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SME internationalisation: Do the types of innovation matter?

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ABSTRACT

Existing evidence suggest that innovative Small and Medium-sized Enterprises (or SMEs) are more likely to internationalise (i.e. have a greater propensity to export) than non-innovative SMEs. However, it is not yet clear whether and to what extent different types of innovation (i.e. product, service, and process) affect SME internationalisation. To address this issue, this study uses a research model that integrates the resource and institutional perspectives and empirically test it using data from the United Kingdom (UK) Longitudinal Small Business Survey. Our results confirm that SME internationalisation is more likely to occur in firms undertaking product innovation than process and/or service innovation, and a specific configuration of resource and institutional drivers influence SME internationalisation depending on the innovation type. These results lead to major policy and managerial implications in relation to promoting SME internationalisation through different types of innovation, given the UK withdrawal from the European Union.

1. Introduction

Even SMEs are nowadays required to innovate their products, services, and processes in order to become less vulnerable to international competition (Genc, Dayan, & Genc, 2019). Export performance can be enhanced by the SME innovation capacity (Oura, Zilber and Lopes, 2016). Innovation and export are argued to be complementary strategies for SME growth, positively reinforcing each other in a dynamic virtuous circle (Golovko & Valentini, 2011). Innovation as “the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations” (Organisation for Economic Co-operation and Development (OECD), 1997, p. 46) helps firms not only to improve their competitiveness at home, but also to seize opportunities presented in international markets (Martineau & Pastoriza, 2016). Innovative SMEs can increase their growth by selling their products overseas (Golovko & Valentini, 2011; Martínez-Román, Gamero, de Loreto Delgado-González, & Tamayo, 2019). SMEs can also be more productive as innovation helps them reduce the cost associated with export-related activities and as a result become more profitable (Cassiman & Golovko, 2011).

SME internationalisation, which is “the process of adapting a firm’s operations (strategy, structure, resource, etc.) to international environments”

(Calof & Beamish, 1995, p. 116) is influenced by the resources and capabilities an SME possesses as well as the institutional environment where it comes from. To assess the drivers of SME internationalisation, studies have used the resource-based view (RBV) and the institutional based view (IBV). While RBV emphasizes the internal working and firm-specific characteristics of exporting, the IBV focuses on the institutional environment of the firm (Wang & Ma, 2018). Prior studies inspired by RBV suggest that SME resources and capabilities foster SME internationalisation (e.g. Golovko & Valentini, 2011; Love, Roper, & Zhou, 2016; Raymond & St-Pierre, 2013). Organizational characteristics, and business strategy are cited as major drivers of exporting (Martineau & Pastoriza, 2016). Some of these studies assume that competitive and institutional environments are homogeneous (Peng, Wang, & Jiang, 2008). However, in the IBV motivated studies, external contexts are shown to affect SME internationalisation (Cahen, Lahiri, & Borini, 2016; Kahiya, Dean, & Heyl, 2014; Makhmadshoev, Ibeh, & Crone, 2015). Findings from this research indicate that improvements in environmental-level antecedents (i.e., industry, and country) will promote SME internationalisation (Cardoza, Fornes, Farber, Duarte, & Gutierrez, 2016). In this study, we integrate the two perspectives to assess whether and to what extent different types of innovation affect SME internationalisation.

Despite the theoretical consensus on the positive role of innovation

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in driving firms' exports, existing evidence on this nexus remain inconclusive and at times contradictory (Wu, Wei, & Wang, 2021). While some studies have found a positive link between SME internationalisation and product innovation (Nguyen, Pham, Nguyen, & Nguyen, 2008; Saridakis, Idris, Hansen, & Dana, 2019), service innovation (Saridakis et al., 2019), and process innovation (Exposito & Sanchis-Llopis, 2019; Nguyen et al., 2008; Saridakis et al., 2019). Other studies have found no significant association between SME internationalisation and product innovation (Higón & Driffield, 2011; Exposito & Sanchis-Llopis, 2019) and process innovation (Higón & Driffield, 2011). Also, a recent study reports a negative association between product innovation and SME export performance (Edeh, Obo-doechi, & Ramos-Hidalgo, 2020). Azar and Ciabuschi (2017: 325) stressed "...the necessity to further examine the effects of introducing different types of innovations". Thus, more empirical evidence is needed to demonstrate innovation-export link in the SME context. To do this, our study will examine the impact of different types of innovation on SME internationalisation. More importantly, such impact will be captured in the presence of resource and institutional drivers that are likely to shape this relationship. This way, a more comprehensive insight of this nexus shall be gained.

Another major issue with this area of research is disregarding the potential of endogeneity. That is, the association between innovation and internationalisation might be the result of reversed causality. Although an extensive body of the literature assesses the innovation-export association, a limited number of studies consider the possible endogeneity of innovation with respect to exporting (Lachenmaier & Wößmann, 2006; Higón & Driffield, 2011; Exposito & Sanchis-Llopis, 2019; Nguyen et al. (2008) claim that not accounting for the endogeneity may produce biased results on the association between innovation and export. Supporting this, Higón and Driffield (2011) found that, by controlling endogeneity, exporting does not have a reverse effect on innovation. This study takes into account endogeneity employing Heckman's two-stage procedure in line with previous studies (e.g. Exposito & Sanchis-Llopis, 2019; Ramdani, Belaid, & Boukrami, 2022).

This research UK context, wherein a pressing need to boost SMEs' internationalisation exists. In fact, a report by the British Business Bank (2020) reveals a decline in the proportion of UK SMEs' exports, from 41% in 2016 to 32% in 2018. In Europe, the share of UK SME exporters was the fifth lowest. In response, the UK government released the 2018 plan with the ambition to boost the country's exports. Interestingly, the same report has also highlighted evidence that international SMEs were typically more innovative than their domestic counterparts. This suggests that the innovation-export nexus could in fact be a strategy that warrants further interrogation.

The remaining of the paper proceeds as follow. We begin by outlining the theoretical base underpinning the hypotheses. We will follow this with by presenting the data and model specification. After that, we show the results from our empirical analysis. Then, we discuss the results in order to derive policy implications. Last, we highlight the conclusions and limitations of our study.

