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Innovation adaptation and post-entry growth in international new ventures

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ABSTRACT

Innovation plays a vital role in the internationalization process of international new ventures (INVs). However, to date, there are insufficient empirical studies exploring the innovation decisions that enable these firms to grow once the internationalization process has started. In response to this research gap, this paper examines the impacts of the technological pattern adopted at the initial foreign entry and the decisions to improve it afterward. In general, while the original technological patterns contributed to the immediate growth of INVs (that is, 1 year after the market entry), the results of this study reveal that the changes that occurred in the patterns have more significance on the post-entry growth (that is, 4 years after the market entry). Therefore, this study is supported by earlier works that emphasize the role of innovation as a stimulus for internal change as well as resource adaptation as a means of achieving sustainable growth in the international markets.

1. Introduction

Research on small entrepreneurial firms that rapidly expand into international markets continues to evolve thanks to scholars of International Entrepreneurship (IE) (Knight & Cavusgil, 1996; McDougall & Oviatt, 2000; McDougall et al., 1994; Zucchella, 2021). These firms, which are often called international new ventures (INVs), seek to derive significant competitive advantage from the use of resources and the sale of outputs in multiple countries (Oviatt & McDougall, 1994). Due to their significant potential as agents of economic growth, INVs have continued to attract considerable attention both from scholars and practitioners (Autio et al., 2011; Buccieri et al., 2020; Trudgen & Freeman, 2014). Despite these burgeoning interests, most of the existing studies focus on the underlying motives and factors of the early internationalization of INVs (Burgel & Murray, 2000; Gassmann & Keupp, 2007; Romanello & Chiarvesio, 2019; Sekliuckiene, 2017). As a result, we know much less about the resources and capabilities driving the survival, growth, and profitability of these firms beyond the initial entry stage (Morgan-Thomas & Jones, 2009; Sadeghi et al., 2018; Sleuwaegen & Onkelinx, 2014). Research on the life-cycle models of INVs' evolution suggests that changes occur in the internationalization process after these firms reached a certain internationalization level (e.g. Gabrielsson et al., 2008; Lindqvist et al., 2010; Rialp-Criado et al., 2010; Gabrielsson & Gabrielsson, 2013). However, most of the recent literature has focused on learning (Casillas et al., 2020; Puthusserry et al., 2020), thereby failing to address the need for adaptation in the new stage of the life-cycle (Gabrielsson & Gabrielsson, 2013). Addressing this research gap is even more important given the pace of change in today's business environment and resource constraints faced by INVs (Autio et al., 2000). In other words, adapting resources to meet these challenges is no longer an option, rather it is becoming an inexorable imperative if an INV wants to survive and grow in the post-entry phase of the internationalization process. Thus, it is important to uncover how these firms exploit key strategic resources to grow in the post-entry stage. In this regard, scholars suggest that the ability to adapt innovation resources is critical to the sustainable growth of INVs (Knight & Cavusgil, 2004).

Innovation resources are widely regarded as a main success factor of business survival and performance (Chatzoglou & Chatzoudes, 2018; Kirbach & Schmiedeberg, 2008). The development of entrepreneurial firms is largely influenced by the extent of their success in implementing innovations (Hagen et al., 2014). Research suggests that small innovative firms are more likely to expand into international markets than

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their non-innovative counterparts (Andersson & Wictor, 2003). Innovation efforts are at the heart of INV internationalization given that most of these firms are either knowledge-intensive in nature or operate in the high-technology sector (Lamotte & Colovic, 2010; Kuivalainen et al., 2012). Prior evidence shows that innovation is a main driver of the initial international success of INVs (Oviatt & McDougall, 1994). However, innovation is path-dependent, meaning that a firm's current innovation investment-related decisions can influence its future international performance (Thrane et al., 2010. Filatotchev & Piesse, 2009). This path dependence represents a growth opportunity if a firm has the ability to adapt its innovation resources to meet the demands of the changing environment as posited by the dynamic capability view (Teece et al., 1997; Zott, 2003). While the INV literature is growing, it has largely ignored the following questions: *Does the original configuration of innovation resources that brought INVs into international markets lead to future growth; or do INVs need to adapt innovation resources to grow in the post-entry stage?*

In this study, we address these concerns. The research focus is very important because it raises the question of which dimensions of innovation resources are linked to the post-entry growth of INVs. Therefore, to answer the above questions, first, we adopt the concept of technological pattern – a set of innovation input and innovation output variables – as it enables us to better explain the post-entry growth of INVs (Hagedoorn, 1996). Second, drawing on Jones and Coviello's (2005) model, we decompose the variables contained in the technological pattern into static and dynamic dimensions. The former dimension represents the original configuration adopted at the initial foreign market entry; whereas the latter dimension refers to the changes that occurred in the original configuration over time. Third, using a sample of Spanish INVs, we analyze the impacts of these dimensions on both the immediate growth and post-entry growth of these firms. The premise of our investigation is that INVs must adapt the innovation resources brought them into foreign markets to remain competitive and sustain their growth (Bausch & Krist, 2007). Accordingly, the dynamic capability view (DCV) offers a fitting theoretical foundation as it suggests that mere ownership of resources does not lead to competitive advantage and growth. It is, rather, in how these innovation resources are adapted, improved, and redeployed to meet the requirements of international market environments (Hughes et al., 2010; Teece et al., 1997; Vithessonthi & Racela, 2016).

The paper contributes to the literature in three main ways. First, from a theoretical perspective, IE literature has indeed identified antecedents and outcomes of the early and rapid entry of INVs into foreign markets. However, extant studies have also left several strategic decisions and growth patterns of INVs relatively unexamined (Ibeh et al., 2018; Sleuwaegen & Onkelinx, 2014). The current paper contributes to the emerging literature on the post-entry performance of INVs by adding strategic adaptation insights to innovation decisions. More precisely, it complements the literature on INVs by highlighting the dynamism involved in the innovation efforts and the benefits embedded in improving these resources in the post-entry phase of the internationalization process.

Second, from a methodical perspective, the paper shows that when analyzing the impacts of innovations on the post-entry growth, it is more fitting to decompose the variables to understand how the changes in the technological pattern influence firm growth. Similarly, international growth involves various dimensions. By using a multidimensional construct – export volume and export intensity –, the paper provides a better understanding of the growth trajectories of INVs.

