development on export involvement. *European Journal of Marketing*, *40*(1/2), 44–60.

Love, J. H., & Roper, S. (2015). SME innovation, exporting and growth: A review of existing evidence. *International Small Business Journal*, *33*(1), 28–48.

Love, J. H., Roper, S., & Zhou, Y. (2016). Experience, age and exporting performance in UK SMEs. *International Business Review*, *25*, 806–819.

Martínez-Román, J. A., & Romero, I. (2013). About the determinants of the degree of novelty in small businesses' product innovations. *International Entrepreneurship Management Journal*, *9*, 655–677.

Martínez-Ros, E. (1999). Explaining the decisions to carry out product and process innovations: The Spanish case. *Journal of High Technology Management Research*, *10*(2), 223–242.

Martínez-Ros, E., & Labeaga, J. (2009). Product and process innovation: Persistence and complementarities. *European Management Review*, *6*(1), 64–75.

Monreal-Pérez, J., Aragón-Sánchez, A., & Sánchez-Marín, G. (2012). A longitudinal study of the relationship between export activity and innovation in the Spanish firm: The moderating role of productivity. *International Business Review*, *21*(5), 862–877.

Nguyen, A. N., Pham, N. O., Nguyen, C. D., & Nguyen, N. D. (2008). Innovation and exports in Vietnam's SME sector. *The European Journal of Development Research*, *20*(2), 262–280.

O'Connor, G. C., & Rice, M. P. (2013). A comprehensive model of uncertainty associated with radical innovation. *Journal of Product Innovation Management*, *30*, 2–18.

Oke, A., Burke, G., & Myers, A. (2007). Innovation types and performance in growing UK SMEs. *International Journal of Operations & Production Management*, *27*(7), 735–753.

Onetti, A., Zucchella, A., Jones, M., & McDougall, P. (2010). Guest editor's introduction to the special issue: Entrepreneurship and strategic management in new technology based companies. *Journal of Management and Governance*, *16*(3), 333–336.

Organisation for Economic Co-operation and Development (OECD). (1997). *The measurement of scientific and technological activities. Proposed guidelines for collecting and interpreting technological data. Oslo manual.* Paris: Organisation for Economic Co-operation and Development.

Organisation for Economic Co-operation and Development (OECD). (2005). *The measurement of scientific and technological activities. Proposed guidelines for collecting and interpreting technological data. Oslo manual*. Paris: Organisation for Economic Co-operation and Development.

Paul, J., Parthasarathy, S., & Gupta, P. (2017). Exporting challenges of SMEs: A review and future research agenda. *Journal of World Business*, *52*, 327–342.

Pavitt, K. (1991). What makes basic research economically useful? *Research Policy*, *20*, 109–119.

Pla-Barber, J., & Alegre, J. (2007). Analysing the link between export intensity, innovation and firm size in a science-based industry. *International Business Review*, *16*(3), 275–293.

Pedeliento, G., Bettinellim, C., Andreini, D., & Bergamaschi, M. (2018). Consumer entrepreneurship and cultural innovation: The case of GinO12. *Journal of Business Research*, *92*, 431–442.

Penrose, E. T. (1959). *The theory of the growth of the firm.* New York: Wiley.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in Behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879–903.

Podsakoff, P.M., MacKenzie, S.B., & Podsakoff, N.P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual Review of Psychology*, *63*, 539–569.

Rammer, C., & Schmiele, A. (2009). Drivers and effects of internationalizing innovation by SMEs. *The Icfai University Journal of Knowledge Management*, *7*(2), 18–61.

Rodil, Ó., Vence, X., & Sánchez, M. C. (2016). The relationship between innovation and export behaviour: The case of Galician firms. *Technological Forecasting & Social Change*, *113*, 248–265.

Rodríguez, J. L., & Rodríguez, R. M. G. (2005). Technology and export behaviour: A resource based view approach. *International Business Review*, *14*, 539–557.

Rogers, M. (2004). Networks, firm size and innovation. *Small Business Economics*, *22*, 141–153.

Roper, S., & Love, J. H. (2002). Innovation and export performance: Evidence from UK and German manufacturing plants. *Research Policy*, *31*, 1087–1102.