2. Theoretical background and hypothesis development

From reviewing the literature, propensity to export is affected by the resources and capabilities an SME possesses and the institutional environment where it comes from. Although different modes of internationalisation such as exporting and foreign direct investment are available to SMEs (Golovko & Valentini, 2011), exporting is often recognised as the first step in the internationalisation process (Jones, 2001). Exporting is defined as the "outward international trade in product and/or services, conducted either directly or through a third party" (Love & Roper, 2015). Following previous studies (e.g., Ramdani et al., 2022; Saridakis et al., 2019), we use export propensity "whether or not a firm exports to foreign markets" (Serra, Pointon and Abdou, 2012, p. 216) as a proxy for internationalisation. This proxy allows the identification of

attributes that are significantly higher in exporters compared to non-exporters. Those factors would then constitute the main triggers of exporting (Haddoud, Onjewu, Nowiński, & Jones, 2021). The suitability of this measure to reflect internationalisation has been supported in previous studies (e.g. Moreno-Gómez, Escandón-Charris, Moreno-Charris, & Zapata-Upegui, 2020; Nguyen & Le, 2019; Saridakis et al., 2019).

2.1. Innovation and SME internationalisation

There is a considerable empirical evidence suggesting a positive association between innovation and SME internationalisation (e.g. Exposito & Sanchis-Llopis, 2019; Ramdani et al., 2022; Saridakis et al., 2019). Yet, this nexus has been explained through two distinct lenses, namely the "self-selection" vs. the "learning-by-exporting" approaches (Fassio, 2018). While the former posits that innovative firms self-select to enter international markets (i.e. innovation leads to exporting), the latter argues the reverse link, that is, as firms enter international markets, they become more innovative. This study is grounded in the self-selection approach. We argue that innovative firms are more likely to enter and sustain their export activities by overcoming sunk costs (Monreal-Pérez, Aragón-Sánchez, & Sánchez-Marín, 2012). In this respect, the extant evidence suggest that internal drivers influence SME internationalisation (Love & Roper, 2015; Paul, Parthasarathy, & Gupta, 2017). This being said, the learning-by-exporting approach still bears relevance as the two approaches may co-exist (Gkypali, Love, & Roper, 2021). SMEs may initially self-select their entry into export markets and, subsequently, become more innovative through learning effects (Van Beveren & Vandenbussche, 2010). In fact, innovation without access to foreign markets does not provide substantial productivity gains (Love, Roper, & Hewitt-Dundas, 2010). In the general international business literature, innovating firms may choose to internationalise because a single market can be limiting and does not support innovation activities (Pla-Barber & Alegre, 2007). Thus, foreign markets represent an area where innovations can be exploited to gain economic advantage (Geldres-Weiss, Uribe-Bórquez, Coudounaris, & Monreal-Pérez, 2016). In the small business context, innovating firms are more likely to export, and more likely to generate growth from exporting than non-innovating firms (Love & Roper, 2015). Innovators gain a competitive advantage over other firms, which in turn helps them in the internationalisation process (Paul et al., 2017). Innovators grow at the expense of non-innovators by dominating the market until their position is no longer attainable due to imitation of innovation or introducing newer products and/or services (Love & Roper, 2015).

Three types of innovation can be introduced by SMEs: product, service, and/or process innovation. Product innovation is the introduction of tangible product that are new or significantly improved (Organisation for Economic Co-operation and Development (OECD), 1997p. 48). Service innovation is "the development of new or enhanced intangible offerings" (Storey, Cankurtaran, Papastathopoulou, & Hultink, 2016, p. 527). Process innovation refers to "the implementation of a new or significantly improved production or delivery method" (Organisation for Economic Co-operation and Development (OECD), 1997 p. 49). Existing evidence suggest that innovative SMEs are more likely to have a greater propensity to export than non-innovative SMEs (Higón & Driffield, 2011; Exposito & Sanchis-Llopis, 2019; Saridakis et al., 2019; Bodlaj, Kadic-Maglajlic, & Vida, 2020; Bodlaj et al.'s (2020) study of 118 SMEs operating in Central and Eastern Europe found that growth in SME export depends on technological and non-technological innovations. They argue that in addition to technological innovation, organizational innovation and product innovation tend to foster marketing innovation, which in turn has a positive impact on SMEs' export growth. Exposito and Sanchis-Llopis (2019) found that innovative SMEs are more likely to participate in international trade (export and/or import). Using a sample of 275 Spanish SMEs, they argue that exporting is more likely to occur in firms introducing process innovation. Saridakis et al. (2019) found

support for this using the UK Longitudinal Small Business Survey (2016). Using an earlier version of the UK data (2004), Higón and Driffield (2011) found that exporting SMEs are highly involved in innovation activities.

However, limited evidence exists on the impact of different types of innovation on SME internationalisation. Evidence on the effect of various types of innovation on exporting are inconclusive. Although earlier studies have found no significant link between innovation and SME internationalisation (e.g. Higón & Driffield, 2011), recent empirical evidence suggests a positive relationship between product and process innovation, and exporting (Exposito & Sanchis-Llopis, 2019; Saridakis et al., 2019). Based on the above, we propose the following hypothesis:

H1. *SME internationalisation is more likely to occur in firms undertaking a specific type of innovation.*

2.2. Innovation, resources and SME internationalisation

According to RBV (Barney, 1991), a firm is considered as a unique entity with a bundle of tangible and intangible resources. These controllable resources influence a firm's competitive advantage and exporting (Katsikeas, Leonidou, & Morgan, 2000). Because of the resource-constrained nature of SMEs (Love & Roper, 2015), internal resources act as drivers for SME internationalisation. Resource drivers include firm size, turnover, age, ownership, multi-plant operations, legal status, Information and Communication Technology (ICT) adoption, number of directors, owner and/or manager gender, and business strategy.

Firm size has been used as a proxy for resources required by an SME to be involved in internationalisation (Higón & Driffield, 2011). Allocating resources to internationalisation may affect the local growth strategies (Mittelstaedt, Harben, & Ward, 2003). Empirical evidence suggest that a critical size is required for SME participation in international trade (Serra et al., 2012; Exposito & Sanchis-Llopis, 2019). Also, Love et al. (2016) found that larger SMEs in terms of turnover are more likely to be export intensive.

