Impact of Exploitation and Exploration on Export Sales Growth: Moderating Role of Domestic and International Collaborations

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Abstract:

This study examines the short- and long-term implications of the impact of exploitation and exploration on export sales growth. It also explores the moderating role of external collaborations by differentiating between domestic collaborations and international collaborations. The authors tested their conceptual model with data from the UK Community Innovation Survey (2010–2016). Using different time lags for exploitation and exploration, the findings indicate that the impact varies over time. Specifically, they reveal that the effect of exploitation is negative in the long-term but turns positive in the short-term, while exploration has no significant effect in the short-term but a positive influence on export sales growth in the long-term. Similarly, the moderating effect of domestic and international collaborations have been found to vary over time. The theoretical and practical implications are also discussed.

Keywords: Exploitation; Exploration; Domestic collaboration; International collaboration; Export sales growth

Exporting is one of the most common means of entering international markets. Innovation has been found to be central in helping exporting firms to compete internationally (Azar and Ciabuschi 2017; Makri, Theodosiou, and Katsikea 2017). It can lead to an inimitable competitive advantage that can be extended to export markets for higher returns (Golovko and Valentini 2011; Monreal-Pérez, Aragón-Sánchez, and Sánchez-Marín 2012). However, challenged by short product life cycles and the ease of imitation in the dynamic international market (Slater, Mohr, and Sengupta 2014), exporting firms face important and multi-faceted problems in terms of developing innovations that can enhance their export performance. Moreover, competitive advantages are uncertain and ephemeral in the geographically, culturally, and economically distant export markets, creating more challenges for information-disadvantaged exporting firms in harnessing their innovation strategies (Deng et al. 2014) to generate positive export performance outcomes.

This study distinguishes between two types of innovation strategies that have become a central theme in the organizational learning literature: exploitation and exploration. Exploitation refers to refinement-led actions to improve existing product-market domains, while exploration refers to discovery-led actions to enter new product-market domains (He and Wong 2004; Zhang et al. 2017). The key difference lies within the type and amount of learning that they both employ. Exploitation relies on experiential learning that focuses on refinement and reuse of existing knowledge, while exploration relies on experimental learning that involves the development of new and heterogeneous knowledge (Bauer et al. 2018; Gupta, Smith, and Shalley 2006; March 1991; Wu and Shanley 2009). Although there has been a debate in the literature on the continuity or orthogonality of exploitation and exploration (Cui, Walsh, and Zou 2014; Luger, Raisch, and Schimmer 2018), this study adopts the orthogonal approach, which supports the idea that these are separate constructs and that a firm can simultaneously engage in both exploitation and exploration in a given market.

The concepts of exploitation and exploration have been widely studied in the management and marketing literature. Research in this area has been prolific in examining how a firm's exploitation and exploration are linked to capabilities such as customer management and new product development (Mehrabi, Coviello, and Ranaweera 2019), learning culture (Gonzalez and de Melo 2018), organizational capital and human capital (Lin et al. 2017), technological performance (Geerts et al. 2018), and organizational failure (Swift 2016). These concepts have also increasingly been used in the international context to explain a variety of phenomena, such as international strategic alliances (Krammer 2018; Nielsen and Gudergan 2012), relationship-specific innovation (Choi, Jean Ruey-Jer, and Kim 2019), propensity to engage in knowledge-seeking FDI (Kedia, Gaffney, and Clampit 2012), divestment and foreign exit decisions (Tan and Sousa 2019), merger and acquisition performance (Bauer et al. 2018), international joint venture performance (Jin, Zhou, and Wang 2016), contract manufacturing exporters performance (Sharma, Nguyen, and Crick 2018), and international performance (Pinho and Prange 2016). There have also been studies focusing on ambidexterity, and viewing exploitation and exploration as complementary (Andriopoulos and Lewis 2009; Gibson and Birkinshaw 2004; Ho et al. 2020).

However, studies examining the impact of exploitation and exploration have taken a mainly static approach and neglected to consider that these constructs may have different short- and long-term implications. This is surprising considering that exploitation is expected to improve the effectiveness and efficiency of existing core capabilities, which can lead to short-term effects (Belderbos et al. 2010; Lisboa, Skarmeas, and Lages 2013), while exploration requires a longer completion time due to the complexity of adopting new techniques. Hence, our current lack of understanding of how exploitation and exploration may have different short- and long-term implications suggests a gap in the existing literature. Indeed, it has been stated that "theorists should be encouraged to think about whether their

theoretical effects vary over time" (Whetten 1989, p. 492).

Although innovation is considered to be an interactive process that requires shared learning (Pérez-Luño et al. 2011), there is a lack of understanding in the current exploitation-exploration literature on the role of external collaborations in facilitating or inhibiting the realization of exploitative and explorative activities (Guan and Liu 2016). This is particularly important in the exporting context because exporting firms are subject to the liability of outsidership and foreignness (Brache and Felzensztein 2019; Johanson and Vahlne 2009). The liability of outsidership is associated with a lack of foreign business knowledge, while the liability of foreignness is associated with a lack of foreign institutional knowledge. However, these liabilities are becoming less country-specific and more network-specific (Johanson and Vahlne 2009). Knowledge sets to help reduce these liabilities of outsidership and foreignness are largely created through network engagement (Yamin and Kurt 2018) by developing external collaborations. Hence, understanding the role of external collaborations is particularly relevant.

Moreover, research has rarely focused on whether the collaborators are domestic or international, even though the international business and marketing literature emphasizes the importance of geographical-boundary-crossing activities. While collaborating with domestic partners has the benefit of easily formed and well-communicated relationships, given the greater similarity in partners' organizational structures and practices, international collaborations provide access to more diverse knowledge (Hsieh et al. 2018). Although previous studies have shown that collaboration with external partners, in general, offers firms the opportunity to increase their knowledge base (Frenz and Ietto-Gillies 2009; Sirmon and Lane 2004; Sousa and Novello 2014; Tsinopoulos, Yan, and Sousa 2019), the type of knowledge and learning gained should differ depending on whether the partners are based domestically or internationally. Addressing this issue is important because it extends the

literature on external collaborations by focusing on the differences and complementarities that may exist between domestic and international partners while increasing our understanding of how the impact of exploitation and exploration on exporting depends on domestic and international collaborations. So far, no study has examined this issue, which represents a significant gap in both the exploitation-exploration and international business/marketing literature.

To address the aforementioned gaps, this paper makes use of organizational learning theory and network literature to explore (1) the short- and long-term implications of the impact of exploitation and exploration on export sales growth, and (2) the moderating effects of domestic and international collaborations on the link between exploitation/exploration and export sales growth. Accordingly, this study offers the following contributions.

First, we examine the impact of exploitation and exploration on export sales growth. Here, we capture export performance as firms' export sales growth, defined as the percentage of change in export sales over time (Assadinia et al. 2019; Chen, Sousa, and He 2019; Morgan, Kaleka, and Katsikeas 2004), which is indicative of the health of a firm's export operations. Moreover, considering that exploitation and exploration have distinctive short- and long-term implications as the former is more short-term oriented and the latter is more long-term oriented (Auh and Menguc 2005; Lisboa, Skarmeas, and Lages 2013), we use different time lags for exploitation and exploration. Although the literature acknowledges that exploitation and exploration are more short- and long-term oriented respectively (Mathias, Mckenny, and Crook 2018), this has been largely ignored in past analyses.

Second, this article explores the moderating role of external collaborations by differentiating between domestic collaboration and international collaboration. Using the network literature, we explore how domestic and international collaborations are important

sources of external knowledge for innovation (Scalera, Perri, and Hannigan 2018). By focusing on external collaborations according to whether they are domestic or international, we offer a more nuanced perspective on their respective influences on shared learning, knowledge, and resource exchange for the purposes of innovation. In addition, this study adds to the previous research that has mainly focused on market-level moderators (Jin, Zhou, and Wang 2016; Mueller, Rosenbusch, and Bausch 2013) and the call for more research to investigate more complex relationships between the two innovation strategies (Wilden et al. 2018).

THEORETICAL BACKGROUND

Exploitation and exploration innovation

The concepts of exploitation and exploration have become a central theme in the organizational learning literature. Their applicability has been extended to characterize how firms strategically prioritize their approach to technological innovation (He and Wong 2004), from the generation of new ideas to the launch of new products (Belderbos et al. 2010; Holmqvist 2004). Exploitation refers to a firm's ability to improve its existing product-market efficiency through improvements to and refinements of its current skills and processes (He and Wong 2004; Mueller, Rosenbusch, and Bausch 2013). It involves the firm taking advantage of its experience-based learning curve and focusing its research on its current knowledge domains in order to generate "safe" returns (Dasí, Iborra, and Safón 2015; March 1991).

