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Dealing with the tensions between innovation and internationalisation in SMEs: a dynamic capability view. *

Daniele Battaglia[1] *and Paolo Neirotti*[2]

Abstract

Previous literature disagrees on the fact that innovation and internationalisation are decisions with a complementary effect on SMEs' performance. We reconcile the contrasting views on this topic by using a dynamic capability perspective. We show that the simultaneous involvement in R&D and export activities positively impacts SMEs' profitability when such firms collaborate with universities and research centres, or when their international experience involves a diverse set of geographical markets. The magnitude of these moderations is different for low and high performers, thereby showing the lack of a 'one best way' to successfully achieve complementarity between R&D and internationalization decisions.

Keywords: dynamic capabilities, innovation, internationalization, international experience, university-industry collaboration, export, SMEs, profitability

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1. *Introduction*

Technological innovation and internationalisation are intertwined necessities for Small and Medium Enterprises (SMEs) in hi-tech sectors (Denicolai, Hagen, and Pisoni 2015). Sales on international markets are essential for SMEs to cover the fixed costs of their Research and Development (R&D) endeavours, primarily when firms operate on small domestic markets with limited growth potential and with a limited local demand for innovative products (Hitt, Hoskisson, and Kim 1997). However, international expansion poses challenges for the product innovation endeavours of SMEs, given the diversity of the product requirements between their home-market and the foreign institutional environments (for example, laws, norms, technical standards and customer' needs can vary significantly from one country to another), and considering that a firm's innovation patterns usually start from domestic rather than to foreign demand (Fabrizio and Thomas 2012).

The presence of the above-mentioned challenges is reflected in the lack of univocal evidence in the literature about the effects of combining innovation and internationalization endeavours on SMEs performance. Beside studies that have shown a complementarity between R&D and internationalization for SMEs (Golovko and Valentini 2011), some other studies have even shown that, under certain circumstances, SMEs that simultaneously pursue international sales and product

innovation can have a lower level of business growth than firms that are focused on just one of these activities (Battaglia, Neirotti, and Paolucci 2018; Booltink and Saka-Helmhout 2018; Kumar, 2009). The lack of complementarity found in some studies is mostly attributed to the resource constraints (related to the managerial attention allocated to different product innovation and internationalization endeavours) that characterise SMEs when they deal with exploration endeavours on both the market and the product domains (Voss and Voss 2013; Zhang, Wang, Li, and Cui 2017).

We propose that dynamic capabilities (Teece 2014; Teece, Pisano, and Shuen 1997) can help SMEs mitigate the conflicts between R&D and international market exploration due to their role in sustaining firms in sensing, seizing and transforming technological and market opportunities. Specifically, we contend that experience in internationalisation and collaboration with scientific and technology institutions (as universities and research centres) are two foundation of the dynamic capabilities that attenuate the tensions in resource orchestration between R&D activities and market exploration in the context of SMEs.

In order to test the role that international market experience and the level of technological collaborations have in mitigating the tension that internationalisation and R&D programmes have on the performance of SMEs, we focus on the impact that the intensity of R&D investments and export activities on sales revenue have on the profitability of SMEs. The focus on exports to capture SMEs' internationalisation is due to the specificities of these firms, where the limited size leads SMEs to use exports rather than direct foreign investments as the most common way to serve foreign markets (Love and Roper 2015). We explore these effects through a Quantile Regression (QR) analysis conducted on a sample of 221 high and medium-tech firms operating in the north-west of Italy. Our findings show that: (i) the adverse effect due to the combination of internationalisation and innovation endeavours is inherent to low performing SMEs; (ii) in the product domain, the development of knowledge through collaborations with universities and research centres positively moderates the impact that R&D and export intensity have on SME profitability for medium and high performers, but not for low performing SMEs; (iii) the diversity of previous international market experience helps

firms to combine the two endeavours under analysis successfully; (iv) by contrast, the length of the experience on international markets accentuates, rather mitigating, the tensions between innovation and internationalisation endeavours. Taken together, these findings suggest that the returns of certain avenues for combining internationalization and R&D endeavours effectively are more evident at high level of SME performance, while other avenues produce positive effects at low level of performance.