Moreover, firm age has been used as a proxy for the firm's internationalisation experience (D'Angelo, Majocchi, Zucchella, & Buck, 2013; Majocchi, Bacchiocchi, & Mayrhofer, 2005). Love et al. (2016) argues that age and experience should be regarded as separate drivers of SME internationalisation. While some studies found age to be positively linked to exporting (e.g. Majocchi et al., 2005), other studies found the effect to be negative (e.g. Ganotakis & Love, 2011).

SME's ownership has been found to significantly influence the development of knowledge-based resources necessary for internationalisation (Zahra, Neubaum, & Naldi, 2007). Family ownership has been found to positively influence SME exporting (Minetti, Murro, & Zhu, 2015). However, other studies have found the impact of family ownership on SME internationalisation to be negative (Fang, Kotlar, Memili, Chrisman, & De Massis, 2018). According to Higón and Driffield (2011), family businesses have been found to focus on local markets and less likely to engage in internationalisation. Besides, they found that multi-plant operations were found to significantly impact SME internationalisation. Roper & Love (2002) suggest that SMEs can overcome their resource constraints by being part of multi-plant group where they have potential access to financial and technology resources. Also, the legal status of a business influences SME internationalisation. Compared to limited companies, sole proprietors and partnerships are less likely to export (Higón & Driffield, 2011).

Furthermore, ICT adoption is one of the key drivers of SME export (Hagsten & Kotnik, 2017). Paul et al. (2017) claims that the inability to access information is one of the internal barriers to SME exporting. Compared with their low-tech counterparts, ICT has been found to be more critical in the export process for high-tech SMEs (Tseng & Johnsen, 2011). Thus, SMEs with more sophisticated ICT (e.g. websites, social media profiles ...etc.) will be more likely to export.

Board size has been found to have a positive impact on SME international involvement (Nas & Kalaycioglu, 2016). A larger number of board members represent board empowerment in small business (Gabrielsson, 2007). According to Nas and Kalaycioglu (2016), the larger board size is critical for SME exporters as they are a source for diverse viewpoints and expertise.

In addition, gender diversity have been found to affect SME internationalisation (Pergelova, Angulo-Ruiz, & Yordanova, 2018; Idris & Saridakis, 2020). SMEs that are female-led face specific barriers to export and are less likely to engage in international activities compared to their male-led counterparts (Orser, Spence, Riding, & Carrington, 2010; Pergelova et al., 2018). Ramón-Llorens, García-Meca, and Duréndez (2017) has found gender not to be a significant predictor of export propensity. Compared with SMEs that have only male directors, SMEs that have women in their boards of directors are less likely to be involved in internationalisation (Idris & Saridakis, 2020).

Also, business strategy has been found to influence the international orientation of small firms. Bell, Crick, and Young (2004) found that strategic patterns, pace, and processes differ among small firms. SMEs with strategic plans to create new products and/or services, invest capital in premises, machinery ...etc.), and start new working practices in the foreseeable future will be more likely to engage in international activities.

2.3. Innovation, institutions and SME internationalisation

Evidence suggests that institutional forces influence SME internationalisation (Love & Roper, 2015; Paul et al., 2017). According to the IBV (Peng et al., 2008), a firm's strategy is shaped by the institutional environment since exporting firms depend on external forces in the host and export markets. Thus, SMEs depend on the institutional environment within which they operate due to the resource-constrained nature of many SMEs (Love & Roper, 2015). Institutional drivers include business environment, industry sector, and government policy.

Business environment has been found as a major institutional driver for SME internationalisation (Martineau & Pastoriza, 2016). Small firms are forced to engage in international activities when faced with domestic market obstacles such as taxation and competition (Higón & Driffield, 2011). Also, a recent study of Chinese exporting SMEs (Rialp-Criado & Komochkova, 2017) found that the business environment moderates the relationship between technological innovation and SME internationalisation.

Although the Industry in which the SME operates has not been found to significantly impact SME internationalisation in earlier studies (e.g. Higón & Driffield, 2011), more recent studies have shown that industry differences influence whether an SME engages in export activities (Paul et al., 2017).

Government policy has a positive impact on SME international involvement (Wang, Chen, Wang, & Li, 2017). To internationalise, SMEs need exogenous events (e.g., trade fairs) that stimulates their exporting activities (Martineau & Pastoriza, 2016). However, other external events such as Brexit can have the reverse effect. According to a recent study by Brown, Liñares-Zegarra, and Wilson (2019), Brexit (UK withdrawal from European Union (EU)) has the potential to rewrite the rules of how UK firms conduct business internationally since many firms are scaling back their capital investment, innovation, and exports.

The grounding of this study is the resource orchestration view (Hughes, Hodgkinson, Elliott, & Hughes, 2018). The resource constrained nature of SMEs forces this breed of companies to generate effective asset synergies to overcome their limitations (Gelhard & Von Delft, 2016), and sustain performance (Ho, Plewa, & Lu, 2016). It is in fact the uniqueness of such synergies that is likely to boost SME performance (Kozlenkova, Samaha, & Palmatier, 2014). In this regard, Barney's (2014): p. 25) posits "the optimal strategy for a particular firm depends on its constellation of resources and capabilities". This advocates that performance is driven by a gestalt of interrelated organizational and

structural factors which reinforce one another (Nordqvist, Sharma, & Chirico, 2014). This applies to SMEs' internationalisation as demonstrated in several recent studies wherein the latter was driven by several combinations of individual and corporate mindsets (Felício, Duarte, & Rodrigues, 2016); networks and decision-making strategies (Gil-Barragan, Belso-Martínez, & Mas-Verdú, 2020); networks and knowledge (Hughes, Cesinger, Cheng, Schuessler, & Kraus, 2019), knowledge and opportunity recognition capability (Mostafiz, Sambasivan, Goh, & Ahmad, 2021) and managerial attributes (Haddoud, Jones, & Newbery, 2021). Accordingly, we argue that it is the configuration of such resource and institutional drivers that is more likely to shape SMEs' internationalisation. More importantly, we posit that for a specific type of innovation, different configurations of resource and institutional factors enable SME internationalisation. That is, if an SME is product oriented, the resource and institutional factors needed will be different from those needed by SMEs that are process, or service oriented. Accordingly, the following hypothesis is proposed:

H2. *The configuration of resource and institutional drivers for SME internationalisation depend on the innovation type.*

3. Empirical analysis

3.1. Data and sample

This study uses the first wave of the Longitudinal Small Business Survey (LSBS). This is the most recent available survey dating back to 2003. This survey is compiled by the UK Department for Business Energy and Industrial Strategy (BEIS, 2016), and is one of the largest surveys comprising 15,502 telephone interviews with owners and managers of firms (<250 employees). Firm size, region, and industry sector were used to stratify the sample. Sources such as the Inter Departmental Business Register (IDBR) for registered businesses, and the Dun & Bradstreet's database for unregistered businesses were used in this sample. Technical details and survey instrument can be found in LSBS report (BEIS, 2016).