By contrast, exploration refers to the ability of a firm to enter new product-market domains through research, discovery, and experimentation (He and Wong 2004; March 1991; Ngo et al. 2019). It advocates deviation from the *status quo* by focusing on experimentation with new

alternatives and promoting a broad search for new and alternative solutions that often generate risky and uncertain returns (Dasí, Iborra, and Safón 2015; Jansen, Van Den Bosch, and Volberda 2006; Zhang, Wu, and Cui 2015). Thus, exploitation and exploration are linked to two different organizational learning processes – experiential and experimental learning – that firms employ to solve problems related to either their existing or new product-market domains (Gupta, Smith, and Shalley 2006). In this context, exploitation focuses on fully utilizing limited experience in existing technology and product-market domains to improve efficiency, while exploration emphasizes novelty and divergent thinking by encouraging new product experimentation that may differentiate it from competitors' offerings (Atuahene-Gima and Murray 2007; Zhang et al. 2017).

A foreign market constitutes a special context for which strong emphasis is placed on organizational learning due to a large number of uncertainties, extensive competitive pressures, and highly complex market environments in terms of the social, economic, cultural, political, and technological aspects (İpek 2019; Tse, Yu, and Zhu 2017). In this case, greater performance can be achieved by firms that can employ both exploitation and exploration to adapt to changing market conditions characterized by heightened levels of dynamism and complexities in the foreign market (Lisboa, Skarmeas, and Lages 2011). This is consistent with March's (2003, p. 4) view on the need to consider both strategies, as illustrated by his argument that "it is clear that a strategy of exploitation without exploration is a route to obsolescence. It is equally clear that a strategy of exploration without exploitation is a route to elimination". Exploitation can lead to positive short-term performance effects by reducing variety and increasing efficiency, while exploration strategies focus on variance-increasing activities that allow the firm to create new knowledge that can lead to positive long-term performance effects (Uotila et al. 2009).

The complementary between innovations and collaborations

Firms rarely command the full range of expertise needed to help with their innovation strategies, leading them to reach out for opportunities to collaborate with external partners. The potential of external collaborations to facilitate knowledge-sharing and interactive learning among participating firms has been widely acknowledged (Pérez-Luño et al. 2011). External collaborations consist of a firm's interactions with external players such as customers, suppliers, universities, and governments (Dyer and Singh 1998; Laursen and Salter 2006; Tsinopoulos, Yan, and Sousa 2019). Exporting firms, in particular, have to engage with factors such as accelerated product research and development, the increased cost of interpreting market information, and greater difficulty in predicting and responding to market opportunities in high-velocity foreign markets (Chadha 2009; Morgan, Kaleka, and Katsikeas 2004). In order to counteract the liabilities of outsidership and foreignness, exporting firms often develop external collaborations (He and Wei 2013; Johanson and Vahlne 2009).

The importance of firms establishing external collaborations to succeed in foreign markets is also consistent with the network literature. The reliance on external collaborations is so crucial that the term "liability of outsidership" has been coined to describe the disadvantages of internationalizing without an appropriate network (Johanson and Vahlne 2009). Specifically, it has been shown that network relationships can help a firm in their international operations by providing them with connections and opportunities (Coviello and Munro 1997; Ojala 2009), by helping them to deal with the liabilities of outsidership and foreignness (Johanson and Vahlne 2009), and enhancing a firm's knowledge base and accelerating its learning processes (Casillas et al. 2009).

Domestic and international partners differ widely in their national innovation systems,

managerial practices, norms, and values. As such, they exert distinctive influences on knowledge recombination processes and should be treated separately (Jin, Zhou, and Wang 2016; Scalera, Perri, and Hannigan 2018). Therefore, whether a firm engages in domestic or international collaboration is expected to be highly relevant to knowledge generation and transfer (Frenz and Ietto-Gillies 2009) and to have unique implications on its ability to integrate new knowledge inputs into its innovation process (Scalera, Perri, and Hannigan 2018).

Domestic collaboration involves a knowledge search within a firm's national boundaries (Wu and Wu 2014) but has the benefit of easily-formed and well-communicated relationships (Patel et al. 2014). Nevertheless, being derived from the same innovation system of which the firm is a part, domestic collaboration places constraints on the novelty of knowledge combinations (Hsieh et al. 2018) and can induce inertia that holds firms back from implementing fundamental changes to their underlying processes, routines, and structures (Hsieh et al. 2018; Wu and Wu 2014).

International collaboration, on the other hand, involves a knowledge search beyond a firm's national boundaries. This type of collaboration may cause excessive information noise when compared with domestic collaboration since international collaboration presents greater coordination challenges (Hsieh et al. 2018), and the diversity of collaboration partners can create exponentially increasing difficulties and challenges (Wirsich et al. 2016). Nevertheless, international collaboration allows firms access to partners with heterogeneous knowledge and potentially more advanced or specialized technologies from separate national innovation systems, allowing the firm to expand its knowledge base (Hsieh et al. 2018; Wu and Wu 2014). This exposure to a greater range of heterogeneous knowledge promotes learning and enhances the firm's capability of developing innovative products (van Beers and Zand 2014; Zahra, Ireland, and Hitt 2000).

As firms develop their innovation strategies, the increased complexity of knowledge bases necessary to develop such strategies encourages them to explore new knowledge beyond their boundaries (de Faria, Lima, and Santos 2010). Collaborating with external partners enables firms to access knowledge and information that may not be available internally. Such a type of collaboration will enhance a firm's innovative abilities and help improve its performance. Research in the network literature argues that a firm's resulting performance is contingent on its social structure due to focusing on the external partners with whom the firm collaborates (Echols and Tsai 2005). Hence, when a firm makes a decision regarding its innovation strategy, it must take into account the social context in which it interacts with other external partners.

Through collaboration with external partners, a firm involves itself in an inter-firm network (Echols and Tsai 2005), which permits access to knowledge and information that can leverage its current knowledge (Lin et al. 2017) and enhance the effects of innovative activities on the firm's performance (Becker and Dietz 2004; Nieto and Santamaría 2007). These effects should be particularly salient in an export context due to the need to overcome the liabilities of outsidership and foreignness. Thus, we contend that the firm's cooperation with external partners (domestic and international) sets the boundary conditions of the impact of exploitation and exploration on the firm's performance in export markets (see Figure 1). Finally, considering that exploitation and exploration have distinctive short- and long-term implications as the former is responsive to current market demands while the latter is adaptive to future market changes (Lisboa, Skarmeas, and Lages 2013), our hypotheses feature two different time periods: exploitation at time T and exploration at time T-1.

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HYPOTHESES DEVELOPMENT

The impact of exploitation and exploration on export sales growth

A firm that adopts exploitation can draw on its experience-based learning and existing resources to ensure low-risk and immediate sales growth when extending operations overseas. As such, firms focusing on exploitation are associated with deepening value delivery within an existing clientele (Yalcinkaya, Calantone, and Griffith 2007) based on experiential learning. Such learning manifests in the form of close monitoring of current customers' requirements, information about existing markets, the competitive products and services in current market domains, and established market linkages (Lisboa, Skarmeas, and Lages 2013). This learning process ensures appropriate and efficient utilization of a firm's current expertise and knowledge, such that the firm's existing products, services, or methods can be adapted (Dasí, Iborra, and Safón 2015) with better quality and/or cost efficiency to enhance the consumption experience of existing customers (Menguc, Auh, and Yannopoulos 2014). Therefore, exporting firms focusing on exploitation can benefit from improved quality and efficiency by fine-tuning their well-defined but limited product-market solutions that are closely related to the firm's past experiences (Li, Chu, and Lin 2010), which in turn helps the firm grow its export sales revenues.

Significantly, we expect that this positive effect of exploitation is an immediate one for two reasons. First, experiential learning is easier to turn into incremental actions (Mathias et al. 2018). Second, the benefits of exploitation from its improvement of quality and efficiency can be delivered to the market in a relatively short period of time and received by target customers quickly (Uotila et al. 2009). Hence, we propose the following:

H1. Exploitation (T) is positively associated with export sales growth (T).