Finally, from an empirical perspective, it provides new evidence on how the post-entry growth of Spanish INVs can be explained based on innovation efforts and decisions to adapt the innovation resources them the foreign markets. In other words, it shows that when pursuing growth strategies in the international markets, INVs adapting and improving their innovation efforts are more likely to achieve better performance.

The paper is organized as follows. In Section 2, we build on the general impact of innovation to explore the need for innovation adaptation beyond the initial foreign market entry. In Section 3, we develop the hypotheses of this study. In Section 4, we present the data and empirical model. The results of the empirical analysis can be found in Section 5. In Section 6, we discuss the results and present the conclusions as well as future research directions.

2. Conceptual framework

The decision to internationalize is derived from a diverse set of factors (Wiedersheim-Paul, Olson & Welch, 1978), among which innovation efforts have been singled out as major drivers of growth (Edeh et al., 2020). Scholars have recognized innovation as 'one of the principal drivers of competition' (Porter, 1985: 164); and a core capability every organization needs to possess (Drucker, 2001). In today's changing environment, the development of small entrepreneurial firms is particularly influenced by the extent of their success in innovation and internationalization (Expósito & Sanchis-Llopis, 2019; Vuorio et al., 2020). Research shows that innovation efforts and proactiveness of INVs are pivotal to their early and rapid expansion into multiple foreign markets (Fletcher, 2004; Knight & Cavusgil, 2004; McDougall & Oviatt, 2000). This is not surprising given that innovations serve as a source of sustainable competitive advantages (Chatzoglou & Chatzoudes, 2018).

Prior studies have identified a number of innovation efforts linked to the survival and growth of INVs in the international markets (Pla-Barber & Alegre, 2007; Zahra et al., 2009). First, product innovation, which is the development and commercialization of new or significantly improved goods and services, is at the core of INV growth strategy (McDougall et al., 2003). For example, it confers a competitive advantage on INVs through horizontal product differentiation to enter new markets or vertical differentiation to increase their shares in existing markets (Sun et al., 2019). Additionally, product strength in terms of attributes of novelty and quality has been identified as a key factor of internationalization success (Dohse & Niebuhr, 2018). Research shows that firms pursuing product innovation strategies are likely to internationalize faster and perform better than their non-innovative counterparts (Burgel & Murray, 2000). Therefore, INVs developing and launching new and innovative products can succeed in the international markets.

Second, the role of research and development (R&D) investments on firm performance has attracted scholarly and policy attention for more than five decades. A robust body of evidence supports a positive linkage between R&D investments, a firm's ability to innovate and superior growth (Hagedoorn & Duysters, 2002; Rodríguez & Nieto, 2016; Stam & Wennberg, 2009). Moreover, scholars indicate that the relationship between a firm's size and R&D investments is largely influenced by the sector to which it belongs (Dosi, 1988; Kamien & Schwartz, 1982). Thus, as the majority of INVs belong to technology-intensive sectors (Crick & Jones, 2000), it is not surprising that they engage in various R&D activities. In so doing, they can create new products and competitiveness that increase their chances of survival and continued growth in the international markets.

Third, as part of their innovation strategy, INVs make investments aimed at protecting their inventions from the actions of their competitors or imitators (Fernández–Ribas, 2010). Protection instruments such as patents have been acknowledged as an integral part of a business strategy, especially for international firms (Chesbrough, 2003; Wang et al., 2010). For example, Andries and Faems (2013) find that small entrepreneurial firms investing in patents generate additional revenue streams relatively higher than that of their larger counterparts. Due to the fierce competition that characterizes today's international markets, INVs investing in patents can appropriate a greater share of

the returns from their innovations and, in turn, sustain their growth trajectory.

Fourth, the role of human capital investments in the internationalization of small entrepreneurial firms is well documented in the literature (Mason et al., 2020). Research shows that human capital is critical to the development and commercialization of innovations (Leiponen,2005; Lenihan et al., 2019). By investing in highly skilled personnel, both in the market and technology domains, INVs can enhance their innovation capabilities and international growth. Prior evidence from Spanish entrepreneurial firms reveals that human capital investments not only influence the decisions to internationalize but also the speed of such decisions (Ramos et al., 2011). Thus, human capital plays a key role in the survival and success of INVs, especially in the face of today's seemingly dynamic market environment.

Taken together, by engaging in these various innovation efforts, INVs can exploit attractive opportunities and achieve sustainable growth in foreign markets (Knight & Cavusgil, 2004; Oviatt & McDougall, 1994). Notwithstanding, the useful contributions of a growing body of innovation literature, it is surprising that the impacts of innovation resources of INVs on post-entry growth are yet to be fully documented. The majority of extant studies focus on how these firms use their existing innovation resources to exploit short windows of opportunities resulting from the competitive pace and product obsolescence in the initial phase of internationalization (Cavusgil & Knight, 2015; Preece et al., 1999). However, the rapid technology advancement, combined with globalization and changing business environment, implies that the competitive advantages linked to the innovation resources that brought INVs to foreign markets can be short-lived (Cooper, 2005). Accordingly, gaining a better understanding of how the firms adapt these innovation resources is imperative as it can explain their growth path in the post-entry phase.

Research indicates that innovation and internationalization strategies are cumulative processes that develop over time. In path dependence literature, history is crucial given that previous or current decisions or investments made by a firm can constrain or enhance its future behavior (Koch et al., 2009; Scherrer & de Vasconcellos, 2019). In other words, path-dependence represents opportunities for INVs as a greater ability to adapt and deploy current resources can lead to continued growth in the foreign markets. For example, in a study of Spanish exporting firms, Casillas et al., and Acedo (2012) find that export decisions at the start of the internationalization process influenced the export growth of firms over time. Despite their contributions to literature, more studies are needed to advance our understanding of how innovation resources adopted by INVs at the start of the internationalization process shape their subsequent international growth pathways (Riviere & Suder, 2016).