The survey provides a wide range of information on the key variables used in this study, including export and innovation activities. It also covers the business profile details, including age, ownership, size, human capital, industry sector ...etc. Moreover, it provides data on whether a firm exports product and/or services outside the UK; has the business introduced any new or significantly improved product, services, or process; resource drivers; and institutional drivers. Thus, this survey provides a rich data source that enables us to empirically examine the effects of different types of innovation (i.e. product, service, and process) as well as the effects of resource and institutional drivers on SME propensity to export.

The final sample contains about 9188 SMEs (out of 15,502 contacted) and includes every sector of the economy, weighted to be representative of small businesses in the UK. Descriptive statistics of the main variables of interest are reported in Table 1 and Table 2. Table 1 shows the number and proportion of SMEs that are exporters and innovators. It also presents the frequency distribution by different types of innovation. As highlighted, 20.93% of firms are exporters, and 41% are innovators in our sample. Firms that introduce new services are reported at 27.79%, followed by 21.63% of firms that introduce a new process,

Table 1
Number of observations and frequency by innovation type.

	N	%
Exporters	1923	20.93
Innovators	3806	41.00
Innovation Type		
Product innovation	1630	17.74
Service innovation	2553	27.79
Process innovation	1987	21.63

Table 2
Frequency distribution of certain variables.

Variable	N	%
Size		
Micro (1–9 employees)	3039	33.08
Small (10–49 employees)	2475	26.94
Medium (50–249 employees)	1356	14.76
Industry		
Production & construction	2206	24.01
Transport	2430	26.45
Business services	2928	31.87
Other services	1624	17.68

and only 17.74% of firms introduce new products. Table 2 shows the distribution of our sample. In terms of size, our sample includes 14.76 medium enterprises, 26.94% small enterprises, and 33.08% micro-enterprises. In terms of industry, 24.01% comes from production and construction, 26.45% from transport, and 31.87% from business services.

3.2. Estimation and empirical specification

To adequately examine the innovation-internationalisation link, we develop an empirical model based on two main steps. Our empirical framework's uniqueness makes the analysis and the deployed modeling approach interesting for various reasons. First, we develop a straight-forward approach of exporting behavior based on a logistic regression model, considering the innovation-decision as predetermined. Second, to correct for potential endogeneity of innovation, we use a simultaneous probit model based on Heckman two-step procedure. Third, the proposed econometric framework accounts for the interaction between export and innovation decisions, at the firm level. In this context, these two variables may be interrelated. In fact, product life-cycle oriented models commonly assume that the implementation of innovation leads to export decisions. Consequently, the causality runs from the innovation implementation to exporting. Nevertheless, it is important to recognize that exporting can also stimulate innovation activities, as assumed in endogenous growth trade models (Exposito & Sanchis-Llopis, 2019; Grossman & Helpman, 1991).

The decision to export is a binary choice, which can be modeled using a discrete-choice model (bivariate choice model). Therefore, to explore the relationship between innovation and export propensity, we develop an empirical model based on a discrete choice model. First, we estimate a traditional probit maximum likelihood estimation method (Stock & Watson, 2011) to examine exporting behavior (Model 1), considering the innovation-decision as a key driver. Probit is considered as an appropriate approach that deals with linear model issues (Gujarati, 1995). Further, we generalize the previous model to account for the innovation endogeneity employing Heckman (1978) two-stage procedure in line with previous studies (Exposito & Sanchis-Llopis, 2019; Higón & Driffield, 2011; Lachenmaier & Wößmann, 2006).

The first step of our modeling approach start by examining the SMEs's export decision based on the probit model. The modeling framework involves estimating model to examine whether exporting is undertaken or not. Thus, we consider the following model:

$$Y_i^* = \alpha_0 + \gamma Inov_i + \alpha_1 X_i + \alpha_2 O_i + \varepsilon_i \tag{1}$$

where the export decision, Y_i^* , is a discrete variable defined as follow:

$$Y_i = \begin{cases} 1, & \text{if } Y_i^* > 0 \\ 0, & \text{if } Y_i^* \leq 0 \end{cases} \tag{2}$$

$Inov_i$ represents the innovation activities, X_i represents the resource drivers, O_i depicts the institutional drivers, and ε_i is the error term, assumed to be $iid-N(0; \sigma_{\varepsilon})$. The drivers of exporting behavior have been selected based on the existing literature of SMEs' internationalisation, as

well as the data availability.

Notwithstanding, the probit model may provide biased estimates because of potential endogeneity of the innovation (Wooldridge, 2002). As aforementioned, to consider the endogeneity, which is a prevalent cause of biases in a non-experimental approach of innovation and exporting decisions, we develop an instrumental variable approach, which consists of a two-stage procedure.

First, we estimate the innovation equation below:

$$Inov_i^* = \varphi_0 + \varphi_1 X_i + \varphi_2 K_i + \mu_i \rightarrow Inov_i = 1 \text{ if } Inov_i^* > 0; Inov_i = 0 \text{ if } Inov_i^* \leq 0 \tag{3}$$

X_i is a set of explanatory variables (exogenous). K_i represents our instruments used in our analysis, i.e., factors that are highly correlated with innovation but not correlated with the residual term in the equation of export (Eq. 1). In this study, we use three key instruments: (i) prospects for the introduction of new products in order to develop the activity (launch new product); (ii) the capital investment to strengthen the company (capital investment); and (iii) prospects to introduce new working practices to boost the business (new working practices).