Exploration pertains to search, discovery, novelty, innovation, and trial and error (Holmqvist 2004), which relies on an experimental learning process (Gupta et al. 2006). Due to its emphasis on experimentation and risk-taking, it allows firms to learn from searching for new or unrecognized customer needs, identifying novel solutions, and generating value from expansion into untapped market opportunities (Lisboa, Skarmeas, and Lages 2013; Mueller, Rosenbusch, and Bausch 2013). It focuses on the learning process to enable the creation of radically new products and services that have not yet been commercialized to generate value by developing new technologies and expanding product ranges to respond to new opportunities.

Exploration is also important for creating demand abroad by continually differentiating products and solutions from competitors' offerings (Fiol and Lyles 1985; Katila and Ahuja 2002) and entering new markets. Firms that pursue distinct and influential innovations have the highest likelihood of attaining positions of market and technological leadership (Wu and Shanley 2009). Therefore, exporting firms that rely on exploration are able to drive export market demands and enhance export sales by offering more new products to shape and address customers' preferences more effectively than existing products, services (Boso et al. 2013), or competitors (Atuahene-Gima and Murray 2007) and expand the market base. Moreover, we expect that this positive effect of exploration on export sales growth is a long-term one for two reasons. First, it takes time for firms to undertake searching and experimental learning (Mathias et al. 2018). Second, it also takes time for firms to materialize what they have learned and realize explorative innovations, for instance, the development/expansion of products and expansion of markets (Lisboa et al. 2013). Accordingly, we suggest the following:

H2. Exploration (T-1) is positively associated with export sales growth (T).

Domestic collaboration

The networking perspective emphasizes the importance of external partners in influencing a firm's performance output (Dimitratos et al. 2014). Networks can facilitate a firm's learning by allowing it to access necessary knowledge and information, particularly when the firm intends to operate in foreign markets (Johanson and Vahlne 2009). In our study, we also propose that collaboration can influence the effects of a firm's learning processes of exploitation and exploration on their export sales growth, as hypothesized in H1 and H2. We differentiate collaborations, based on their geographic location, into domestic and international ones, which can impact the learning processes and the outcome differently (Jin, Zhou, and Wang 2016; Scalera, Perri, and Hannigan 2018).

Domestic collaboration represents networks with partners within a firm's national boundaries. Domestic collaboration has been found to be able to provide relationships that are easier to establish and communicate with (Pantel et al. 2014; Wu and Wu 2014) to help the firm's international operations (Milanov and Fernhaber 2014; Preece, Miles, and Baetz 1999). It can also limit the variety and novelty of learning and knowledge (Hsieh et al. 2018) and induce inertia that dampens a firm's efforts at implementing fundamental changes in processes, practices, and systems (Hsieh et al. 2018; Wu and Wu 2014).

Firms focusing on exploitation carry out experiential learning that is associated with a high level of self-reflection and less tolerance of information noise (Rowley, Behrens, and Krackhardt 2000). In this learning process, they assimilate familiar knowledge bases to secure efficiency both in time and cost (Hortinha, Lages, and Lages 2011; Lisboa, Skarmeas, and Lages 2011) and prepare exportable, market-ready improved products within the shortest possible time. In this case, domestic collaboration is expected to enhance the positive impact of exploitation on export sales growth by offering a manageable "twist" in terms of knowledge recombination possibilities. Specifically, domestic collaborators share the same

institutional framework with the focal firm in terms of sets of common habits, routines, established practices, institutional environments, and competitive demands (Boschma 2005; Sirmon and Lane 2004). Therefore, domestic networks facilitate communication and information exchange (Milanov and Fernhaber 2014) to guarantee fast learning in exploitation to achieve efficiency of production and product improvement.

Hence, we predict that collaboration with domestic partners assists knowledge-transfer and absorption that efficiently enhance a firm's exploitation in its efforts to respond to export customer demands and grow its export sales revenues.

H3: Domestic collaboration (T) strengthens the positive relationship between exploitation (T) and export sales growth (T).

On the other hand, network partners residing in the same national innovation system are highly routinized and conservative due to their interdependent structural positions (Boschma 2005). This makes it less likely to stimulate fundamental changes in a firm's underlying processes, practices, routines, and structures (Hsieh et al. 2018; Wu and Wu 2014) that are critical for those firms that pursue an explorative strategy. Moreover, domestic collaboration is more likely to facilitate the generation of redundant knowledge due to innovation system overlaps (Garcia Martinez et al. 2018; Wirsich et al. 2016). This situation obstructs novel knowledge combinations for exploration (Scalera, Perri, and Hannigan 2018), making disruptive product offerings and new market entry less likely. As such, domestic collaboration hinders the effect of exploration that requires completely new knowledge and skills, new organizational arrangements, or new institutions (Boschma 2005). As a result, domestic collaboration can erode the distinctiveness of exploration that drives sales in the export market. This leads us to the following hypothesis:

H4: Domestic collaboration (T-1) weakens the positive relationship between exploration (T-1) and export sales growth (T).

International collaboration

International collaboration involves interactions with partners beyond the firm's national boundaries. In comparison with domestic collaboration, international collaboration is relatively more difficult to develop and communicate about because international partnerships with variegated members frequently face hurdles such as difficult challenges related to informational noise and coordination (Hsieh et al. 2018; Wirsich et al. 2016). Effective solutions to these issues are not always time-efficient. However, international collaboration also offers firms the chance to gain heterogeneous knowledge from their international partners (Hsieh et al. 2018; Wu and Wu 2014) to enrich their learning process and knowledge base (van Beers and Zand 2014) for explorative innovations. We propose that international collaboration has the potential to influence the effects of exploitation and exploration on export sales growth differently.

International collaboration is expected to weaken the positive impact of exploitation on export sales growth. Firms focusing on exploitation usually engage in experiential learning for incremental firm renewal and small deviations from current knowledge (Lisboa, Skarmeas, and Lages 2013) with less tolerance of information noise (Rowley, Behrens, and Krackhardt 2000). What is important in this learning process is that the absorption of convenient knowledge is time- and cost-effective (Hortinha, Lages, and Lages 2011; Lisboa, Skarmeas, and Lages 2011) in producing and delivering improved products. However, international collaboration is not as conducive to this process for two reasons.

First, collaborators from other countries present heterogeneous institutional frameworks in

terms of different sets of languages, common habits, routines, and established practices and rules or laws (Boschma 2005; Erkelens et al. 2015). This setting complicates and prolongs the processing of communication and information exchange (Milanov and Fernhaber 2014), which is instrumental in efficient learning for exploitation. As a result, the efficiency of improvement of both product and production can be delayed.

Second, although international collaboration allows firms to tap into knowledge exhibiting multinational diversity (Wu and Wu 2014), it may not be beneficial for a firm focusing on current knowledge domains and convergent thinking with an intention to achieve improvement along existing product-market domains. Hence, we predict that collaboration with international partners may harm a firm's exploitation efforts to grow export sales through quick learning and efficiency enhancement. Therefore, we have posited the following:

H5: International collaboration (T) weakens the positive relationship between exploitation (T) and export sales growth (T).

On the other hand, international collaboration offers diverse and specialized forms of knowledge stemming from separate innovation systems abroad (Hsieh et al. 2018) such that the ideas, perspectives, and technologies being offered differ considerably in their characteristics compared with those available domestically (Kafouros and Forsans 2012; van Beers and Zand 2014). Such heterogeneous knowledge provides more potential opportunities for truly novel and valuable combinations of knowledge by evoking "kaleidoscopic thinking" (Jung 2016; Wu and Wu 2014; Zhou and Li 2012). Kaleidoscopic thinking denotes behaviors that link to a combination of knowledge bases from a variety of disciplines and heterogeneous market domains in unprecedented ways, which generate breakthrough ideas (Wu and Shanley

2009; Zhou and Li 2012).

Having a greater number of combination opportunities enhances the performance benefits of exploration by generating novel insights relating to problem identification, formulation, and solution (Wu and Shanley 2009). This helps firms to overcome their embeddedness in existing search and learning trajectories and gives rise to innovation breakthroughs, creating new demand in both existing and new export markets. In addition, through broad international collaboration, firms can access an abundance of direct and reciprocal feedback regarding the design of new features and processes (Salomon and Shaver 2005), which enhances the compatibility of exploration with foreign customers' needs, thereby enabling export sales growth. Thus, we suggest the following:

H6: International collaboration (T-1) strengthens the positive relationship between exploration (T-1) and export sales growth (T).