The growth objectives and non-linearity of the internationalization process of INVs (Vissak & Francioni, 2013) seemingly motivate these firms to engage in various innovation efforts, which, in turn, give rise to technological patterns (Beneito, 2002). Thus, identifying the key patterns that lead to greater growth in the post-entry stage can enhance our understanding of the development of INVs over time. In this regard, scholars proposed the concepts of *static patterns* (fingerprint patterns) and *dynamic profiles*, which generally, refer to a specific configuration of a firm at a point in time; and the changes that occur in the configuration for a specific duration of time (Jones & Coviello, 2005). Accordingly, we draw on these insights to identify two patterns related to the innovation resources of firms of INVs. First, the static dimension, which refers to a combination of innovation input and innovation output resources that a firm adopts at a given point in time (in our case, at the start of the internationalization) Second, the dynamic dimension, which is the changes that occur in these innovation resources over a period of time, that is, in the post-internationalization phase.

There is an emerging consensus that possession of innovation resources can provide increased sales, profits, and competitive strength for firms (Sivades & Dwyer, 2000; Hult et al., 2004; Lee & Yoo, 2019). However, to survive and sustain growth in the international markets, mere possession of innovation resources is not enough (Verona, 1999). Hughes et al. (2010):7) argue that “it is not ownership of resources and capabilities that generate positional advantage but rather the manner in which they are managed and deployed". This makes the case for the need for continual renewal and adaptation of these innovation resources as the dynamic capabilities view (DCV) posits (Teece et al., 1997). The DCV reminds us of the importance of capabilities to integrate and reconfigure resources to adapt to the dynamic markets (Zott, 2003). In other words, firms with these capabilities can transform their resources, increase their competitive advantage and consequently, sustain their growth, especially in the face of fierce global competition and rapid technological change (Sapienza et al., 2006; Wu, 2010). On this basis, we argue that INVs adapting and improving their initial innovation resources can achieve superior growth in the post-internationalization phase (Teece, 2007). This is because the initial innovations that brought these firms to the international markets may be at odds with the ones required for growth in the post-entry phase (Khan & Lew, 2018).

Similarly, Rivier and Suder (2016) suggest that resources must be continually improved because internationalization involves a firm's ability to respond efficiently to the dynamism of international markets. Autio et al. (2000) propose that firms with greater adaptability are likely to achieve superior international growth rates. Due to their advantage of flexibility and adaptability, INVs can redeploy their resources quicker and achieve greater growth over their established rivals (Sapienza et al., 2006). Taken together, in the post-entry stage, INVs are exposed to new competitive conditions and rapid changes that result in the shortening of the useful lifecycles of the innovation resources that brought them to foreign markets. As a result, it is reasonable to expect INVs to adapt their initial innovation resources to fit the demands of the market environments to secure sustainable future growth.

3. Hypothesis development

3.1. Product innovation and post-entry growth

Competition in the international markets is rapidly driving product innovation. The Schumpeterian model of creative destruction suggests that product innovation is a vital factor for firm productivity (Love & Roper, 2015). Vernon (1966) argues that the productivity of firms is driven by technological innovation induced by product competition. Other studies show that INVs particularly invest in product innovation because most of them operate in knowledge-intensive industries or depend on product innovations to succeed in foreign markets (Abrahamsson et al., 2019). Cirera et al., and Markwald (2015) argue that the ability to develop and commercialize new and unique products is pivotal to the success of small firms in the export markets. Thus, given the positive relationship between product innovation and firm growth, it can be assumed that new or significantly improved products launched at the start of internationalization will influence the future growth performance of INVs (Autio et al., 2000).

However, after successfully launching new products into foreign markets, INVs need to be responsive to changes in the business environments. More precisely, INVs that fail to react fast to the demands of international markets stand the risk of recording a negative performance. This claim is in line with Cavusgil and Kirpalani (1993:9) who argue that: “Product adaptation on initial export entry is not a necessary component of success. However, subsequent adaptation contributes significantly to success”. In other words, INVs need to continuously adapt and improve their products to satisfy the dynamism of foreign markets' demands (Buccieri et al., 2020). Taken together, we expect product innovation (original configuration at the start of internationalization – static dimension) and the decision to improve it in the post-entry phase (dynamic dimension) to affect the

subsequent growth of INVs. Thus, we propose the following hypotheses:

H1a: Product innovation in its original configuration is positively related to growth in the foreign markets at time (t) and over a subsequent period (t+n)

H1b: The change that occurred in the original configuration of product innovation is positively related to the future growth in the foreign markets at time (t+n)

3.2. Patenting and post-entry growth

Firms need to make their innovation activities inimitable to retain the rent, or secure competitiveness (Oviatt & McDougall, 1994). Patenting is an important strategic tool for protecting technological knowledge from imitation and appropriating returns from investment (Cockburn & MacGarvie, 2010). The European Patent Office reports that one in four applications filed is from a small firm (EPO Annual report, 2017). More and more INVs are engaging in patenting as a means of pursuing growth in the foreign markets. Without such protections, many firms would be hesitant in committing a large amount of funds to R&D activities, especially in today's economic setting. Patenting stimulates innovation and confers temporal monopoly, which allows firms to recoup the investment in R&D and generate some additional benefits as a reward for investment risk (Scherer, 1965). Also, it improves corporate image by signaling a firm's quality to uninformed external parties (Spence, 1984), and serves as a common measure of innovation outputs (Deyle & Grupp, 2005).

However, while patenting mitigates competitors' commercialization of imitations and increases turnover from innovation, it involves a considerable cost, which can negatively affect firm performance (Andries & Faems, 2013). For example, the patent application is very expensive, especially for INVs, as they are often confronted with financial constraints. In addition, these firms have to pay annually to retain their rights. These factors make the case for selecting an appropriate patent protection strategy that fits a firm's growth objective, especially once a new venture becomes international. For example, a patent from a firm's home market can be an ineffective protection and appropriation mechanism in international markets. In other words, as a new venture expands internationally, it needs to change its patenting strategy by investing more in foreign patents. In so doing, they not only ward off competitors' commercialization of imitations but also maximizes return from its innovations in the international markets. These arguments highlight the need for adaptation and improvement of intellectual property right instruments to achieve superior growth in the international markets. Thus, we expect patenting (original configuration at the start of internationalization – static dimension) and the decision to improve it in the post-entry phase (dynamic dimension) to affect the subsequent growth of INVs. Thus, we hypothesize that:

H2a: Patenting in its original configuration is positively related to growth in the foreign markets at time (t) and over a subsequent period (t+n)

H2b: The change that occurred in the original configuration of patenting is positively related to the future growth in the foreign markets at time (t+n)

3.3. R&D expenditures and post-entry growth

As noted above, R&D investments have been identified as a vital source of competitiveness, technological advancement, and performance (Booltink & Saka-Helmhout, 2018). Prior studies suggest that R&D drives the performance of small innovative firms as it allows them to develop new products, build efficient processes and generate strategic cooperation (De Jong & Freel, 2010). Eberhart et al. (2004) reveal that R&D investment improves the operating performance of firms, especially in the long run. Similarly, Pandit et al. (2011) show that R&D activities contribute to firms' future performance. Besides, Loforet (2009) suggests that small entrepreneurial firms engaging in R&D investments can increase their chances of survival and growth.

While *a priori*, firms with a greater R&D investment are generally considered more innovative, it is important to understand the aspect of such investments that is more beneficial to the international growth of firms. Following other studies, we distinguish between internal and external R&D expenditures (Love & Roper, 2015). Firms engaging in R&D activities have to decide how much to invest and how to make such an investment (Love & Roper, 2002). On this basis, once INVs become international, they must decide whether to invest in the actual development of R&D activity (internal R&D expenditure) or procurement of technological know-how (external R&D expenditure). Besides, they have to decide whether to use them as substitutes (Veugelers, 1997) or to use them complementarily, (Grimpe & Kaiser, 2010) depending on the availability of resources and capabilities.

Even though prior research reveals that both internal and external R&D expenditures have positive impacts on the performance of INVs (Ramos et al., 2011), it is still unclear whether it is the original configuration of these types of R&D investments or the changes that occurred in them in the post-entry phase that contribute more to the growth of INVs in the foreign markets. However, given the changing market demands, we expect INVs that are adapting their initial R&D investment in line with these demands to achieve better growth in the foreign markets. These arguments lead us to propose the following hypotheses:

H3a: R&D investments in its original configuration is positively related to growth in the foreign markets at time (t) and over a subsequent period (t+n)

H3b: The change that occurred in the original configuration of R&D investments is positively related to the future growth in the foreign markets at time (t+n)

3.4. Human capital investment and post-entry growth

Human capital plays a very important role in the international behavior of firms. According to Hirsch and Bijaoui (1985), the decision to invest in R&D specialists can be viewed as a wager on innovation, since such an investment makes a firm more innovative. INVs investing in R&D experts can achieve growth in the foreign markets. However, investing solely in R&D specialists can be restrictive as it tends to focus more on innovation development, thereby neglecting new market development. Thus, if a wider perspective is taken, and the qualifications of the personnel are considered, greater flexibility may be realized. In other words, a firm investing in both R&D specialists and non-technical qualified personnel can perform better, regardless of the development path it adopts in the foreign markets.

Against this background, some scholars suggest that higher education is an adequate measurement for representing human capital investment (He & Wong, 2009). This idea may be justified following the knowledge-based view of firms (Nonaka & Takeuchi, 1995). For example, for a new venture to be creative and efficient, its team needs to access, gather, and merge information from different sources. Thus, the combination of market and technological knowledge is essential to competitiveness (Prashantham & Young, 2011). Wiklund and Shepherd (2003) state that, "knowledge about market and technology are two strands of procedural knowledge that increase a firm's ability to discover and exploit opportunities." While engaging in a more comprehensive human capital investment enables INVs to internationalize, they need to adapt and improve their strategies to achieve better growth in the foreign markets. On this basis, we make the following hypotheses:

H4a: Human capital investments in its original configuration is positively related to growth in the foreign markets at time (t) and over a subsequent period (t+n)

H4b: The change that occurred in the original configuration of human capital investments is positively related to the future growth in the foreign markets at time (t+n)

4. Data and variables

4.1. Sample

The study takes advantage of a rich and high-quality Survey on Business Strategies (SBS), which began from 1990 onwards, was carried out by the Foundation SEPI with the support of the Ministry of Industry of Spain. The database has been widely used in technological patterns, productivity, and internationalization studies (e.g. Beneito, 2002; Tojeiro-Rivero & Moreno, 2019). It is chosen for several reasons: First, it is from 1990 onwards and contains a representative sample of small Spanish firms in the manufacturing sector. Second, the database provides the dynamics for us to observe patterns and variations in our focal variables – technological and internationalization activities. From the database, we selected the period between 1990 and 2011. This period is appropriate for testing the hypotheses presented here. Besides, it covers the period that Spain gained full access to the European Union and rapidly opened up its economy to the international markets. This transformation motivated small entrepreneurial firms from Spain to invest in technological innovations to compete efficiently in the international markets.

Following prior studies, we selected INVs based on firms that start their international activities within three years after the foundation (Oviatt & McDougall, 1997; Shrader et al., 2000). Regarding size, we are aware the European Commission categorized small and medium-sized enterprises as entities with fewer than 250 people. We use 10 to 200 employees, being the sampling cut-off point of SBS. From the sample, we included several variables related to the firms' life to ensure that important aspects of their evolution are not omitted. First, to control internal experience, we selected the firms founded not more than 2 years before the inception of the database (1990). Second, we considered only international firms that offered information at least 4 years after a selected event (i.e. internationalization). The resulting sample consisted of 243 firms. We are aware of the restrictive character of these conditions. However, since the objective of this paper is to understand the changes in the technological patterns after a critical event (internationalization), this approach is an effective means of guaranteeing consistency in the results. Besides, this approach prevents the omission of previous internationalization episodes of the firms under study.

4.2. Description of Variables and Methodology

4.2.1. Dependent Variable

The dependent variable, international growth, was measured in two ways following prior export literature (e.g. Casillas et al., 2012; Wang & Ma, 2018). First, *the Export Volume was measured* as the export sales in a specific year. To capture the growth pattern, we measure it both in 1 year (Expvol (1)) and 4 years (Expvol (4)) after the market entry respectively. Second, *the Export Intensity was measured* as the ratio of export sales to total sales of a firm in a specific year. Accordingly, we measured it both in 1 year (Expints (1)) and 4 years (Expints (4)) after the market entry respectively.