Sainio, L. M., Ritala, P., & Hurmelinna-Laukkanen, P. (2012). Constituents of radical innovation – Exploring the role of strategic orientations and market uncertainty. *Technovation*, *32*, 591–599.

Schoonhoven, C. B., Eisenhardt, K. M., & Lymman, K. (1990). Speeding products to market: Waiting time to first product introduction in new firms. *Administrative Science Quarterly*, *35*(1), 177–207.

Serra, F., Pointon, J., & Abdou, H. (2012). Factors influencing the propensity to export: A study of UK and Portuguese textile firms. *International Business Review*, *21*, 210–224.

Sheng, M. L., & Chien, I. (2016). Rethinking organizational learning orientation on radical and incremental innovation in high-tech firms. *Journal of Business Research*, *69*, 2302–2308.

Simon, M., Elango, B., Houghton, S., & Savelli, S. (2002). The successful product pioneer: Maintaining commitment while adapting to change. *Journal of Small Business Management*, *40*(3), 187–203.

Sterlacchini, A. (1999). Do innovative activities matter to small firms in non-R&D-intensive industries? An application to export performance. *Research Policy*, *28*, 819–823.

Stock, H. J., & Watson, M. M. (2012). *Introduction to econometrics* (3rd ed.). Harlow, UK: Pearson Education.

Teece, D. J. (2017). A capability theory of the firm: An economics and (strategic) management perspective. *New Zealand Economic Papers*. DOI: 10.1080/00779954.2017.1371208.

Tellis, G. J., Prabhu, J. C., & Chandy, R. K. (2009). Radical innovation across nations: The preeminence of corporate culture. *Journal of Marketing*, *73*, 3–23.

Tether, B. S. (2002). Who co-operates for innovation, and why: An empirical analysis. *Research Policy*, *31*, 947–967.

Tidd, J. B. J., Pavitt, K., & Bessant, J. R. (2011). *Managing innovation: Integrating technological, market and organisational change*. London: Wiley.

Tödtling, F., & Kaufmann, A. (2001). The role of the region for innovation activities of SMEs. *European Urban and Regional Studies*, *8*(3), 203–215.

Van Beers, C., & Zand, F. (2014). R&D cooperation, partner diversity, and innovation performance: An empirical analysis. *Journal of Product Innovation Management*, *31*(2), 292–312.

Vernon, R. (1966). International investment and international trade in the product cycle. *The Quarterly Journal of Economics*, *80*(2), 190–207.

Vernon, R. (1971). Sovereignty at bay: The multinational spread of US enterprises. *TheInternational Executive*, *13*(4), 1–3.

Vernon, R. (1979). The product cycle hypothesis in a new international environment. *Oxford Bulletin of Economics and Statistics*, *41*(4), 255–267.

Wakelin, K. (1998). Innovation and export behavior at the firm level. *Research Policy*, *26*(7–8), 829–841.

Wang, C. H., Lu, I. Y., & Chen, C. B. (2008). Evaluating firm technological innovation capability under uncertainty. *Technovation*, *28*, 349–363.

Williams, A., & Shaw, G. (2011). Internationalization and innovation in tourism. *Annals of Tourism Research*, *38*(1), 27–51.

Windahl, C. (2017). Market sense-making in design practice: Exploring curiosity, creativity and courage. *Journal of Marketing Management*, *33*(3–4), 280–291.

Wolff, J. A., & Pett, T. L. (2000). Internationalization of small firms: An examination of export competitive patterns, firm size, and export performance. *Journal of Small Business Management*, *38*(2), 34–47.

Xie, Z., & Li, J. (2013). Internationalization and indigenous technological efforts of emerging economy firms: The effect of multiple knowledge sources. *Journal of International Management*, *19*(3), 247–259.

Zhou, K. Z., & Li, C. B. (2012). How knowledge affects radical innovation: Knowledge base, market knowledge acquisition, and internal knowledge sharing. *Strategic Management Journal*, *33*, 1090–1102.