METHODOLOGY

Data

Three waves of the firm-level UK Community Innovation Survey (CIS 8, 9, and 10) conducted by the UK Office for National Statistics (ONS) covering the years 2010-2016 were used to test the framework proposed in this research. The focus of the CIS is on general business and economic information, products, service and process innovation, and innovation-related activities such as changes in business strategy and practices. The survey covered UK enterprises with ten or more employees in sections C-K of the Standard Industrial Classification (SIC) 2007. The sample was drawn from the ONS Inter-Departmental Business Register (IDBR). The survey was voluntary and conducted every two years, with an average

sample size of 29,525 firms across CIS 8, 9, and 10 via a postal questionnaire, and a follow-up telephone interview for businesses that had not yet completed their postal responses.

A response rate of 51 percent was achieved in both CIS 8 and CIS 9; and 43 percent was achieved in CIS 10. The responses were weighted back to the total business population of those in the IDBR in order to be representative of the population of the firms. Weighting was used to compensate for the businesses that did not respond to the survey and those not selected for the sample. Businesses were not weighted by factors that would give more weight to larger firms, such as employment or turnover, in order to further ensure their representativeness of the UK enterprise population (Tsinopoulos, Sousa, and Yan 2018). They were weighted based on business weights (frequency weights that indicate the number of enterprises a respondent represents within their strata) or employment weights (frequency weights that indicate the number of enterprises a respondent represents according to the number of employees in their business and the total number of employees within their strata from IDBR). Covering all manufacturing sectors and most private services as well as small, medium, and large firms, the CIS provides the most comprehensive data in terms of the range of firms surveyed. On average, each respondent represented 12 enterprises in the population. Furthermore, all the information contained in the surveys is subject to strict controls for validity and consistency.

A frequently accepted period for the effect of an innovation to materialize is two years (Salomon and Shaver 2005; Tsinopoulos, Sousa, and Yan 2018). However, exploitation improves the effectiveness and efficiency of existing core capabilities and leads to short-term effects (Belderbos et al. 2010; Lisboa, Skarmeas, and Lages 2013), while exploration requires a longer completion time due to the complexity of adopting new techniques. As such, our hypotheses feature two different time-periods for exploitation and exploration. Exploration is

lagged by one survey period and is measured using survey period T-1 to allow a longer time period for the effects of it to materialize, while exploitation is measured using survey period T to reflect its relatively immediate impact.

The obtained sample constitutes an unbalanced panel because a stratified design drawn from the IDBR with a Neyman allocation was used to determine the sample size in each stratum. Overall, approximately 10 percent of the target population was sampled in each survey, and therefore, the firms constituting the sample varied across the surveys. The same firm could participate in one, two, or all three waves depending on whether it had been included in the sample for each CIS. We merged the datasets across three waves using an unique firm identifier to generate a single dataset for analysis. Since this study specifically targeted exporting firms, we identified these as companies reporting a positive value of export sales. A final sample of 1,590 exporting firms was obtained for the model featuring time period T-1 and 1,650 exporting firms for the model featuring time period T, with an average of 258 employees and covering several industries.

Variables and measures

Our measures were based on the previous research. Table 1 provides information regarding the operationalization of the different constructs.

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Dependent variable. Our empirical model measured export sales growth using percentage change in export sales over one survey period. Two export sales growth measurements were obtained for each company based on the change between the time periods of CIS 8, 9 and CIS 9, 10.

Independent variables. The operationalization of exploitation and exploration were adapted from He and Wong (2004). The items were selected to measure how important it is for a firm to carry out innovation activities to enter new product-market domains or to improve existing product-market efficiency (e.g., increase the range of goods or services [exploration] vs. improve the existing quality [exploitation]; enter new markets [exploration] vs. reduce the cost per unit produced [exploitation]).

Moderator variables. We elaborated on Frenz and Ietto-Gillies (2009) and introduced two variables that reflected the breadth of domestic and international collaborations. Domestic collaboration is measured by adding the number of external parties with which firms reported cooperating on a UK regional or national basis. International collaboration was measured by adding the number of external parties with which firms reported cooperating on an international (outside the UK) basis.

Control variables. We controlled for past export intensity, geographic diversity, foreign funding, R&D intensity, firm size, born-global, product innovation intensity, survey year, and the industry to address concerns regarding the potential endogeneity of the exploitation and exploration measures and other firm-level unobserved heterogeneity (see Table 1 for measurement).

Method of analysis

We used Structural Equation Modelling (SEM) in Stata 14.0 to test our hypotheses. This is most appropriate when the research model is driven by strong theoretical foundations (Richter et al. 2016), such as in our study. It offers further advantages over conventional regression and causal path analyses.

First, it allows the use of latent constructs with multiple indicators to measure exploitation and exploration, which is consistent with He and Wong's (2004) modeling of exploitation and exploration as latent variables. Second, SEM allows the simultaneous estimation of multiple relationships between observed and latent constructs, and accounts for measurement errors (Ambos, Andersson, and Birkinshaw 2010). We first conducted a confirmatory factor analysis (CFA) assessing the validity of the measurement model and the discriminant validity of individual constructs (exploitation and exploration). Next, we fitted a structure model to estimate the path coefficients for the control variables and the main effects concerning H1 and H2 for time periods T and T-1, respectively. We then created single indicants to estimate the interactions between innovation strategies and collaborations, and utilized conventional product-term analysis to test for moderation effects (Ping 1995).

Descriptive statistics

We have provided a correlation matrix and summary statistics among the variables in Tables 2a and 2b, based on the time period T-1 and T, respectively. They show that, on average, the R&D intensity in our sample was 4.54 percent at T-1 and 4.85 percent at T. These are higher than the UK average, which was 1.1 percent in the year 2012, according to the UK ONS. This corroborates the claim that exporters are more innovative than non-exporters (Love and Roper 2015; Monreal-Pérez, Aragón-Sánchez, and Sánchez-Marín 2012).

We also found no confounding effects of the independent variables with the dependent variable across both time periods, T-1 and T, because there are no significant correlations between them. We then tested the multicollinearity effects and reported the variance inflation factor (VIF) (see Tables 2a and 2b). The maximum VIF is 1.62 for time period T-1 and 1.53 for time period T, which are lower than the threshold of 10, indicating that multicollinearity is

not a concern (Baum 2006).

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Insert Table 2a and 2b about here
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Measure validation

Table 3 provides further evidence of the scale reliability, convergent validity, and discriminant validity of the measurement model at both time-periods, T-1 and T.

****
Insert Table 3 about here
****

CFA was used to assess the validity of all the multi-item constructs. The composite reliability of the indicators of each construct was acceptable, with values all higher than .70 (Bagozzi and Yi 1988). A good discriminant validity of measurement scales was supported because the average variance explained (AVE) was above the recommended level of .50 (Fornell and Larcker 1981). Additionally, convergent validity was established by the large and significant standardized loadings ($p < .01$) of each observed indicator (or item) for the respective constructs (Shoham 1999), indicating highly significant loadings (Boehe and Cruz 2010). Discriminant validity was established by the fact that the shared variance between any two constructs (i.e., the square of their inter-correlation) was less than the average variance explained in the items by the construct (Fornell and Larcker 1981), indicating that the focused construct was different from the other constructs (Ambos, Andersson, and Birkinshaw 2010).

Taken together, the exploitation and exploration constructs are homogeneous. Further evidence for the validity of our exploitation and exploration constructs is reflected in the goodness-of-fit statistics for the measurement model for both time periods. Specifically, at time T-1, the chi-square test, comparative fit index (CFI), and the root mean square error of approximation index (RMSEA) were as follows: $\chi 2$ (df) = 141.73 (4); p = .00; CFI = .99 and

RMSEA = .06. At time T, the results were: $\chi 2$ (*df*) = 283.64 (4); p = .00; CFI = .97 and RMSEA = .07.

Testing of hypotheses

Tables 4a and 4b present the results of our conceptual framework testing with SEM for time periods T-1 and T, respectively. Specifically, Table 4a examines H2, H4, and H6, while Table 4b examines H1, H4, and H5. The results reveal that H1, H2, H3, H5, and H6 are supported, whereas H4 is not supported.

****
Insert Table 4a and Table 4b about here
****

Model 1 in Tables 4a and 4b includes all the control variables for time periods T-1 and T. Model 2 estimates the main effect model. The results in Table 4b indicate that the exploitation–export sales growth path estimate was positive and significant (path coefficient = .05, p = .02), showing that exploitation leads to an immediate increase in export sales growth, thus supporting H1. Regarding H2, the results in Table 4a indicate that the exploration–export sales growth path estimate was positive and significant (path coefficient = .07, p = .01). This means that lagged exploration leads to an increase in export sales growth, thereby supporting H2.