4.2.2. Independent variables

To understand the impact of the initial configuration of innovation resources on international growth and the changes that occurred in the post-entry phase, we measured each of the focal variables to conform to a pattern in two different ways. First, we considered each of the innovation variables on the static dimension, measured at a specific point in time (that is, 1 year after the market entry). Second, the dynamic dimension captures the changes in each of the innovation variables between two periods of time (that is, the difference between year 1 and year 4 after the market entry).

4.2.2.1. Innovation Output Indicators

Product Innovation. Product innovation, which is the development and commercialization of new or significantly improved products, is used as a proxy for innovation output. For the static dimension, we calculated the number of product innovations in year 1 after the market entry (NIP). For the dynamic dimension, we measured it as the difference between the number of product innovations in year 1 and year 4 after the market entry (*IncNIP*).

Patents. To account for the impact of intellectual property rights on international growth, we use the number of patent applications. Prior studies suggest that the patents are effective protection and appropriation mechanisms (Morikawa, 2019). In line with previous research (Deyle & Grupp, 2005), we use it as an innovation output indicator. Accordingly, for the static dimension, we calculated the number of patents in year 1 after the market entry (*PAT*). For the dynamic dimension, we measured it as the difference between the number of patents in year 1 and year 4 after the market entry (*IncPAT*).

4.2.2.2. Innovation input indicators

R&D Investment. We use R&D investments as a proxy of innovation inputs (Martin & Nguyen-Thi, 2015). In our models, we distinguish between internal R&D investment and external R&D investment. The former is measured as the amount of resources committed (expenditure over total sales) to the actual development of R&D activity. The static dimension is measured as internal R&D expenditures in year 1 after the market entry (*IRED*); whereas the dynamic dimension is measured as the difference between internal R&D expenditures in year 1 and year 4 after the market entry (*IncIERD).* The latter is measured as the amount committed to purchasing the necessary technological know-how (external R&D expenditures). Likewise, the static dimension is measured as external R&D expenditures in year 1 after the market entry (*EERD); while the dynamic dimension is measured as* the difference between external R&D expenditures in year 1 and year 4 after the market entry *(IncEERD).*

Human Capital Investment. A common approach when considering the impact of human resources is the skilled R&D staff. However, there are other possible approaches. For example, Cheng and Stough (2006) propose the number of college graduates as a proxy variable for labor quality. This approach considers higher education as a generally better representation of human capital than the number of scientists and engineers (Sun et al., 2002) or the adult literacy level (He & Wong, 2009). To ensure a better representation, we considered both types of variables: first, qualified personnel, measured as the proportion of graduates within a firm's total employees in year 1 after the market entry for the static dimension (QUAL). The dynamic dimension is measured as the difference between qualified personnel in year 1 and year 4 after the market entry (IncQUAL). Second, R&D personnel, measured as the proportion of personnel dedicated to R&D activities in year 1 after the market entry for the static dimension (RDPERS). The dynamic dimension is measured as the difference between R&D personnel in year 1 and year 4 after the market entry (IncRDPERS)

4.2.3. Control variables

In line with conventions in previous research, we included several control variables that can influence international growth (D'Angelo & Buck, 2019). First, the size of the firm was controlled using the total number of total employees (SIZE). Second, recent research shows that age at foreign market entry influences international performance (Casillas et al., 2020). We measure this variable as the time between the company foundation and the time it started to export (MARKET ENTRY). Finally, we control the effect of the sector on international growth by considering whether a company is operating in a technology-intensive sector or not (SECTOR). It is coded as a dummy variable based on the technological classifications of the Spanish National Institute of Statistics.

4.2.4. Statistical technique

We used the hierarchical multiple regression analysis to test the formulated hypotheses. This statistical technique is fitting as it captures an additional variance explained by a *new* construct along with other theoretically meaningful variables that are already linked to the dependent variable (Hair et al., 2006). Hence, we start by estimating two sets of models, each referring to the two measures of the dependent variables used in this study: Export volume (*expvol (1)* and *expvol (4)*; and Export intensity (*expints (1)* and *expints (4)*. We estimated five models: Models 1 and 3, considered only the control variables; in Model 2, a set of innovation resources (input and output variables) committed at the initial market entry is regressed on *expvol (1)* and *expints (1)* respectively. Next, these variables are included in Model 4 to capture the effects of static dimensions on future growth: *expvol (4)* and *expints (4)*. In Model 5, the changes that occurred in these variables (dynamic dimension) were regressed on *expvol (4)* and *expints (4)*. Finally, to avoid estimation biases, we test the variance inflation factor (VIF) score for every regression model. The values are between 1.012 and 2.638, thus, they are within the recommended threshold of 10 (Hair et al.,2006).

5. Regression analysis results

Table 1 presents the descriptive statistics and correlation matrix for independent variables. As can be seen, no correlation among the independent variables exceeds (0.56); and as such, no serious risk of multicollinearity is evident.

5.1. Export volume results

Table 2 presents the results of the five regression models when the Export Volume is the dependent variable as described in the methodology section. As shown in Model 1 and Model 3, among the three control variables in the analysis, only firm size (β =1.106; p<0.00; β =1860.721; p<0.00), and sector (β =98.628; p<0.07) are positive and significantly related to the international growth of INVs. Hypothesis (H1a) links the original configuration of product innovation (static dimension) to export sales in 1 year (*Expvol 1*) and 4 years (*Expvol 4*) after the market entry respectively. Results in Model 2 reveal that product innovation is negative and significant for immediate growth (β =-0.009; p<0.00); and insignificant for future international growth (β =- 5.345; p<0.86) as shown in Model 4. In hypothesis (1b), the change that occurred in the original configuration of product innovation (dynamic dimension) is not significantly related to future international growth (β =7.425; p<0.81) as shown in Model 5. Therefore, hypotheses 1a and 1b are not supported.

Furthermore, hypothesis (H2a) posits that the original configuration of patenting is positively related to export sales in 1 year and 4 years after the market entry. As shown in Model 2, patents are positively related to immediate growth (β =0.355; p<0.07); however,

Table 1
Descriptive statistics and correlation matrix.