Figure 1 The theorised model
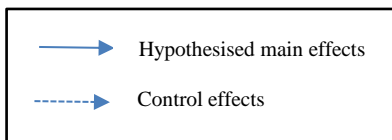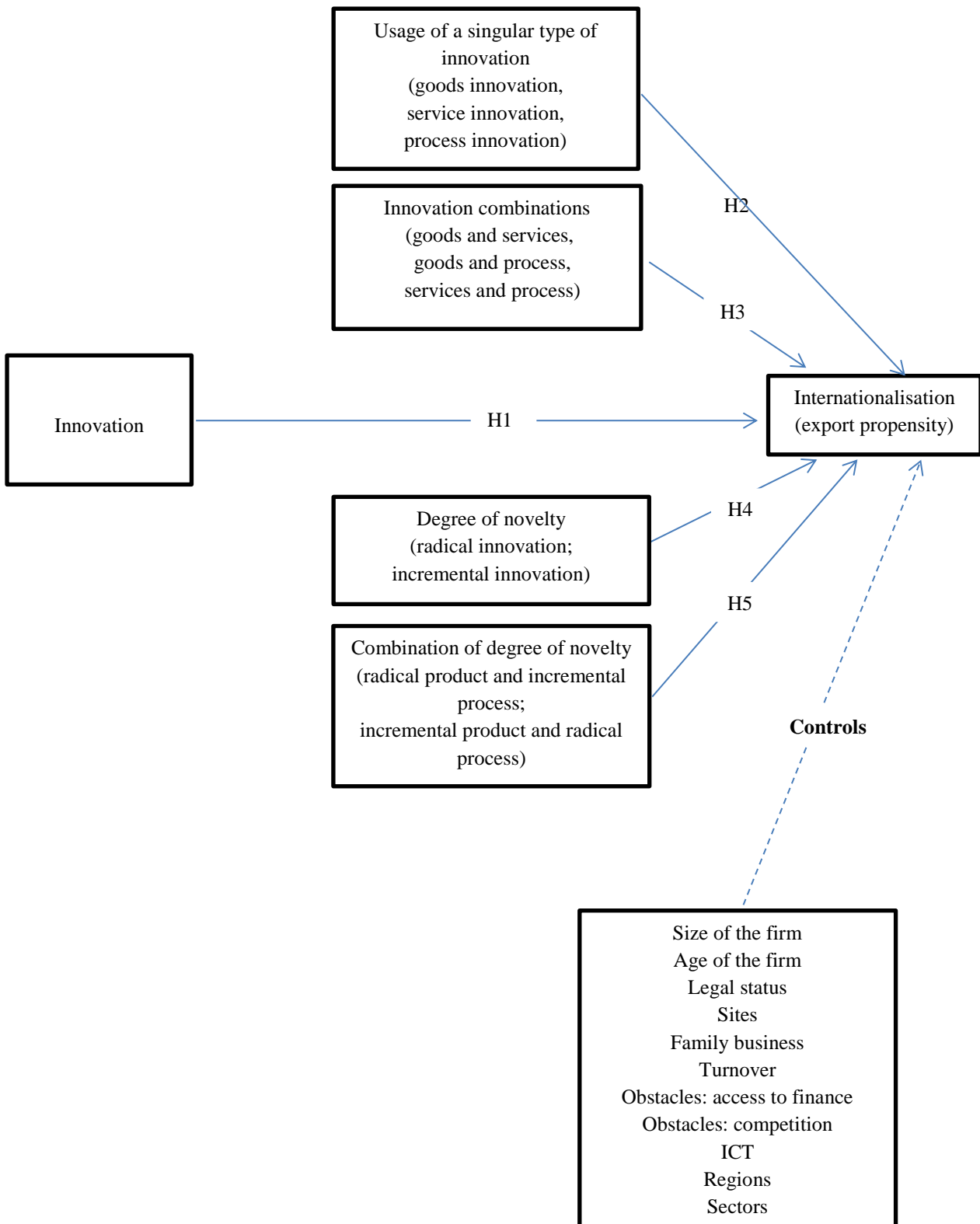
Table 1 Summary of the proposed hypotheses

H1	Innovative SMEs have a higher likelihood of internationalisation than non-innovative SMEs.
H2	The likelihood of SME internationalisation differs according to the type of innovation.
H3	A combination of different types of innovation has a stronger effect on the likelihood of SME internationalisation than the effect of a single type of innovation.
H4	SMEs that introduce radical product/process innovation have a higher likelihood of internationalisation than SMEs that introduce incremental product/service innovation.
H5	Combining radical and incremental innovation has a stronger effect on the likelihood of SME internationalisation than the effect of a single radical innovation.