In terms of the moderating effects, Models 3 and 4 in Table 4b indicate that domestic collaboration is beneficial to export sales growth for exploitation (path coefficient = .02, p = .05). However, international collaboration is damaging to export sales growth for exploitation (path coefficient = -.04, p = .02), thereby providing support for H3 and H5. Further evidence is provided in Figures 2a and 2b, showing that domestic collaboration enhances, but international collaboration weakens, the positive relationship between

exploitation and export sales growth.

****
Insert Figure 2a and 2b about here
****

Next, we present the results regarding the moderating impact of external collaborations on the relationship between lagged exploration and export sales growth. The result of Model 5 in Table 4a suggests that domestic collaboration does not affect lagged exploration (path coefficient = .00, p = .91), thereby failing to support H4. Finally, Model 6 in Table 4a shows that international collaboration is beneficial to export sales growth for lagged exploration (path coefficient = .04, p = .07), which is consistent with H6. Further evidence is provided in Figure 2c, showing that international collaboration enhances the positive relationship between lagged exploration and export sales growth.

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Insert Figure 2c about here
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Short- and long-term effects

In order to further examine whether the theoretical effects vary over time, Table 5 presents a comparison of the short- and long-term effects of exploitation and exploration, as well as the moderating effects of domestic and international collaborations on export sales growth.

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Insert Table 5 about here
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Comparing the short- and long-term effects, we found that:

- The effect of exploitation on export sales growth varies over time. Specifically, the effect is negative in the long-term (time T-1) but positive in the short-term (time T).

- The effect of exploration on export sales growth varies over time. Specifically, the effect is positive in the long-term (time T-1) but is not significant in the short-term (time T).

- Domestic collaboration is beneficial to the exploitation-export sales growth relationship over time. Specifically, it weakens the negative effect of exploitation on export sales growth in the long-term (time T-1) and strengthens the positive effect of exploitation on export sales growth in the short-term (time T).

- International collaboration is beneficial to the exploitation-export sales growth relationship in the long-term (time T-1) but is detrimental in the short-term (time T). Specifically, it weakens the negative effect of exploitation on export sales growth in the long-term (time T-1) and weakens the positive effect of exploitation on export sales growth in the short-term (time T).

- Domestic collaboration has no influence on the exploration-export sales growth relationship both in the short- and long-terms.

- International collaboration is beneficial to the exploration-export sales growth relationship over time. Specifically, it strengthens the positive effect of exploration on export sales growth in the long-term (time T-1) and the effect of exploration on export sales growth in the short-term (time T).

Competing models

Several competing models were examined. Specifically, we tested innovation ambidexterity's impact on export sales growth and the results are summarized in Table 6, based on time period T-1. Models 1 and 2 show that the interaction effects between lagged exploitation and exploration on export sales growth are positive and significant (path coefficient = .05, p = .00)

whereas the absolute difference between the two lagged innovation strategies is not significant (path coefficient = -.01, p = .50). Overall, we only found support for the possibilities of "fit as moderating" but not the "fit as matching" hypotheses as competing models[1]. Although lagged exploitation and exploration add value to each other to improve export sales growth, placing relatively equal emphasis on both does not influence export sales growth in the long-term.

****
Insert Table 6 about here
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The moderating effect of total collaboration (the sum of domestic and international collaborations) was tested, and the results (see Table 7) revealed that total collaboration positively moderates lagged exploitation (path coefficient = .02, p = .00) and lagged exploration (path coefficient = .02, p = .06). This is consistent with the findings of our main conceptual model[2], which shows that drawing from a higher number of external collaboration sources weakens the negative effect of exploitation on export sales, while it strengthens the positive effect of exploration on export sales growth in the long-term.

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Insert Table 7 about here
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We further examined whether lagged exploitation and exploration might lead to export sales growth subject to the mediating effect of product innovation intensity (He and Wong, 2004). The results in Table 8 show that lagged exploitation significantly influences product innovation intensity (path coefficient = .02, p = .01), whereas lagged exploration is found not

[1] For time period T, we found neither support for "fit as moderating" nor "fit as matching" hypotheses as competing models.
[2] For time period T, we found total collaboration to have had no significant moderating effect on exploitation and exploration. This is consistent with the findings of our main conceptual model. We also found similar results to time period T-1, that exploitation and exploration do not lead to export sales growth subject to the mediating effect of product innovation intensity.

to impact product innovation intensity (path coefficient = -.02, p = .14). Model 1 in Table 4a shows that product innovation intensity appears not to significantly influence export sales growth (path coefficient = -.06, p = .17). Therefore, the relationships between the two lagged innovation strategies and export sales growth are not subject to the mediating effect of product innovation intensity[3].

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Insert Table 8 about here
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DISCUSSION AND CONCLUSIONS

Our research was motivated by the underdeveloped state of the research on the impact of exploitation and exploration on exporting firms in the short- and long-terms and the possible roles external collaborations may play in influencing these relationships. In addition, the debate on whether exploitation and exploration are complimentary or non-complimentary, and whether they are continuous or orthogonal, has been ongoing (Andriopoulos and Lewis 2009; Gibson and Birkinshaw 2004). This research follows the orthogonal approach and applies the organizational learning theory and the network literature to address two important questions: what are the relationships of firms' exploitation and exploration with export sales growth with consideration of the time effect, and how do domestic and international collaborations influence these relationships?

Our findings provide new insights into the impact of exploitation and exploration on performance outcomes in the exporting context. They reveal that the effect of exploitation and exploration on export sales growth varies over time. Specifically, in the case of exploitation

[3] For time period T, we found similar results showing exploitation and exploration and export sales are not subject to the mediating effect of product innovation intensity.

the effect is negative in the long-term but becomes positive in the short-term, while exploration has no significant effect in the short-term, but a positive influence on export sales growth was observed in the long-term. In relation to the influence of external collaborations (domestic and international), our findings demonstrate that domestic and international collaborations weaken the negative effect of exploitation on export sales growth in the long-term. This means that both types of external collaborations ease the knowledge and resource constraints faced by exporting firms when focusing on exploitation to achieve superior export sales growth in the long term. We further discovered that in the short-term, domestic collaboration strengthens the positive effect of exploitation on export sales growth, while international collaboration has a negative influence.

Additionally, the study found no evidence that domestic collaboration influences the effect of exploration on export sales growth in either the long- or short-term. This may be the case because domestic collaboration is more likely to yield redundant knowledge, which offers no real value to the development of exploration due to innovation system overlaps. However, international collaboration positively moderates the exploration-export sales growth relationship in the long- and short-term. This demonstrates that the "collaboration-fits-all" approach is not a universal one for all innovation strategies.

Theoretical implications

This study adds to the literature in two ways. First, it investigates the influence of exploitation and exploration on firms' export outcomes in term of export sales growth, which is an indicator of the health of a firm's export operations, conceptualized and operationalized as the percentage change in export sales over time (Assadinia et al. 2019; Chen, Sousa, and He 2019). Although exploitation and exploration have drawn growing attention in management

and marketing research, this knowledge in the international marketing context is relatively limited (Pinho and Prange 2016; Sharma, Nguyen, and Crick 2018). Organizational learning is particularly important for firms that want to achieve superior performance in international markets, which are characterized by high-levels of uncertainty, competition, and complexity of markets across their social, economic, cultural, political, and technological aspects (İpek 2019; Tse, Yu, and Zhu 2017). In this setting, firms need to employ exploitation and exploration to remain adaptive to the changing market environment (Lisboa, Skarmeas, and Lages 2011).

Furthermore, this research contributes to the literature by showing that the effects of exploitation and exploration vary over time. Exploitation results in positive short-term performance effects through variety reduction and efficiency improvement, while exploration emphasizes activities that enhance variance and therefore enable firms to generate new knowledge for positive long-term performance (Auh and Menguc 2005; Lisboa, Skarmeas, and Lages 2013; Uotila et al. 2009). While these aspects have been acknowledged in past research, empirical testing has been lacking. In this study, we address this gap by taking into account that exploitation is more short-term oriented and exploration is more long-term oriented, and by applying different time lags for exploitation and exploration.