In raising this evidence, the paper reconciles previous mixed findings in the literature on the complementarity between innovation and internationalisation in SMEs (Battaglia et al. 2018; Booltink and Saka-Helmhout 2018; Golovko and Valentini 2011; Kumar 2009) by showing that dynamic capabilities help SMEs to mitigate the aforementioned tensions. This idea is rooted in the idea that dynamic capabilities consist of superior asset orchestration choices (Teece 2014). In this vein, we show that collaboration with scientific and technological institutions and the diversity of international market experience can represent two foundations of dynamic capabilities that help SMEs innovating for international markets by supporting them in sensing, seizing market and technology opportunities and in reconfiguring their resources accordingly.

2. *Theoretical Background - How to develop dynamic capabilities to combine internationalisation and R&D investments in SMEs*

The position of scholars concerning the capability of firms to capture the value created through innovation and internationalisation activities is much more controversial, primarily when they are jointly pursued (Battaglia et al. 2018; Golovko and Valentini 2011). Studies that report a negative effect, due to the simultaneous effort of SMEs in R&D and internationalisation, advocate that internationalisation increases the complexity and the variety of the R&D programmes needed to target foreign markets with product requirements that meet the local customers' needs. In the international business literature, such a position is reflected in the decreasing marginal returns international expansion has when it leads firms to diversify its geographical presence in different market areas (for example Lu and Beamish 2004). Geographical diversification puts SMEs in a

situation of information overload and requires asset orchestration capabilities in product development processes, since the product often has to be adapted to local contingencies (Calantone, Kim, Schmidt, and Cavusgil 2006).

Moreover, international studies point out the lack of brand, reputation and complementary assets in sales and distribution that SMEs generally exhibit as well as the limited bargaining power and information asymmetry they may have with export intermediaries due to the lack of such assets (George, Wiklund, and Zahra 2005). Some studies also show that the lack of these assets eventually hinders the absorptive capacity needed to use the knowledge of foreign markets effectively in the innovation process (Neirotti and Paolucci 2015). In short, SMEs that try to put innovative products on multiple foreign markets face challenges related to innovative knowledge absorption, collaboration and negotiation with local distribution partners on foreign markets, and information overload in the portfolio management of their R&D programmes.

Firms with dynamic capabilities can manage the complexity of such challenges, due to their capacity in sensing, seizing and transforming the opportunities that are available in the firm's product and market domain (Teece 2014; Teece, Pisano, and Shuen 1997). Sensing refers to the routines and processes enacted by a firm to recognise and shape opportunities and threats. Seizing refers to the capacity of a firm to capture such opportunities, while transforming refers to the processes enacted by a firm to reconfigure the existing endowment of resources and capabilities (Verona and Ravasi 2003). In this regard, Teece (2007) identified the building block of dynamic capabilities as the 'asset orchestration' mechanisms through which firms evolve and adapt their capabilities and are capable to capture value from their innovation (Teece 2006). Such mechanisms refer to the coordination, learning and reconfiguration processes through which firms internalise new technological resources in an entrepreneurial fashion. In the specific case of SMEs that are trying to target foreign markets with innovative products, asset orchestration may refer to the mechanisms through which SMEs reconfigure their networks of suppliers, distribution partners and their intangible assets, such as

reputation and specialisation in new technologies, to develop new products that target the requirements and the customer' needs that are specific of different geographical regions.