		Mean	S.D.																			
1	Market Entry	2,622	1,253	1																		
2	Sector	0,450	0,498	0,012	1																	
3	Size	5,155	1,286	0,214**	-0,022	1																
4	R&D External Expenditures (RDEE)	4,725	5,195	0,220**	0,078	0,147*	1															
5	R&D Internal Expenditures (RDIE)	8,419	4,724	0,357**	0,217**	0,376**	0,269**	1														
6	R&D personnel (RDPERS)	1,365	1,336	0,244**	0,265**	0,556**	0,287**	0,636**	1													
7	Qualified personnel (QUAL)	0,694	1,198	0,175**	0,145*	0,118	0,200**	0,167**	0,009	1												
8	Nr Innovations (NIP)	7,490	47,143	0,033	-0,078	0,030	-0,066	0,098	0,068	-0,068	1											
9	Patents (PAT)	0,124	0,615	0,120	-0,020	0,182**	0,180**	0,135*	0,276**	0,282**	-0,026	1										
10	QUAL variation	1,323	5,316	0,027	0,000	-0,053	0,015	-0,065	-0,138*	0,154*	-0,028	-0,044	1									
11	RDPERS variation	0,167	1,022	0,109	0,082	0,077	-0,012	0,085	-0,036	0,058	-0,044	-0,050	-0,038	1								
12	RDIE variation	10,310	62,412	-0,121	0,091	0,108	-0,060*	-0,011	0,118	0,054	-0,002	-0,012	0,019	-0,010	1							
13	RDEE variation	5,816	23,331	0,154*	-0,089	0,062	0,200**	0,139*	0,145*	-0,024	0,008	-0,034	0,039	0,078	0,010	1						
14	NIP variation	-2,600	28,307	0,008	0,033	-0,035	0,062	-0,043	-0,061	0,098	-0,751**	0,028	0,058	0,034	-0,005	0,062	1					
15	PAT variation	-0,025	0,200	0,012	0,117	-0,033	0,054	0,012	0,011	0,050	0,019	-0,292**	0,025	0,036	-0,008	0,011	-0,022	1				
16	Export sales/Total sales	0,229	0,266	-0,066	0,025	0,136*	0,007	0,081	0,217**	-0,242**	-0,064	0,022	-0,198**	-0,008	0,035	0,067	0,032	-0,111	1			
17	Export sales	13,050	2,842	0,084	0,033	0,493**	0,091	0,364**	0,404**	-0,066	-0,093	0,133*	0,052	0,019	0,060	0,064	0,131*	-0,156*	0,557**	1		

*p < 0,05; **p < 0,01; ***p < 0,001.

Table 2
Regression models with dependent variable: Export Volume.

	Export volume in Year (1)		**Export volume in Year (4)**		
	Model 1	Model 2	Model 3	Model 4	Model 5
	Coef. /S. E	Coef. /S. E	Coef. /S. E	Coef. /S. E	Coef. /S. E
Market Entry	-0.048	-0.192	-27.823	-27.902	-51.900
	(0.146)	(0.150)	(261.78)	(279.945)	(174.932)
Sector	0.044	0.038	98.628**	1645.65	948.516
	(0.031)	(0.030)	(55.97)	(279.53)	(179.114)
Size	1.106***	0.903***	1860.721***	85.09***	19.937***
	(0.132)	(0.150)	(235.23)	(55.610)	(34.918)
R&D Internal Expenditures (RDIE)		-0.013		-65.392	-2.848
		(0.032)		(58.996)	(37.463)
R&D External Expenditures (RDEE)		0.160***		56.222	37.552
		(0.045)		83.089	(51.910)
R&D personnel (RDPERS)		0.036		427.414	345.741**
		(0.176)		(327.694)	(212.531)
Qualified personnel (QUAL)		-0.405***		-601.683*	-580.906***
		(0.140)		(260.681)	(164.464)
Nr Innovations (NIP)		-0.009***		-5.345	1.046
		(0.003)		(5.967)	(5.401)
Patents (PAT)		0.355**		-8.113	433.788
		(0.271)		(504.973)	(360.500)
RDIE variation					-21.511***
					(8.051)
RDEE variation					1.275
					(2.969)
RDPERS variation					118.966***
					(7.679)
QUAL variation					19.753***
					(3.077)
NIP variation					7.425
					(9.123)
PAT variation					-16.501
					(13.807)
Constant	6.910***	7.131***	-7417.816***	-6553.183***	-3113.975***
R^2	0.252	0.346	0.229	.269	.726
R^2ajust	0.239	0.317	0.216	.237	.707
Inc R^2		0.094		.040	.457

*p < 0,05; **p < 0,01; ***p < 0,001.

negative and insignificant for future international growth (β =-8.113; p<0.78) as shown in Model 4. Similarly, Model 5 shows that the dynamic dimension of patents does not significantly contribute to future international growth (β -16.501; p<0.64). Accordingly, these results illustrate that patents only contribute to the initial international success of INVs.

More so, hypothesis (H3a) tests the relationship between the original configuration of R&D expenditures and export sales in 1 year and 4 years after the market entry. As shown in Model 2, external R&D expenditures (β =0.160; p<0.00), but not internal R&D expenditures (β =-0.013; p<0.67), are positive and significant for immediate growth. However, both the static and dynamic dimensions of R&D expenditures are not positively related to the future international growth as shown in Model 4 and Model 5 respectively. Thus, except for external R&D expenditures' impact on the immediate growth, other dimensions did not support hypotheses 3a and 3b.

Finally, in hypothesis (H4a), investments in qualified personnel significantly reduced immediate growth (β =-0.405; p<0.00); however, investment in R&D personnel is positive and insignificant (β = 0.036; p<0.84). For the impact of the static dimension of human capital investments on future international growth, only investment in qualified personnel is significant, albeit with a negative sign (β =-601.683; p<0.03) as shown in Model 4. These results indicate that the human capital investments at the initial market entry do not play important role in the future growth of these firms. However, the changes that occurred in these variables contributed to international growth. More precisely, investments in both qualified (β =19.753; p<0.00) and R&D personnel (β =118.966; p<0.00) are positively related to export volume in year 4. Therefore, these results support hypothesis 4b.