Table 2 The association between innovation and export propensity – probit estimates

Sample	All Firms						
	1	2	3	4	5	6	7
Probit regression	ME	ME	ME	ME	ME	ME	ME
Innovation	0.086***						
	0.006						
Goods innovation		0.121***			0.105***		
		0.009			*0.010*		
Service innovation			0.053***		0.012		
			0.007		*0.007*		
Process innovation				0.061***	0.032***		
				0.008	*0.008*		
Innovation combination							
(Base category: no innovation)							
Goods innovation						0.189***	
						0.021	
Service innovation						0.049***	
						0.012	
Process innovation						0.030**	
						0.014	
Goods and service innovation						0.098***	
						0.018	
Goods and process innovation						0.026***	
						0.030	
Service and process innovation						0.079***	
						0.014	
All innovation						0.153***	
						0.016	
Innovative firms							
(Base category: process innovation)							
Goods innovation							0.181***
							0.028
Service innovation							0.015
							0.021
Goods and service innovation							0.075***
							0.026
Goods and process innovation							0.255***
							0.038
Service and process innovation							0.048**
							0.022
All innovation							0.135***
							0.024
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
log Likelihood	-5152.3014	-5132.5212	-5203.2066	-5198.5511	-5120.1371	-5097.828	-3011.0267
Chi 2 (degrees of freedom)	3405.49(44)	3445.05(44)	3303.68(44)	3312.99(44)	3469.82(46)	3514.44(50)	1897.24(49)
Obs.	12823	12823	12823	12823	12823	12823	6460

Notes: Marginal effects (ME) at the sample mean values of the regressors are reported. All models control for the variables mentioned previously (the results are available on request).
As a robustness check, we use the logit model. The results are similar and available on request. Values in *italics* are standard errors. *** $p < 0.01$, ** $p < 0.05$.

Table 3 The association between the degree of novelty and the export propensity – probit estimates

Sample	All Firms				
	(1)	(2)	(3)	(4)	(5)
probit regression	ME	ME	ME	ME	ME
Degree of novelty					
(Base category: no innovation)					
Radical product	0.180***		0.162***		
	0.013		*0.014*		
Incremental product	0.065***		0.057***		
	0.008		*0.008*		
Degree of novelty					
(Base category: no innovation)					
Radical process		0.133***	0.050***		
		0.018	*0.016*		
Incremental process		0.043***	0.022***		
		0.008	0.008		
Degree of novelty					
(Base category: no innovation)					
Combined radical innovation only				0.236***	
				0.025	
Combined incremental innovation only				0.089***	
				0.013	
Radical product and incremental process innovation				0.196***	
				0.027	
Incremental product and radical process innovation				0.113***	
				0.038	
Radical product innovation only				0.173***	
				0.018	
Incremental product innovation only				0.059***	
				0.011	
Radical process innovation only				0.083**	
				0.042	
Incremental process innovation only				0.021	
				0.015	
Degree of novelty					
(Base category: combined incremental innovation)					
Combined radical innovation only					0.144***
					0.027
Radical product and incremental process innovation					0.104***
					0.029
Incremental product and radical process innovation					0.020
					0.039
Radical product innovation only					0.084***
					0.021
Incremental product innovation only					-0.031**
					0.015

39

Radical process innovation only					-0.004
					_0.043_
Incremental process innovation only					-0.069***
					_0.018_
Controls	Yes	Yes	Yes	Yes	Yes
log Likelihood	-5102.8956	-5186.4677	-5095.385	-5094.8857	-3011.7471
Chi 2 (degrees of freedom)	3504.3(45)	3337.16(45)	3519.32(47)	3520.32(51)	1895.8(50)
Obs.	12823	12823	12823	12823	6460

Notes: Marginal effects (ME) at the sample mean values of the regressors are reported. All models control for the variables mentioned previously (the results are available on request).