Second, this research expands the literature by inquiring into the moderating effect of external collaborations via exploration of the distinction between domestic and international collaborations from the networking perspective (Casillas et al. 2009; Coviello and Munro 1997; Ojala 2009). Collaborations of domestic and international scopes are important sources from which firms may learn from outside the organization to enhance innovation (Scalera, Perri, and Hannigan 2018). These are particularly important for international firms as these channels and sources of learning are located in different systems across borders (Frenz and Ietto-Gillies 2009; van Beers and Zand 2014). This research adds to the literature by

providing a fine-grained approach to the distinctive impact of both types of external collaborations, namely domestic and international collaborations, on shared learning to influence the innovation-performance link. Moreover, this research extends previous studies that had largely considered market-level moderators (Jin, Zhou, and Wang 2016; Mueller, Rosenbusch, and Bausch 2013), and therefore adds a valuable effort to examine more nuanced and detailed associations between exploitation and exploration.

Implications for managers and policy makers

Managers of exporting companies and policy makers can benefit from this study in several ways. First, our research finds no evidence of ambidexterity in exploitation and exploration, which means that, although firms can implement both strategies, they are not necessarily complementary. Nevertheless, our advice is for firms to implement both because they are particularly beneficial when firms sell into international markets characterized by uncertainty. On the one hand, they can carry out exploitation via improving current product-market efficiency through enhancing and refining current set of skills and processes to obtain "safe" returns. On the other hand, they can undertake exploration by developing capabilities in research, discovery, and experimentation to win new product-market opportunities.

Second, managers need to understand that exploitation and exploration have different time effects in influencing export sales growth. Exploitation's effect is positive for the short-term but will become detrimental in the long-term. Exploration does not improve export sales growth immediately, but its positive effect will materialize in the long-term. Therefore, it is critically important for managers to allocate investment for both exploitation and exploration efforts because they demonstrate different time effects on export sales growth.

Third, managers need to carefully configure their use of domestic and international collaborations to align with their exploitation and exploration for better export performance. Our research reveals four scenarios for them as follows: (i) Firms need to expand the variety of their domestic collaborations when pursuing exploitation to drive export sales growth in the short-term. Domestic collaboration is also helpful in mitigating the long-term negative effect of exploitation on export sales growth; (ii) Domestic collaboration does not help to improve exploration's positive effect on export sales growth, either immediately or over time; (iii) International collaboration is a double-edged sword for exploitation because it helps firms diminish the harmful impact of exploitation on export sales over time on one hand, but, on the other hand, it dampens the positive short-term effect of exploitation on export sales; (iv) International collaboration is useful in helping exploration to exert a positive effect on export sales growth in both the short and long-terms.

Fourth, policy makers can design policies to incentivize businesses to undertake both exploitation and exploration. In designing these incentives, policy-makers need to understand firms that receive incentive packages for their exploitation will have short-term improvement in export sales growth; businesses that use the incentives for exploitation will take longer to show positive export sales growth. Moreover, policy-makers need to actively establish and employ policies that boost businesses' collaborations with domestic and international entities (e.g., through government programs) to help firms benefit from their exploration and exploitation. In particular, these policies can be designed in such a way as to incentivize and assist exporting firms that intensively engage with exploitation/exploration to establish and expand a wide domestic/international collaboration. This should have significant positive performance implications for the international competitiveness of local firms.

Limitations and recommendations for future research

Notwithstanding its theoretical and managerial contributions, this study is not without its limitations that could serve as starting points for future research. First, the use of a two-year-lagged structure considerably improves precision when assessing the causality between exploration, domestic and international collaboration, and export sales growth. Although an accepted period for the results of innovation to materialize is two years (Salomon and Shaver 2005; Tsinopoulos, Sousa, and Yan 2018), an extended period could be used to further capture changes in the tendency towards exploration and the use of domestic and international collaborations over time.

Second, we empirically tested our hypotheses in only one country, but researchers are encouraged to conduct future studies in other countries, especially emerging markets, to validate our findings. For example, it has been shown that in emerging markets such as China, the alignment of "guanxi" with channel members can enhance the effect of exploitation and exploration on business performance (Chen, Huang, and Lin 2012; Chung, Yang, and Huang 2015). In this case, firms establish external collaborations based on close personal ties, making external collaboration choices (domestic and international) more limited and selective.

Finally, future studies could also examine the importance of other moderating factors not considered in the current study. For instance, a fruitful direction for future studies would be to explore the impact of managers' individual values, which have been found to play a major role in the firm's export activities (Sousa, Ruzo, and Losada 2010). Export experience-related factors could also be of interest because more experienced firms are in a better position to concentrate their efforts on the most profitable opportunities available in the overseas market (Bernini, Du, and Love 2016; Sousa and Tan 2015).