5.2. Export intensity results

In Table 3, the results of the impacts of innovation resources (both on static and dynamic dimensions) on export intensity are presented in a similar order as in Table 2. Concerning the control variables, firm size (β =0.216; p<0.03), and sector (β =0.064; p<0.01; β =1485.129; p<0.00) are positive and significantly related to export intensity as shown in Model 1 and Model 3. When the original configuration of product innovation is linked to export intensity, the results in Model 2 and Model 4 reveal that product innovation negatively affected immediate growth (β =-0.004; p<0.05) as well as not significant for future international growth (β =-1.969; p<0.19). Hence, these results fail to support hypothesis 1a. However, the dynamic dimension is positively related to future international growth (β = 12.708; p<.030) as shown in Model 5. Accordingly, hypothesis 1b is well supported.

Second, the static dimension of patents is positively related to immediate growth (β =0.366; p<0.08) as shown in Model 2. However, this dimension as well as the dynamic dimensions are not significant for future international growth as shown in Model 4 and Model 5. Apart from the patent's contributions to the growth at the initial market entry stage, the results fail to support hypotheses 2a and 2b.

Third, regarding the R&D investments as posited in hypothesis 3a, the results in Model 2 reveal that external R&D expenditures (β =0.065; p<0.07) are positively related to immediate growth. In the dynamic dimension, internal R&D expenditures negatively affect

Table 3
Regression models with dependent variable: Export Intensity.

	Export intensity in Year (1)		Export intensity in Year (4)		
	Model 1	Model 2	Model 3	Model 4	Model 5
	Coef. /S. E	Coef. /S. E	Coef. /S. E	Coef. /S. E	Coef. /S. E
Market Entry	-.036	-.085	58.724	-48.039	-21.152
	(.109)	(.112)	(151.764)	(164.550)	(118.086)
Sector	.064*	.038*	1485.129***	1304.936***	916.938***
	(.025)	(.030)	(136.368)	(164.306)	(120.909)
Size	.216*	.060	0.287	-5.512	-35.023
	(.102)	(.023)	(32.448)	(32.690)	(23.571)
		.014		-23.441	11.889
R&D Internal Expenditures (RDIE)		(.025)		(34.678)	(25.289)
R&D External Expenditures (RDEE)		.065**		55.922	37.030
		(.036)		(48.839)	(35.042)
R&D personnel (RDPERS)		.049		230.627	61.534
		(.137)		(192.616)	(143.467)
Qualified personnel (QUAL)		-.502***		33.727	31.865
		(.112)		(153.226)	(111.020)
Nr Innovations (NIP)		-.004**		-1.969	4.568
		(.002)		(3.507)	3.646
Patents (PAT)		.366**		-165.057	33.142
		(.206)		(296.819)	(243.351)
RDIE variation					-21.755***
					(5.434)
RDEE variation					-2.263
					(2.004)
RDPERS variation					38.845***
					(5.184)
QUAL variation					20.983***
					(2.077)
NIP variation					12.708*
					(6.158)
PAT variation					-7.109
					(9.320)
Constant	-3.880***	-3.715***	-4486.438***	-4123.378***	-2345.754***
R^2	.054	.184	.358	.374	.691
R^2ajust	.035	.144	.347	.374	.691
Inc R^2		.131		.016	.317

*p < 0,05; **p < 0,01; ***p < 0,001.

future international growth (β =-21.755; p<0.00). Thus, hypothesis 3b is not supported by the results.

Lastly, the results in Model 2 show that investment in qualified personnel negatively affected immediate growth (β =-0.502; p<0.00). Similarly, none of the static R&D variables has an impact on future international growth as shown in Model 4. Thus, the results fail to provide support for hypothesis 4a. However, in support of hypothesis 4b, the investments in R&D personnel (β =38.845; p<0.00) and qualified personnel (β =20.983; p<0.00) have positive and significant impacts on international growth as shown in Model 5.

6. Discussion and implications

6.1. Theoretical implications

Our research has four main theoretical contributions. First, internationalization is no easy task because it involves a series of time-constraining decisions. The task is even more challenging for INVs given their liabilities of smallness and foreignness (Zahra, 2005). Prior evidence suggests that small firms engaging in innovation efforts are more likely to internationalize more successfully than their non-innovative counterparts (Teirlinck, 2017). In this regard, our study shows that when approaching the foreign markets, it is externally sourced R&D activities that lead to immediate growth of INVs (Lefebvre et al., 1998). These results support prior studies highlighting the importance of networks and open innovation in the internationalization process of innovative firms (Abrahamsson et al., 2019; Chesbrough, 2003). In other words, increased knowledge intensity and complexity of implementing innovations are forcing small innovative firms to look outside their own boundaries (Chesbrough, 2017). Thus, our study contributes to the literature by showing that the externalization of R&D activities is a means of exploring new knowledge that is relevant to the post-entry growth of INVs. In other words, INVs exploiting and exploring external R&D opportunities can improve their survival chances and sustain growth in the foreign markets, especially in face of recent changes in the business and technological environments that have altered competitive foundations Berchicci, 2013).

Second, patents contributed to the immediate growth of INVs in the foreign markets. This finding is interesting because it shows that INV that invest in technological knowledge, such as R&D activities, require protection strategies against the actions of their competitors. Patenting allows INVs to benefit from their R&D investments by letting them appropriate some of the returns from their inventions. In other words, inimitability is a critical factor because it enables INVs to achieve growth in the international markets (Autio et al., 2000). Our study is in line with previous studies, for example, Hall and Sena (2017) who found that the UK innovative firms that invested in intellectual property mechanisms such as patents are more productive than their counterparts. Similarly, it confirms a recent report from the European Union Intellectual Property Office suggesting that small European innovative firms rely heavily on intellectual property rights to compete with large firms and grow in the international markets (EUIPO, 2019). Tied together, to achieve growth in the foreign markets, our study shows that INVs using patent protections will find sufficient incentives to invest in R&D activities.