Then, in the second stage, we substitute the innovation factor $Inov_i$ in Eq.1 (Export equation) by the predicted probabilities gained from Eq. 3 (Maddala, 1986). This approach may provide unbiased estimates of the impact of innovation on exports. The vector K_i in the innovation equation (Eq.3) must incorporate one variable not included in Eq. (1). Therefore, in this analysis, we eliminate the variables depicting the firm's investment strategy, including prospects for introducing new products; the capital investment to strengthen the company, and

prospects to introduce new working practices. This identification strategy stems mainly from the availability of valid instruments (K_i), i.e., factors that may affect firms' innovation, and its impact on export decision must perform exclusively through its indirect impact on innovation.

4. Results

Our study results of the effects of product, service, and process innovation on SME propensity to export are set out in Tables 3, 4, and 5 respectively. Each table presents logistic regression estimation reporting the results of the export propensity drivers without taking into account the endogeneity issue. The estimated coefficients represent the marginal effects, i.e. the variation, *ceteris paribus*, in the probability that a firm will export in relation to a variation in each explanatory variable. The coefficient estimates for the logistic model are reported as log-odds, where the odds of event impacting the export variable is calculated using the following exponential formula: $e^{B \cdot x}$. The fifth column of each table provides the corresponding odd-ratio, which is an association measure between an exposure and an outcome, which refers to the ratio of the probability of exporting to the probability of not exporting. The change in odds when a factor changes by one unit looks somewhat like a partial effect, the odds in favour of an event is the ratio $\text{Prob}(Y = 1)/\text{Prob}(Y = 0)$ (Greene, 2012).

To account for endogeneity, each table provides the two-stage estimation results: one for the export and the other for the specific type of innovation. Table 3 reports the simultaneous estimation results for exporting and product innovation. Model A presents the results of logistic regression without considering endogeneity. Model B presents

Table 3
Product innovation models.

		Model A (Logistic regression estimation)			Model B (Heckman 2 stage estimation)						
		Export			Export			Product Innovation			
		Estimate	Std. Err.	Odd Ratios	Estimate	Std. Err.	Odd Ratios	Estimate	Std. Err.	Odd Ratios	
	Intercept	-2.769***	0.178		-1.469***	0.087	0.230	1.836***	0.093	6.269	
Size	Product Innovation	0.721***	0.069	2.056	1.649***	0.061	5.202				
	Micro vs. Medium	-0.050	0.107	0.952	0.029	0.058	1.029	0.015	0.063	1.016	
	Small vs. Medium	-0.003	0.094	0.997	0.029	0.052	1.030	0.013	0.056	1.013	
Turnover	Less than £82 K vs. £2 m or more	-0.970***	0.119	0.379	-0.510***	0.062	0.601	-0.018	0.067	0.983	
	£82 K -£499,999 vs.£2 m or more	-0.678***	0.094	0.508	-0.325***	0.051	0.722	0.086	0.055	1.089	
	£500 K -£1.99 m vs. £2 m or more	-0.330***	0.079	0.719	-0.177***	0.044	0.838	-0.024	0.048	0.976	
Age	<5 years old	-0.370***	0.090	0.691	-0.160***	0.047	0.852	0.055	0.049	1.057	
Ownership	Family owned	-0.404***	0.072	0.668	-0.210***	0.040	0.810	0.012	0.043	1.012	
Multi-plant	>1 site	-0.073	0.073	0.930	-0.017	0.040	0.983	0.051	0.043	1.053	
Legal Status	Sole proprietor vs. Company	-0.566***	0.116	0.568	-0.269***	0.057	0.764	-0.030	0.059	0.970	
	Partnership vs. Company	-0.396***	0.106	0.673	-0.193***	0.056	0.825	0.019	0.058	1.020	
ICT Adoption	Has its own website	0.845***	0.114	2.328	0.409***	0.056	1.505	-0.176***	0.057	0.839	
	Has its own social media	-0.083	0.067	0.920	-0.044	0.036	0.957	-0.064	0.039	0.938	
Board Size	One vs. two or more	0.154**	0.077	1.167	0.113***	0.041	1.119	0.123***	0.045	1.131	
Owner/Manager	Gender	Women-led	-0.333***	0.085	0.717	-0.160***	0.044	0.852	0.058	0.046	1.060
	Business Strategy	Launch new products	0.890***	0.064	2.436			-0.881***	0.034	0.414	
Business Environment	Capital investment	0.052	0.062	1.053			-0.182***	0.034	0.834		
	New working practices	-0.226***	0.063	0.798			-0.130***	0.034	0.878		
	Finance obstacle	-0.325***	0.081	0.723	-0.175***	0.043	0.839	-0.084**	0.042	0.920	
	Competition obstacle	0.106	0.058	1.112	0.062**	0.031	1.064	-0.027	0.033	0.974	
Industry	Taxation obstacle	-0.189**	0.063	0.828	-0.097**	0.034	0.907	0.020	0.036	1.020	
	Production & construction	1.241***	0.122	3.459	0.441***	0.061	1.555	-0.442***	0.058	0.643	
	Transport	1.084***	0.121	2.958	0.440***	0.059	1.552	-0.230***	0.057	0.794	
Government Policy	Business services	1.336***	0.116	3.805	0.619***	0.057	1.857	-0.090	0.056	0.914	
	Impact of EU referendum	0.563***	0.062	1.756	0.259***	0.034	1.295	-0.152***	0.037	0.859	

Notes: ** significant at 5%; *** significant at 1%; nSMEs = 9188.

Model A: Log likelihood = -7637; Area under curve (AUC) = 0.77.

Model B: Log likelihood = 1414.88; $\rho = 0.697$; $X^2(1) = 164.86$; $\text{Pr} > \text{ChiSq} \leq 0.0001$.

Table 4
Process innovation models.