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Figure 1: Conceptual Model

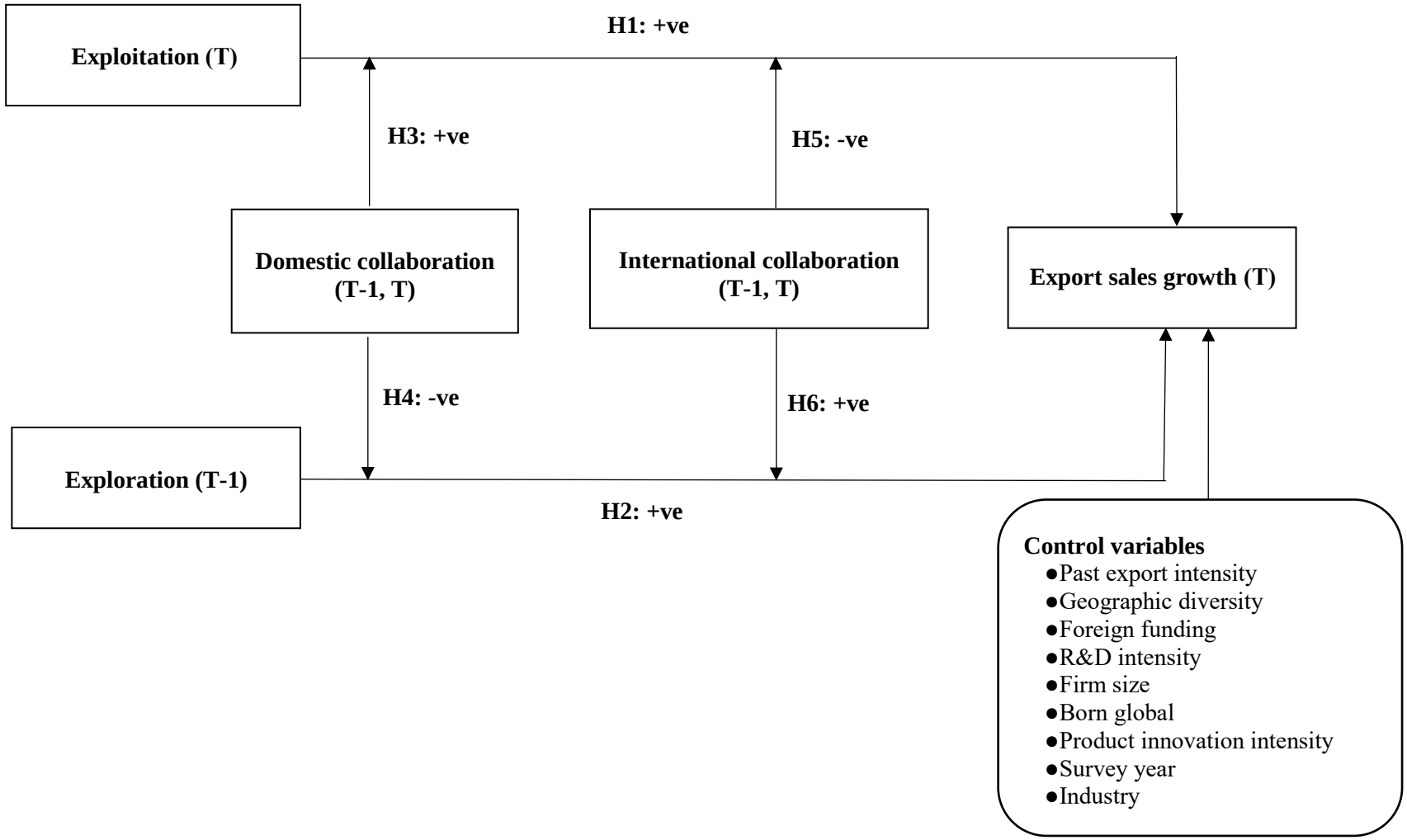

Table 1: Measurement of Constructs

Construct	Measurement
Exploitation	"During the 3-year period, how important were each of the following factors in your decisions to innovate in goods or service and/or processes?" (1 ="low", 2 = "medium" and 3 = "high"). EXPLOIT1: Improve quality of goods or services EXPLOIT2: Improve flexibility for producing goods or services EXPLOIT3: Improve capacity for producing goods or services EXPLOIT4: Reduce cost per unit produced or provided
Exploration	"During the 3-year period, how important were each of the following factors in your decisions to innovate in goods or service and/or processes?" (1 ="low", 2 = "medium" and 3 = "high"). EXPLORA1: Increase range of goods or services EXPLORA2: Enter new markets
Domestic collaboration	"During the 3-year period, did your business co-operate on any innovation activities with any of the following?" Firms confirm having such cooperation in any of the two geographical areas ("UK regional", "UK national") with any of the seven partners listed below are coded as 1 or 0 otherwise. Subsequently, the seven types of domestic collaboration are added up so that a higher number indicates the level of domestic collaboration is higher.
International collaboration	"During the 3-year period, did your business co-operate on any innovation activities with any of the following?" Firms confirm having such cooperation in any of the two geographical areas ("European Countries", "Other Countries") with any of the seven partners listed below are coded as 1 or 0 otherwise. Subsequently, the seven types of international collaboration are added up so that a higher number indicates the level of international collaboration is higher. *Partners list: (a. suppliers of equipment, materials, services or software; b. clients or customers from the private sector; c. clients or customers from the public sector; d. competitors or other businesses in your industry; e. consultants, commercial labs, or private R&D institutes; f. universities or other higher education institutions; g. government or public research insti*tutes)
Export sales growth	Percentage change in export sales over one survey period
Past export intensity	Share of export sales over total sales
Geographic diversity	A score of 1 is given to firms operating in both European countries and other foreign countries and 0 for those who only operates in either European countries or other foreign countries.
Foreign funding	A score of 1 is given to firms receiving public financial support for innovation activities from European Union institutions, programs or from other levels of government abroad.

Table 1. cont.

R&D intensity (log)	Natural logarithm of R&D expenditures divided by total sales
Firm size	Natural logarithm of total number of employees
Born Global	A score of 1 is given to exporting firms that are newly established and have accrued at least 10 percent of sales from exporting, and 0 otherwise
Product innovation intensity	The percentage of total annual sales that consist of new or significantly improved products introduced over the last three years.
Survey year (3 dummies)	A score of 1 is given to firms undertaking each year of the Community Innovation Survey and 0 for those who do not
Industry (10 dummies)	A score of 1 is given to firms operating in each of the 10 industries and 0 for those who do not respectively. *a. the manufacture of food, clothing, wood, paper, and publishing and printing; b. the manufacture of fuels, chemicals, plastic metals, and minerals; c. the manufacture of electrical and optical equipment; d. the manufacture of transport equipment; e. manufacturing not elsewhere classified; f. wholesale and retail; g. computer and digital device-related activities; h. financial intermediation; i. mining and quarrying; and j. others.*

Table 2a: Descriptive Statistics and Correlation Coefficients at Time Period T-1, Standardized

Variables	Mean	Min	Max	SD	1	2	3	4	5	6	7	8	9	10	11	12	VIF
1 Export sales growth	-.05	-.95	.86	.41	1												
2 Exploitation	.25	-2.66	1.61	.91	-.02	1											1.14
3 Exploration	.17	-1.38	.77	.55	.05*	.31*	1										1.18
4 Domestic collaboration	1.73	0	7	1.74	-.03	.15*	.23*	1									1.57
5 International collaboration	.92	0	7	1.27	-.01	.10*	.19*	.57*	1								1.62
6 Past export intensity (log)	-1.85	-10.39	0	1.48	.09*	.01	.08*	-.01	.20*	1							1.19
7 Geographic diversity	.69	0	1	.47	.06*	.02	.06*	.04	.11*	.32*	1						1.13
8 Foreign funding	.21	0	1	.41	-.04	-.05*	-.03	.04	.07*	-.04	-.01	1					1.03
9 R&D intensity (log)	-4.08	-8.30	1.95	.86	-.04	-.05*	.00	.12*	.19*	.09*	.06*	-.02	1				1.07
10 Firm size (log)	4.63	1.95	8.59	1.38	.04	.09*	-.03	.12*	.10*	-.01	.07*	.04	-.06*	1			1.05
11 Born-global	.01	0	1	.10	.03	-.01	.03	.02	-.01	.03	.01	-.03	-.01	-.06*	1		1.01
12 Product innovation intensity	.33	0	1	.27	-.03	.03	-.03	.01	.03	.04	.02	-.11*	.12*	-.08*	.04	1	1.04

Note: N = 1590; * significant at .05 level **mean VIF= 1.18**

Table 2b: Descriptive Statistics and Correlation Coefficients at Time Period T, Standardized

Variables	Mean	Min	Max	SD	1	2	3	4	5	6	7	8	9	10	11	12	VIF
1 Export sales growth	.04	-.85	1.13	.44	1												
2 Exploitation	.10	-1.56	.84	.57	.04	1											1.16
3 Exploration	.17	-1.38	.77	.55	.02	.29*	1										1.12
4 Domestic collaboration	2.12	0	7	2.01	-.01	.20*	.16*	1									1.48
5 International collaboration	1.15	0	7	1.46	.03	.13*	.13*	.53*	1								1.53
6 Past export intensity (log)	-1.88	-10.39	0	1.50	.02	.05*	.08*	-.02	.19*	1							1.17
7 Geographic diversity	.67	0	1	.47	.05	.03	.07*	.04	.12*	.30*	1						1.12
8 Foreign funding	.49	0	1	.50	-.04	-.08*	-.03	-.01	.01	-.07*	-.05*	1					1.02
9 R&D intensity (log)	-3.94	-7.87	1.95	.79	-.05	.01	.04	.11*	.20*	.08*	.04	-.05	1				1.06
10 Firm size (log)	4.63	1.81	8.78	1.09	.01	.12*	.01	.09*	.09*	-.01	.09*	.03	-.08*	1			1.05
11 Born-global	.01	0	1	.10	.02	.01	.01	.02	.02	.03	-.02	.02	.04	-.05	1		1.01
12 Product innovation intensity	.22	0	1	.21	-.02	.14*	.10*	.14*	.13*	.08*	.04	-.05*	.11*	-.05*	.02	1	1.06

Note: N = 1650; * significant at .05 level **mean VIF= 1.16**

Table 3: Measurement Model at Time Period T-1 and T

Construct	Factor loadings		AVE		Composite reliability	
	T-1	T	T-1	T	T-1	T
Exploitation			.62	.61	.87	.86
Improve quality of goods or services	.91	.77				
Improve flexibility for producing goods or services	.76	.81				
Improve capacity for producing goods or services	.79	.85				
Reduce cost per unit produced or provided	.67	.67				
Exploration			.57	.60	.72	.75
Increase range of goods or services	.81	.81				
Enter new markets	.69	.74				

Table 4a: Main Model: Regression for Export Sales Growth Rate, Long-Term Effect

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Control Variables (T-1)						
Past export intensity	.02	.02	.02	.02	.02	.02
	(3.10***)	(2.74***)	(2.81***)	(2.81***)	(2.79***)	(2.89***)
Geographic diversity	.04	.03	.03	.03	.03	.02
	(1.52)	(1.41)	(1.17)	(1.10)	(1.10)	(1.00)
Foreign funding	-.01	-.01	-.01	-.02	-.01	-.01
	(-.19)	(-.19)	(-.18)	(-.11)	(-.13)	(-.14)
R&D intensity	-.02	-.01	-.01	-.01	-.01	-.01
	(-1.22)	(-1.07)	(-.97)	(-.90)	(-.90)	(-.96)
Firm size	.01	.02	.01	.01	.01	.01
	(1.16)	(1.87*)	(1.64*)	(1.60)	(1.56)	(1.56)
Born-global	.14	.13	.13	.13	.13	.14
	(1.28)	(1.21)	(1.21)	(1.21)	(1.21)	(1.30)
Product innovation intensity	-.06	-.04	-.04	-.03	-.03	-.03
	(-1.37)	(-1.01)	(-.89)	(-.82)	(-.83)	(-.83)
Year and Industry				Included		
***Moderators* (T-1)**						
Domestic collaboration		-.01	-.02	-.01	-.01	-.01
		(-1.39)	(-2.29**)	(-1.60)	(-1.57)	(-1.00)
International collaboration		.00	.00	-.01	-.01	-.02
		(-.07)	(-.04)	(-1.05)	(-1.00)	(1.71*)
Independent Variables (T-1)						
Exploitation (T-1)		-.06	-.09	-.09	-.09	-.08
		(-2.26**)	(-3.00***)	(-3.15***)	(-2.15**)	(-1.91*)
H2: Exploration (T-1)		.07	.08	.08	.08	.06
		(2.46***)	(2.70***)	(2.81***)	(1.18)	(.93)
Interaction						
Exploitation (T-1)*Domestic collaboration (T-1)			.02	.01	.01	.01
			(2.64***)	(.94)	(.71)	(.79)
Exploitation (T-1)*International collaboration (T-1)				.03	.03	.02
				(2.32**)	(2.25**)	(1.74*)
H4: Exploration (T-1)*Domestic collaboration (T-1)					.00	-.01
					(.09)	(-.49)
H6: Exploration (T-1)*International collaboration (T-1)						.04
						(1.75*)
(d.f.)		311.42(92)	373.62(96)	378.86 (100)	395.07(104)	402.30(108)
P value		.00	.00	.00	.00	.00
RMSEA		.039	.043	.042	.042	.041
	2.79%	3.67%	4.05%	4.38%	4.38%	4.61%