As a robustness check, we use the logit model. The results are similar and available on request. Values in _italics_ are standard errors. *** $p < 0.01$, ** $p < 0.05$.

Appendices

Table A1 Variable definitions used in this study

Variable	Definition
Export propensity	Whether the firm sells goods and/or services outside the UK (coded 1) or not.
Innovation	Dummy variable = 1 if the firm has introduced goods, service, or process innovation.
Goods innovation	Dummy variable = 1 if the firm has introduced new goods.
Service innovation	Dummy variable = 1 if the firm has introduced new services.
Process innovation	Dummy variable = 1 if the firm has introduced new processes.
Innovation combination	Dummy variable = 1 if the firm has introduced goods innovation.
	Dummy variable = 1 if the firm has introduced service innovation.
	Dummy variable = 1 if the firm has introduced process innovation.
	Dummy variable = 1 if the firm has introduced goods innovation and service innovation.
	Dummy variable = 1 if the firm has introduced goods innovation and process innovation.
	Dummy variable = 1 if the firm has introduced service innovation and process innovation.
	Dummy variable = 1 if the firm has introduced goods innovation, service innovation, and process innovation.
Degree of novelty of product innovation	Dummy variable = 1 if the product (i.e., goods/service) innovation is new to the market.
	Dummy variable = 1 if the product (i.e., goods/service) innovation is new to the firm.
Degree of novelty of process innovation	Dummy variable = 1 if the process innovation is new to the market.
	Dummy variable = 1 if the process innovation is new to the firm.
Degree of novelty	Dummy variable = 1 if the firm has introduced radical innovation.
	Dummy variable = 1 if the firm has introduced incremental innovation.
	Dummy variable = 1 if the firm has introduced radical product (i.e., goods/service) and incremental process innovation.
	Dummy variable = 1 if the firm has introduced incremental product (i.e., goods/service) and radical process innovation.
	Dummy variable = 1 if the firm has introduced radical product (i.e., goods/service) innovation only.
	Dummy variable = 1 if the firm has introduced incremental product (i.e., goods/service) innovation only.
	Dummy variable = 1 if the firm has introduced radical process innovation only.

	Dummy variable = 1 if the firm has introduced incremental process innovation.
Size of the firm	ln(1 + number of employees).
Age of the firm	Broken down into age bands (0–5 years = 1, 6–10 years = 2, 11–20 years = 3, and > 20 years = 4). Dummy variables are created for each category.
Legal status	Legal status of the business (sole proprietorship = 1, company = 2, and partnership = 3). Dummy variables are created for each category.
Sites	Number of sites the business has (1 site = 1, 2 sites = 2, 3 sites = 3, 4–10 sites = 4, and 11+ sites = 5). Dummy variables are created for each category.
Family business	Dummy variable = 1 if the business is a family business and 0 otherwise.
Turnover	Broken down into turnover bands (1 = less than £82,000, 2 = £82,000–£99,999, 3 = £100,000–£249,000, 4 = £250,000–£499,000, 5 = £500,000–£999,999, 6 = £1 m–£1.99 m, 7 = £2 m–£2.8 m, 8 = £2.81 m–£4.99 m, 9 = £5 m–£9.99 m, 10 = £10 m–£14.99 m, 11 = £15m–£24.99 m, and 12 = £25 m or more. Dummy variables are created for each category.
Business environment – finance	Dummy variable = 1 if the major obstacle for the business is obtaining finance and 0 otherwise.
Business environment – competition	Dummy variable = 1 if the major obstacle for the business is competition in the local market and 0 otherwise.
External advice/information	Dummy variable = 1 if the firm sought external advice/information and 0 otherwise.
ICT	Dummy variable = 1 if the firm used ICT and 0 otherwise.
Regions	Location of the business (England = 1, Scotland = 2, Wales = 3, and Northern Ireland = 4). Dummy variables are created for each category.
Sectors	SIG 2007 (1-digit) classification. Dummy variables are created for each category.