		Model A (Logistic regression estimation)			Model B (Heckman 2 stage estimation)					
		Export			Export			Process Innovation		
		Estimate	Std. Err.	Odds Ratios	Estimate	Std. Err.	Odds Ratios	Estimate	Std. Err.	Odds Ratios
	Intercept	-2.987***	0.175		-1.608***	0.086		1.496***	0.085	
Size	Process Innovation	0.313***	0.066	1.368	1.202***	0.078	3.327			
	Micro vs. Medium	-0.449***	0.094	0.638	-0.138***	0.052	0.871	-0.195**	0.053	0.823
	Small vs. Medium	-0.172**	0.087	0.842	-0.050	0.048	0.951	-0.056**	0.049	0.945
Turnover	Less than £82 K vs. £2 m or more	-0.963***	0.117	0.382	-0.553***	0.066	0.575	0.111	0.066	1.118
	£82 K -£499,999 vs.£2 m or more	-0.699***	0.093	0.497	-0.396***	0.054	0.673	-0.010**	0.054	0.990
	£500 K -£1.99 m vs. £2 m or more	-0.327***	0.078	0.721	-0.190***	0.046	0.827	-0.007**	0.046	0.993
Age	<5 years old	-0.424***	0.088	0.654	-0.198***	0.047	0.821	-0.042**	0.047	0.959
Ownership	Family owned	-0.451***	0.071	0.637	-0.248***	0.040	0.780	0.016**	0.041	1.016
Multi-plant	>1 site	-0.050	0.072	0.952	-0.031	0.040	0.969	0.019**	0.040	1.019
Legal Status	Sole proprietor vs. Company	-0.674***	0.112	0.510	-0.355***	0.056	0.702	0.043**	0.056	1.044
	Partnership vs. Company	-0.423***	0.105	0.655	-0.252***	0.056	0.777	0.006**	0.056	1.006
ICT Adoption	Has its own website	0.887***	0.113	2.429	0.433***	0.056	1.542	0.160**	0.053	1.174
	Has its own social media	-0.076	0.066	0.927	-0.008	0.036	0.992	-0.005**	0.037	0.995
Board Size	One vs. two or more	0.063	0.076	1.065	0.064	0.041	1.066	-0.099**	0.042	0.906
Owner/Manager Gender	Women-led	-0.331***	0.084	0.718	-0.186***	0.044	0.830	-0.028**	0.042	0.973
Business Strategy	Launch new products	1.014***	0.062	2.755				0.567**	0.033	1.762
	Capital investment	0.078	0.062	1.081				0.162**	0.032	1.176
	New working practices	-0.239***	0.063	0.788				0.443**	0.034	1.557
Business Environment	Finance obstacle	-0.333***	0.080	0.717	-0.165***	0.043	0.848	0.023**	0.041	1.023
	Competition obstacle	0.120**	0.057	1.127	0.081***	0.031	1.084	-0.002**	0.032	0.998
	Taxation obstacle	-0.216***	0.062	0.806	-0.132***	0.034	0.876	0.058**	0.034	1.059
Industry	Production & construction	1.465***	0.120	4.328	0.643***	0.060	1.903	0.235**	0.054	1.265
	Transport	1.272***	0.119	3.569	0.628***	0.058	1.874	-0.097	0.054	0.908
	Business services	1.393***	0.115	4.026	0.599***	0.058	1.820	0.330	0.050	1.392
Government Policy	Impact of EU referendum	0.577**	0.061	1.780	0.279***	0.035	1.322	0.174	0.035	1.189

Notes: ** significant at 5%; *** significant at 1%; nSMEs = 9188.

Model A: Log likelihood = -8286; Area under curve (AUC) = 0.78.

Model B: Log likelihood = 1467.56; $\rho = 0.571$; $X^2(1) = 89.77$; $Pr > ChiSq \leq 0.0001$.

results of Heckman 2 stage estimation taking into account the endogeneity. Comparing the results of Model A and Model B, the significance remained unaffected with only small changes in the estimated coefficients. These results are similar to the results obtained by Higón & Driffield, 2011 and Nguyen et al., 2008. We notice that the product innovation coefficient is positive and statistically significant, underlying a highly significant impact on the likelihood of exporting.

The results indicate that enterprises undertaking product innovation has an odds of exporting 5 times higher than firms that do not innovate their products. Also, the standard logit estimation notably underestimates the role of product innovation in explaining SMEs' propensity to export. Table 4 and Table 5 replicates the analysis presented in Table 3 with focus on service innovation and process innovation respectively. Again, process innovation and service innovation are statistically significant with a highly strong impact on the likelihood of exporting. The odd ratios are equal to 3.3 and 3.16 respectively, i.e. process and service innovators are 3 times more likely to export. This confirms H1 – SME internationalisation is more likely to occur in firm undertaking product innovation than service and/or process innovation.

Model B (export) across all types of innovation indicate that resource drivers for exporting are turnover, age, ownership, legal status, ICT adoption, and owner and/or manager gender. Moreover, it indicates that, across all types of innovation, institutional drivers for exporting are business strategy, business environment, industry and government policy. Because these results are consistent across all types of innovation, we will only highlight the product innovation results from Table 3. resource drivers for exporting in firms undertaking product innovation are turnover, age, ownership, legal status, ICT adoption, and owner and/or manager gender. Accordingly, the odds of exporting increase

significantly for firms with low income. For example, the odds of exporting for firms with turnover less than £82,000 is about 2 times lower than for firms that have turnover higher than £2 million (The coefficient is equal to -0.51 with and odd ratio of 0.61).

Firms with turnover less than £82,000 are 51% less likely to export compared with firms that have turnover higher than £2 million. Also, younger firms are 16% less likely to export compared with firms that have been operating for 5 years or longer. Moreover, family-owned firms are 21% less likely to export compared with firms that are not family-owned. In terms of legal status, sole traders and partnerships are 26% and 19% less likely to export compared with limited companies. Furthermore, firms that have their own websites have 40% more propensity to export. Also, firms that are led by one person instead of two or more are 11% more likely to export. Finally, women-led firms are 16% less likely to export compared with male-led enterprises.

As illustrated in Table 3, institutional drivers for exporting in firms undertaking product innovation are business strategy, business environment, industry and government policy. In terms of business strategy, firms that are launching new products are 88% less likely to export, while firms with capital investment and new working practices are 18% and 13% less likely to export. Also, firms that indicated obtaining finance and taxation as obstacles are less likely to export, but firms that have competition in the market within which they operate have more propensity to export. In terms of industry, firms from production and construction are 44% more likely to be involved in export. Finally, firms whose managers and/or owners believe that EU referendum has an impact on their businesses are 15% less likely to export.

Regardless of the innovation type, SME internationalisation is influenced by firm's turnover, age, ownership, legal status, ICT

Table 5
Service innovation models.