Note: Level of statistical significance: *** p≤.01; ** p≤.05; * p≤.10; Source: own elaboration on the basis of UK Innovation Survey, CIS 8, 9, 10, N= 1590.

Table 4b: Main Model: Regression for Export Sales Growth Rate, Short-Term Effect

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Control Variables (T)						
Past export intensity	.01	.00	.00	.00	.00	.00
	(.57)	(.14)	(.18)	(.15)	(.12)	(.07)
Geographic diversity	.04	.05	.04	.04	.04	.04
	(1.75*)	(1.86*)	(1.79*)	(1.76*)	(1.77*)	(1.71*)
Foreign funding	-.03	-.04	-.04	-.04	-.04	-.04
	(-1.19)	(-1.33)	(-1.38)	(-1.42)	(-1.43)	(-1.51)
R&D intensity	-.02	-.03	-.03	-.03	-.03	-.03
	(-1.64*)	(-1.92*)	(-1.93**)	(-1.89*)	(-1.90*)	(-1.93**)
Firm size	.00	.00	.00	.00	.00	.00
	(.13)	(-.33)	(-.32)	(-.17)	(-.18)	(-.15)
Born-global	.13	.13	.13	.13	.14	.15
	(1.18)	(1.21)	(1.21)	(1.22)	(1.25)	(1.36)
Product innovation intensity	-.03	-.04	-.04	-.05	-.05	-.05
	(-.62)	(-.76)	(-.79)	(-.87)	(-.88)	(-.88)
Year and Industry				Included		
***Moderators* (T)**						
Domestic collaboration		-.01	-.01	-.01	-.01	-.01
		(-.78)	(-1.24)	(-1.64*)	(-1.74*)	(-1.33)
International collaboration		.02	.02	.03	.03	.02
		(2.03**)	(2.07**)	(2.62***)	(2.64***)	(1.91*)
Independent Variables (T)						
H1: Exploitation (T)		.05	.02	.03	.03	.03
		(2.34**)	(.51)	(.79)	(.88)	(.91)
Exploration (T)		-.04	-.04	-.04	-.05	-.05
		(-1.42)	(-1.35)	(-1.43)	(-1.48)	(-1.51)
Interaction						
H3: Exploitation (T)*Domestic collaboration (T)			.02	.03	.04	.04
			(1.97**)	(2.97***)	(2.75***)	(2.95***)
H5: Exploitation (T)*International collaboration (T)				-.04	-.04	-.04
				(-2.34**)	(-2.36**)	(-2.71***)
Exploration (T) *Domestic collaboration (T)					.01	-.01
					(.61)	(-.67)
Exploration (T)*International collaboration (T)						.03
						(1.68*)
(d.f.)		366.89(92)	386.56(96)	388.15(100)	391.62 (104)	394.67(108)
p value		.00	.00	.00	.00	.00
RMSEA		.043	.043	.042	.041	.040
1.07%		1.66%	1.89%	2.21%	2.24%	2.41%

Note: Level of statistical significance: *** p≤.01; ** p≤.05; * p≤.10; Source: own elaboration on the basis of UK Innovation Survey, CIS 8, 9, 10, N= 1650.

Table 5: Short- and Long-Term Effects

	Time period	
	T-1 (from Table 4a)	**T (from Table 4b)**
Main effects		
Exploitation-export sales growth	-.06 (-2.26**)	.05 (2.34**)
Exploration-export sales growth	.07 (2.46***)	-.04 (-1.42)
Moderating effects		
Exploitation*Domestic collaboration	.02 (2.64***)	.02 (1.97**)
Exploitation*International collaboration	.03 (2.32**)	-.04 (-2.34**)
Exploration *Domestic collaboration	.00 (.09)	.01 (.61)
Exploration *International collaboration	.04 (1.75*)	.03 (1.68*)

Note: Level of statistical significance: *** p≤ .01; ** p≤ .05; * p≤ .10

Table 6: Competing Model: Ambidexterity at Time Period T-1

	Model 1	Model 2
Control Variables		
Past export intensity	.02	.02
	(2.75***)	(2.88***)
Geographic diversity	.03	.03
	(1.37)	(1.38)
Foreign funding	-.01	-.01
	(-.37)	(-.13)
R&D intensity	-.02	-.02
	(-1.39)	(-1.34)
Firm size	.01	.01
	(1.27)	(1.29)
Born-global	.13	.13
	(1.23)	(1.23)
Product innovation intensity	-.05	-.05
	(-1.28)	(-1.15)
Year and Industry	Included	
Independent Variables		
Exploitation	-.02	-.02
	(-1.83*)	(-1.61**)
Exploration	.04	.02
	(2.21**)	(1.41)
Exploitation*Exploration	.05	
	(2.94***)	
|Exploitation - Exploration|		-.01
		(-.68)

Note: Level of statistical significance: *** p≤ .01; ** p≤ .05; * p≤ .10.
Source: own elaboration on the basis of UK Innovation Survey, CIS 8, 9 10, N= 1590.

Table 7: Competing Model: Regression for Export Sales Growth and Total Collaboration at Time Period T-1

	Model 1	Model 2
Control Variables		
Past export intensity	.02	.02
	(2.89***)	(2.97***)
Geographic diversity	.03	.03
	(1.06)	(1.15)
Foreign funding	.00	-.01
	(-.09)	(-.16)
R&D intensity	-.01	-.02
	(-.95)	(-1.23)
Firm size	.01	.01
	(1.61)	(1.61)
Born-global	.13	.14
	(1.19)	(1.28)
Product innovation intensity	-.03	-.04
	(-.76)	(-1.01)
Year and Industry	Included	
Moderator		
Total collaboration	-.01	-.01
	(-2.73***)	(-2.47**)
Independent Variables		
Exploitation	-.10	-.04
	(-3.30***)	(-1.55)
Exploration	.08	.01
	(2.82***)	(.20)
Interactions		
Exploitation*Total collaboration	.02	
	(3.23***)	
Exploration*Total collaboration		.02
		(1.88*)

Note: Level of statistical significance: *** p≤ .01; ** p≤ .05; * p≤ .10;
Source: own elaboration on the basis of UK Innovation Survey, CIS 8,9,10, N= 1590.

Table 8: Competing Model: Regression for the Impacts of Lagged Exploitation and Exploration's on Product Innovation Intensity

	Model 1 Exploitation (T-1)	**Model 2** Exploration (T-1)
Control Variables		
Past export intensity	.01	.01
	(1.27)	(1.31)
Geographic diversity	.01	.01
	(.44)	(.45)
Foreign funding	-.02	-.02
	(-.90)	(-.76)
R&D intensity	.03	.03
	(3.90***)	(3.94***)
Firm size	-.01	-.01
	(-2.96***)	(-2.90***)
Born-global	.10	.10
	(1.46)	(1.49)
Year and Industry	Included	
Independent Variables		
Exploitation (T-1)	.02	.02
	(2.47***)	(2.42**)
Exploration (T-1)	-.02	-.02
	(-1.46)	(-1.26)
Exploitation*Exploration	.02	
	(1.87*)	
|Exploitation - Exploration|		.01
		(.83)

Note: Level of statistical significance: *** p≤ .01; ** p≤ .05; * p≤ .10;
Source: own elaboration on the basis of UK Innovation Survey, CIS 8,9,10, N= 1590.

Figure 2: Moderating Effects of Domestic and International Collaborations