Third, our study reveals that the original configuration of product innovations is negatively related to the immediate growth of INVs. On the one hand, this finding is similar to Freel and Robson (2004) who found that product innovation is significantly negatively

associated with growth in small innovative firms in the manufacturing sector. Other empirical studies with negative significance suggest that the impact of product innovation on productivity may depend on demand dynamism and a competitive environment (Dai & Cheng, 2018). Due to the growing competitive pressure, the identification of specific niche markets where INVs can realize the gains of product innovations may be linked to the decisions to adopt specific innovation strategies and, in turn, re-adapt and improve them. This claim is substantiated by the positive impact of the dynamic dimension of product innovation on the future growth of INVs as revealed in our study. It shows that INVs are improving their product strengths to enhance their growth trajectory in the foreign markets (Cavusgil & Kirpalani, 1993; Zhou et al., 2010). Thus, by discomposing the innovation efforts of INVs, our study shows that the dynamic dimension of innovation resources is more important than the static dimension when pursuing future growth in the international markets. These findings are interesting as they complement previous studies in strategic renewal and adaptation of innovation capabilities (Riviere & Suder, 2016).

Finally, another area of significance revealed in our study is human capital investment. As an essential part of innovation strategy, human capital provides a competitive advantage for small firms in terms of skills and expertise (McGuirk et al., 2015). However, what remains largely unexplored is the dimension of human capital that contributes to the growth of INVs. Our study shows that qualified personnel in its original configuration negatively affected immediate growth in the foreign markets. Nevertheless, the dynamic dimensions of both R&D experts and qualified personnel contributed to future growth of INVs. In other words, these findings are consistent with studies suggesting that the acquisition of new knowledge, especially through better educated and productive people, is a key element for effective identification and exploitations of new opportunities (Naldi & Davidsson, 2014; Storper & Scott, 2009). Therefore, as new ventures become international, additional knowledge acquired through qualified and R&D personnel can lead to the expansion of a firm's set of productive opportunities that can be used to pursue future growth opportunities (Añón, 2016).

6.2. Practical implications

The results of this study have some important implications for practitioners as well. First, INV managers should be mindful of the full extent of the benefits that investing in innovation resources offers to their growth objectives. It is important to recognize that innovation efforts should not only be used as a strategy for enhancing growth but also achieving learning outcomes. Due to the short life cycle of technology, it is understandable that INV managers may be pressurized to recoup their investments in developing the inventions and earn financial rewards. However, while such a strategy may work in the short-run, INVs must improve their learning capabilities to grow sustainably in the international markets. In other words, INVs that fail to identify, exploit, and utilize the technological learning available in the international market have missed important opportunity (Prashantham & Dhanaraj 2010). This calls for an outlook that takes an all-inclusive rather than a narrow view of the innovation outcomes. Our key message is that INVs must recognize that international markets offer both financial growth and technological learning opportunities and they can strategically exploit them.

Second, given that investing in various types of technological resources may place some constraints on the financial and managerial capacities of INVs. Managers should have appropriate expectations about the type of innovations that will help achieve their overall growth objectives. Thus, if managers are interested in increasing their international growth, our study recommends that they should pay special attention to human capital investment, R&D activities, and patents. Specifically, if the objective is to increase immediate growth (e.g., within one year), external R&D activities and patents represent an important input. Conversely, if managers desire to achieve future growth in the foreign markets, they should consider readapting product innovation and human capital strategies.

Taken together, innovation efforts have differentiated impacts on the post-entry growth of INVs. Our study reveals that not all innovation decisions lead to the same result: certainly not every combination of innovation has the same effect on the post-entry growth. Therefore, managers should be aware of not only the challenges of investing in innovation options simultaneously but also the growth implications, especially when pursued in the post-entry phase of the internationalization process.

6.3. Limitations and future research

This study has several limitations, which need to be recognized and possibly overcome in future research. First, INVs may invest in various appropriability mechanisms depending on the characteristics of the knowledge embodied in the inventions. In our study, we used patents; however, when approaching international markets INVs may select an appropriate protection strategy that fits a firm's growth objectives. For example, beyond patents, INVs invest in other formal protection instruments (e.g. trademarks, copyrights, and design rights) and even informal methods (e.g. confidentiality agreements, secrecy, and lead time). In future research, it would be interesting to ascertain how INVs use and re-adapt these appropriability tools to achieve post-entry growth objectives.

Second, internal R&D activity is linked to growth. In our study, it did not play a significant role in the growth of INVs. One might think of INVs as having nothing to do with an expensive and risky activity such as internal R&D due to the liability of smallness and resource constraints (Santarelli & Sterlacchini, 1990). However, it is important to investigate whether different results are obtainable when the R&D activities of INVs are decomposed into formal and informal R&D investments.

Third, INVs are more exposed to the liabilities of foreignness, that is, the additional costs that they face relative to their indigenous competitors when operating in international markets. We acknowledge that the liabilities are likely to affect the level of innovation investments, adaptation decisions, and growth of INVs. Therefore, there is a need for more research examining how these firms allocate as well as improve their innovation resources to overcome these challenges and achieve their growth objectives.

Fourth, the internationalization of firms is a time-based process. Firms do not only decide what type of innovation resources contribute to post-entry growth but also the timing of such decisions are critical to successful international operations. As firms need to develop the capabilities to simultaneously engage in these decisions, more future research can uncover how INVs manage the constraints inherent in such activities as they can negatively affect their overall innovation and international objectives.

Finally, there is a reverse causality relationship between innovation and internationalization. Internationalization involves a series of decisions taken over time. We call for more studies investigating how these internationalization decisions influence subsequent innovation decisions and the growth of INVs in the international markets. Despite the limitations of this research, we hope this work will open up more productive fields for future research.

6.4. Conclusion

Our study examined the benefits of adapting and improving innovation resources to achieve growth once the internationalization process has started. Based on the analysis of Spanish INVs, we explained the impacts of the technological pattern adopted at the initial foreign entry and the decisions to improve it afterward. In general, while the

original configuration of innovation resources contributed to the immediate growth of INVs, our study shows that the changes that occurred in them have more significance on future growth of these firms. Therefore, our study is supported by earlier works that emphasize the role of innovation as a stimulus for internal change (Cavusgil & Naor, 1987; McGuinness & Little, 1981), as well as resource adaptation as a means of achieving sustainable growth in the international markets (Khan & Lew, 2018; Teece et al., 1997).

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