		Model A (Logistic regression estimation)			Model B (Heckman 2 stage estimation)					
		Export			Export			Service Innovation		
		Estimate	Std. Err.	Odds Ratios	Estimate	Std. Err.	Odds Ratios	Estimate	Std. Err.	Odds Ratios
	Intercept	-2.808***	0.178		-1.566***	0.087	0.209	1.210***	0.081	3.353
Size	Service Innovation	0.190***	0.065	1.209	1.152***	0.066	3.164			
	Micro vs. Medium	-0.063	0.106	0.939	-0.003	0.058	0.997	-0.010	0.058	0.990
	Small vs. Medium	-0.019	0.093	0.982	-0.002	0.051	0.998	-0.019	0.051	0.981
Turnover	Less than £82 K vs. £2 m or more	-0.952***	0.118	0.386	-0.512***	0.062	0.599	-0.059	0.060	0.942
	£82 K -£499,999 vs.£2 m or more	-0.687***	0.094	0.503	-0.372***	0.051	0.689	-0.055	0.050	0.946
	£500 K -£1.99 m vs. £2 m or more	-0.323***	0.078	0.724	-0.198***	0.044	0.820	-0.078	0.044	0.925
Age	<5 years old	-0.386***	0.089	0.680	-0.197***	0.047	0.822	-0.018	0.044	0.982
Ownership	Family owned	-0.403***	0.071	0.668	-0.219***	0.040	0.803	-0.013	0.041	0.987
Multi-plant	>1 site	-0.097	0.073	0.908	-0.074	0.040	0.929	-0.073	0.039	0.930
Legal Status	Sole proprietor vs. Company	-0.566***	0.115	0.568	-0.270***	0.057	0.763	0.001	0.053	1.001
	Partnership vs. Company	-0.405***	0.106	0.667	-0.221***	0.056	0.802	0.050	0.054	1.051
ICT Adoption	Has its own website	0.859***	0.114	2.360	0.418***	0.056	1.520	-0.125***	0.050	0.882
	Has its own social media	-0.074	0.066	0.928	-0.053	0.036	0.948	-0.129***	0.035	0.879
Board Size	One vs. two or more	0.128	0.077	1.137	0.076	0.041	1.079	0.032	0.041	1.033
Owner/Manager										
Gender	Women-led	-0.339***	0.085	0.712	-0.186***	0.044	0.831	0.009	0.039	1.010
	Launch new products	1.015***	0.064	2.759				-0.780***	0.031	0.458
Business Strategy	Capital investment	0.083	0.062	1.086				-0.138***	0.031	0.871
	New working practices	-0.214***	0.063	0.807				-0.265***	0.032	0.767
	Finance obstacle	-0.314***	0.080	0.730	-0.202***	0.043	0.817	-0.140***	0.039	0.870
Business Environment	Competition obstacle	0.106	0.058	1.111	0.080***	0.031	1.083	0.030	0.030	1.030
	Taxation obstacle	-0.200***	0.063	0.819	-0.143***	0.034	0.867	-0.109***	0.033	0.897
	Production & construction	1.386***	0.122	3.997	0.802***	0.060	2.230	0.474***	0.052	1.606
Industry	Transport	1.172***	0.121	3.228	0.674***	0.059	1.962	0.398***	0.049	1.489
	Business services	1.370***	0.116	3.935	0.672***	0.057	1.957	0.026	0.046	1.027
Government Policy	Impact of EU referendum	0.578***	0.061	1.783	0.297***	0.035	1.346	-0.086***	0.034	0.918

Notes: ** significant at 5%; *** significant at 1%; nSMEs = 9188.
 Model A: Log likelihood = -8739; Area under curve (AUC) = 0.81.
 Model B: Log likelihood = 1477.91; $\rho = 0.577$; $X^2(1) = 128.56$; $Pr > ChiSq \leq 0.0001$.

adoption, owner/manager gender, business strategy, business environment, industry, and government policy. However, what differentiated SME internationalisation with a specific innovation orientation is an additional resource driver. Board size, firm size, and multi-plant influence product, process and service innovation respectively. This confirms H2 - depending on the type of innovation undertaken by SMEs, a specific configuration of resources and institutional drivers influence SME internationalisation.

5. Discussion and policy implications

Regardless of the innovation type, our results confirm that innovative SMEs have a greater propensity to export than non-innovative SMEs. These results are in line with previous studies (Exposito & Sanchis-Llopis, 2019; Higón & Driffield, 2011; Nguyen et al., 2008; Saridakis et al., 2019) highlighting the role of innovation in SME internationalisation. However, SME internationalisation can be explained by the type of innovation introduced, and the resource and institutional drivers of export. The extent of export depends on the type of innovation. This study found that SME internationalisation is more likely to occur in firms undertaking product innovation than firms undertaking service and/or process innovation. This is consistent with previous studies showing that product innovation is more strongly associated with propensity to export than process innovation (Cassiman, Golovko, & Martínez-Ros, 2010; Saridakis et al., 2019). Moreover, this study confirms that depending on the type innovation undertaken by SMEs, a specific configuration of resources and institutional drivers influence SME internationalisation. Regardless of the innovation type, SME internationalisation have been found to be influenced by firm’s

turnover, age, ownership, legal status, ICT adoption, owner/manager gender, business strategy, business environment, industry, and government policy. However, a distinctive innovation type has been found to be influenced by an additional resource driver. Board size, firm size, and multi-plant influence product, process and service innovation respectively. Board size has been found to be a significant resource driver for product innovators. This is in line with previous studies (e.g. Nas & Kalaycioglu, 2016; Gabrielsson, 2007), which found board size to have a positive effect on SME international involvement. Also, we found that medium-sized firms undertaking process innovation are more likely to export compared with micro firms. This is in line with previous studies (Cassiman et al., 2010; Saridakis et al., 2019;), which found larger firms to be more likely to export. Finally, we found that multi-plant operation to be a significant resource driver for service innovators. This is in line with previous evidence (Higón & Driffield, 2011), which found that being part of multi-plant group has a positive impact on SME internationalisation.