SMEs can develop the dynamic capabilities necessary to enter and penetrate foreign markets with innovative products in two ways. First, through openness with universities and research centres. In this vein, collaboration with scientific and technological partners in innovation activities sustains firms in opportunity recognition and in a more rapid and efficient transformation of innovative knowledge into new products (Giudici, Guerini, and Rossi-Lamastra 2019). Second, through experience on international markets, firms can be exposed to a greater diversity of institutional and market settings that can contribute to their absorptive capacity and to developing new ways of learning that are applicable in unfamiliar knowledge domains (Lopez-Vega, Tell, and Vanhaverbeke 2016). Moreover, the longer and the more diversified their experience on international markets is, the lower their relational dependence may be on export intermediaries that can capture part of their profit margin on international sales (Bai, Krishna, and Ma 2017) and can hinder the absorption of the market knowledge that is specific of each geographical area where the firm is exporting (Hollender, Zapkau, and Schwens 2017). This could imply that SMEs with a high weight of international sales may plan an intensification of their R&D programmes only in the moment they have gained enough experience on international markets.

The use of dynamic capabilities as theoretical lens to investigate the circumstances under which SMEs capture value from the combination of export and innovation is coherent with how international business studies see firms' attempts to focus their direct investments on the R&D and the marketing stages of global value chains (Mudambi 2008; Wan and Wu 2017).

2.1 Universities and research centres.

The openness of innovation processes can contribute significantly to the dynamic capability of a firm (Teece, Peteraf, and Leih 2016). This is inherent to the vision of Teece (2014) of dynamic capabilities being the capability to do 'the right thing' concerning the goal of evolutionary fitness that

firms have in environments characterised by high technology and market dynamism. Under these circumstances, collaboration with universities and research centres goes in this direction, since it allows firms to access innovative technological or scientific knowledge (Brunswicker and Vanhaverbeke 2015).

The depth of collaboration with universities and research centres (that is, the extent to which firms draw deeply from such entities to develop new knowledge; Laursen and Salter 2006) may seem beneficial in relation to the capability of an SME to develop radical innovations (West and Bogers 2014). Firms that are used to collaborating with universities and research centres are expected to develop superior absorptive capacities, to compress time and costs in learning and product development processes (Kafouros, Wang, Piperopoulos, and Zhang 2015), but also to learn further knowledge from other sources, such as customers, suppliers and competitors (Love, Roper, and Vahter 2014). Moreover, the more technical and scientific universities develop technology transfer capabilities, the more they can lower the search costs for SMEs, thus preventing firms from falling into problems of local search or over-search (Friesike, Widenmayer, Gassmann, and Schildhauer 2015). In this vein, the depth of collaboration with technical/scientific partners, such as universities, is necessary for an SME to explore new technological trajectories (van de Vrande, de Jong, Vanhaverbeke, and de Rochemont 2009). Moreover, collaborations with universities may lead to the enhancement of problem-solving capabilities, by lowering the costs that arise in the process of integration of external knowledge into a firm's knowledge (Fabrizio 2006). This can have positive effects on the capability of a firm to develop and market new products that meet the technical and market requirements of a wide variety of geographical markets and can be reflected in superior profitability. In line with these arguments, recent evidence report that collaborations with universities and research centres often go hand in hand with the export activities of SMEs (D'Angelo 2012).

2.2 Experience

A second way of developing dynamic capabilities emerges from experience. Learning processes are gradual and path-dependent, since organisations develop new knowledge on the

boundary of previous knowledge (Kogut and Zander 1992). For those SMEs that approach international markets with innovative products, this implies that previous experience on international markets can support them in the learning process that is needed to enter new market areas and to improve market shares in a region where the company has already established a limited presence.

The role of experience in understanding the capability of an SME to enter new market areas should be considered concerning the meta-routines related to the rate at which firms 'learn to learn' (Levitt and March 1988). This point refers to what Zollo and Winter (2002) defined as second-order dynamic capabilities, which is essential when firms exposed to new environmental conditions have to develop new routines, skills and capabilities. This can refer to the situation of entering a new country that exhibits differences in institutional factors (for example, market regulations and/or the supply chain structure) and which requires a firm to learn new ways to market the product. International sales may thus require an SME to learn new things fast and effectively, given the diversity that different market areas exhibit about institutional factors (Johanson and Vahlne 2003), distribution strategies, pricing mechanisms and financial markets (Eriksson, Fjeldstad, and Jonsson 2017). In this vein, experience allows firms to anticipate and respond to specific international conditions (Cieślik, Kaciak, and van Stel 2018), to identify and exploit opportunities that arise on foreign markets, and to cope with threats (Zou and Stan 1998).