Table A2 Descriptive statistics

Variable	All firms	Exporting firms	Non-exporting firms
Innovation	50.370	30.247	69.752
Goods innovation	20.054	39.540	60.459
Service innovation	35.795	27.385	72.614
Process innovation	26.896	32.908	67.091
Innovation combination			
No innovation	49.621	14.867	85.132
Goods innovation	5.287	43.657	56.342
Service innovation	12.368	19.735	80.264
Process innovation	6.878	24.489	75.510
Goods and service innovation	5.825	28.112	71.887
Goods and process innovation	2.417	59.677	40.322
Service and process innovation	9.061	26.333	73.666
All innovation (goods, service, and process innovation)	8.539	39.086	60.913
Degree of novelty of the product (i.e., goods/services)			
No innovation	56.500	16.038	83.961
Radical product innovation	13.998	44.233	55.766
Incremental product innovation	29.501	24.953	75.046
Degree of novelty of the process			
No innovation	73.103	18.828	81.171
Radical process innovation	5.872	41.965	58.034
Incremental process innovation	21.024	30.378	69.621
Degree of novelty			
No innovation	49.621	14.864	85.132
Combined radical innovation only	3.782	48.453	51.546
Combined incremental innovation only	11.814	29.108	70.891
Radical product and incremental process innovation	3.212	46.844	53.155
Incremental product and radical process innovation	1.208	32.258	67.741
Radical product innovation only	7.003	40.757	59.242
Incremental product innovation only	16.478	21.438	78.561
Radical process innovation only	0.881	27.433	72.566
Incremental process innovation only	5.997	24.057	75.942

$n_{SMEs} = 12823$; $n_{micro} = 7031$; $n_{small} = 3313$; $n_{medium} = 2479$.

Table A3 Correlation between the key explanatory variables and the dependent variable (export) by firm size

Variable	All firms	Micro	Small	Medium
Innovation	0.183*	0.172*	0.172*	0.159*
Goods innovation	0.215*	0.169*	0.234*	0.263*
Service innovation	0.085*	0.123*	0.044*	0.011
Process innovation	0.149*	0.116*	0.145*	0.139*
Innovation combination				
No innovation	-0.183*	-0.172*	-0.172*	-0.159*
Goods innovation	0.118*	0.097*	0.133*	0.151*
Service innovation	-0.025*	0.008	-0.053*	-0.074*
Process innovation	0.012	-0.002	0.009	0.007
Goods and service innovation	0.032*	0.056*	0.023	0.004
Goods and process innovation	0.139*	0.058*	0.178*	0.183*
Service and process innovation	0.028*	0.061*	-0.004	-0.036
All innovation (goods, service, and process innovation)	0.120*	0.100*	0.111*	0.138*
Degree of novelty of the product (i.e., goods/service)				
No innovation	-0.179*	-0.176*	-0.166*	-0.151*
Radical product	0.208*	0.191*	0.227*	0.203*
Incremental product	0.036*	0.051*	0.006	-0.001
Degree of novelty of the process				
No innovation	-0.149*	-0.116*	-0.145*	-0.139*
Radical process innovation	0.115*	0.103*	0.124*	0.104*
Incremental process innovation	0.095*	0.068*	0.087*	0.085*
Degree of novelty				
No innovation	-0.183*	-0.172*	-0.172*	-0.159*
Combined radical innovation only	0.122*	0.109*	0.119*	0.131*
Combined incremental innovation only	0.056*	0.060*	0.034*	0.028
Radical product and incremental process innovation	0.105*	0.063*	0.124*	0.116*
Incremental product and radical process innovation	0.025*	0.021	0.048*	-0.009
Radical product innovation only	0.119*	0.134*	0.132*	0.084*
Incremental product innovation only	-0.012	0.008	-0.041*	-0.025
Radical process innovation only	0.010	0.010	0.012	0.001
Incremental process only	0.008	-0.007	0.005	0.007

n_{SMEs} = 12823; n_{micro} = 7031; n_{small} =3313; n_{medium} = 2479. * $p < 0.05$.