Our findings lead to relevant policy and managerial implications for SMEs, given the UK withdrawal from the EU. Despite the major efforts by the UK government in promoting SMEs’ internationalisation, and encouraging them to be more innovative, the new insights from this study require policy adjustments. First, given that innovative SMEs are more likely to export than non-innovative SMEs, it can be argued that it is more important now than ever before to encourage SMEs to be more innovative to export to new non-EU markets. Second, it is important to note that not all innovations are equal. Our results suggest that export is more likely to occur in SMEs undertaking product innovation than process/service innovations. This means that government efforts and incentive schemes should be directed towards firms with product

innovation orientation. This does not mean that the UK government disregards firms that focus on process and/or service innovations, because these firms are also more likely to export compared with the non-innovators. Encouraging SMEs to be innovators should be at the forefront of government policy. Third, specific resource and institutional drivers are critical for SME internationalisation. These drivers can be used to profile SMEs that are more likely to be involved in international trade and target them with specific schemes and programs for internationalisation (Ramdani et al., 2022). As advised by Exposito and Sanchis-Llopis (2019), creating an appropriate environment for SME innovation comes from coordinating and integrating innovation and export activities focused on SMEs. Our results are relevant for SMEs' owners and/or managers. They can use the results to determine what is needed in terms of resource and institutional driver, and the type of innovation they should be involved in to increase their chances of being exporters especially in the post-Brexit era.

6. Conclusions and limitations

Our study examined whether and to what extent different types of innovation affect SME export. Our results confirm that SME internationalisation can be explained by the type of innovation introduced, and the resource and institutional drivers of export. SME internationalisation is more likely to occur in firms undertaking product innovation than process and/or service innovations. Also, depending on the type of innovation undertaken by SMEs, a specific configuration of resource and institutional drivers influence SME internationalisation.

Our study makes four contributions to the extant literature of SME internationalisation. First, we consider the effect of each type of innovation on SME propensity to export, in which scarce evidence exists (Azar & Ciabuschi, 2017). This study adds to the emerging evidence on whether innovation type matters for SME internationalisation. Our results indicate that SME internationalisation depend on the type of innovation. Second, this study integrates the two theoretical perspectives namely RBV and IBV. This responds to a recent call for using multiple theoretical perspectives (Elbanna, Hsieh, & Child, 2020) to frame SME internationalisation. Third, this study adds important insights on the extent to which the innovation type influences SME internationalisation. Previous research suggests that institutional environment to have a significant effect on export behaviors, compared to

the firm competencies (Gao, Murray, Kotabe, & Lu, 2010). However, this study provides evidence that a specific additional resource driver differentiates the internationalisation of SME innovators. Board size, firm size, and multi-plant operation have been found to influence product, process and service innovation respectively. Fourth, our study contributes to existing evidence on the configuration of resource and institutional drivers needed regardless of the innovation type an SME is oriented towards. This study confirms that firm's turnover, age, ownership, legal status, ICT adoption, owner/manager gender, business strategy, business environment, industry, and government policy influence SME internationalisation regardless of the type of innovation.

Several limitations must be considered when interpreting the results of our study. First, our study focuses only on SME propensity to export. To gain further insights, SME intensity to export should also be examined (Martineau & Pastoriza, 2016). Second, this study disregarded an important part of the international trade activities, which is SME decision to import. Future studies need to simultaneously examine import and export decisions when analysing the potential drivers and obstacles of internationalisation (Exposito & Sanchis-Llopis, 2019; Halilem, Amara, & Landry, 2014). Third, this study highlights the resource and institutional drivers for SME propensity to export. Future studies might examine whether other drivers such as human capital (Huggins, Prokop, & Thompson, 2017) affect SME internationalisation. Fourth, this study did not examine the mediating and moderating factors effects on the association between innovation, resource and institutional drivers, and SME internationalisation. Martineau and Pastoriza (2016) calls for more research on the moderating and mediating factors on the association between the drivers and SME internationalisation. Fifth, our study did not examine country differences. Since researchers advocate measuring innovation at a country-level (Janger, Schubert, Andries, Rammer, & Hoskens, 2017; Ramdani et al., 2022; Saridakis et al., 2019), it will be interesting to study a single country or compare multiple countries in the UK namely England, Scotland, Wales, and Northern Ireland. Finally, the sample used was limited to UK SMEs. It will be interesting to explore international trade activities of SMEs in other countries using other longitudinal surveys.

Data availability

The authors do not have permission to share data.

Appendix A. Appendix

Table A1

Definition of the variables.

Variable	Definition
Export propensity	Whether the enterprise sells product and/or services outside the UK (coded 1) or not.
Product innovation	Dummy variable = 1 if the enterprise has introduced new product.
Service innovation	Dummy variable = 1 if the enterprise has introduced new services.
Process innovation	Dummy variable = 1 if the enterprise has introduced new processes.
Size	Dummy variable = 1 if the enterprise belongs to size-bands: Micro (1 to 10 employees), Small (11 to 50 employees), or Medium-sized (50 to 249 employees)
Turnover	Annual turnover broken down into bands (Less than £82,000 = 1; £82,000–£499,999 = 2; £500,000–£1.99 m = 3; £2 m or more = 4). Dummy variables are created for each category.
Age	Dummy variable = 1 if the enterprise has been trading for <5 years
Ownership	Dummy variable = 1 if the enterprise is a family business.
Multi-plant	Dummy variable = 1 if the enterprise is has more than one site.
Legal Status	Legal status of the enterprise (Sole proprietorship = 1, Company = 2, and Partnership = 3). Dummy variables are created for each category.
ICT Adoption	Dummy variable = 1 if the enterprise has its own website. Dummy variable = 1 if the enterprise has its own social media profile, e.g. on Facebook, LinkedIn or Twitter.
Board Size	Number of directors and partners (One = 1, Two or more = 2). Dummy variables are created for each category.
Owner/Manager Gender	Dummy variable = 1 if there is a majority of women managers or directors.
Business Strategy	Dummy variable = 1 if the enterprise plans to develop and launch new products and/or services. Dummy variable = 1 if the enterprise plans to reinvest capital (in premises, machinery, etc.) Dummy variable = 1 if the enterprise plans to introduce new working practices.

(continued on next page)

Table A1 (continued)

Variable	Definition
Business Environment	Dummy variable = 1 if the major obstacle for the enterprise is obtaining finance. Dummy variable = 1 if the major obstacle for the enterprise is competition in the local market.
Industry	Dummy variable = 1 if the major obstacle for the enterprise is taxation, VAT, PAYE, National Insurance, business rates. The industry in which the enterprise operates. Production and construction = 1, Transport = 2, Business services = 3, and other services = 4. Dummy variables are created for each category.
Government Policy	Dummy variable = 1 if the EU referendum impacted on previous plans.

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