According to Cadogan, Diamantopoulos and Siguaw (2002), strategising on international markets is a function of learning on two different dimensions, namely international experience intensity (that is, the number of years a firm exports abroad with continuity) and international experience diversity (that is, the number of geographical regions in which the company exports or has a direct market or productive presence) (Miller, Lavie, and Delios 2016). We expect that those SMEs that have higher levels of international experience intensity and international experience diversity will be more able to successfully combine R&D and export endeavours, as these experience dimensions can be associated with second-order dynamic capabilities that lead to more successful sensing, seizing and transforming capabilities in the product/market domain.

Thus, experience in international markets results in superior capabilities of sensing and seizing market opportunities abroad and in superior transformational capabilities which enable the new knowledge that is necessary to enter new markets abroad to be replicated or developed quickly.

3. *Hypothesis development*

For SMEs, the use of external sources in the innovation process often consists of partnerships with actors who operate at the frontier of technology and scientific development, such as universities and research centres. Specifically, relying on these categories of partners may lower the direct commitment of the resources sustained by firms in an attempt to incorporate new technologies that represent a radical innovation (Kafouros et al. 2015). In this context, Laursen and Salter (2006) demonstrated that firms that search for more radical knowledge in external actors go deeper into their search activity and are able to perform effective external searches that will result in a higher innovative performance to introduce products with a higher novelty degree onto the market, thus obtaining benefits in terms of exports (Saridakis, Idris, Hansen, and Dana 2019).

As far as SMEs are concerned, the benefits that derive from collaborations with universities and research centres can put these firms in the condition of more effectively developing R&D programmes that target foreign markets (that is, in less time and with lower costs). More specifically, such a kind of collaboration enables SMEs to sense and seize the opportunities of the application of new technologies or scientific principles to the product domain and can also play an important role in helping SMEs to build their reputation as tech companies on international markets, as explained hereafter.

Collaboration with universities can support SMEs in the chain of activities required to sense and seize technological opportunities and to incorporate such technologies in new products. Research laboratories can allow SMEs to enrich their understanding (**sense**) of the properties and characteristics of a new technological paradigm (for example, new lightweight materials, new manufacturing processes, new product architectures), and to support their efforts in **seizing** new opportunities and

transforming new knowledge into marketable products by assisting them in the validation and testing of their new products that incorporate the technologies on which the universities have a specialisation. Without such technological/scientific partners, this stage of validation and industrialisation is very often a time and resource-consuming activity, especially for those SMEs that are involved in international operations (Hollender et al. 2017). For instance, this phenomenon is quite common in Tier-1 suppliers that follow an OEM initiative to move to a new technological paradigm. This has been well documented by Goracinova et al. (2017) in their phenomenological research on university-industry collaboration to embrace radical technologies, such as new materials or electric engines in the car-making sector. In this regard, SMEs can use universities to test the performance of new technology-based products based on the requirements set by OEMs. Therefore, the validation of technologies by universities offers both product and market advantages.

Finally, collaborating with universities and research centres can enhance the reputation of small firms reputation (Worthington, Ram, and Jones 2006) on foreign markets. This can be particularly important in the context of international market relationships when SMEs suffer from the well-known 'liability of foreignness' in dealing with prospective foreign customers. In a dynamic capability perspective, a university can thus support SMEs in the **transformation** of their assets and help them to build the market reputation of an innovative company at the international level (Teece 2014). However, the reputation enhancing effect generated by technological collaboration with universities can be more salient when SMEs invest, at the same time, more resources in more radical R&D programmes and have a broader market presence abroad.

Overall, these arguments support the idea that a deeper collaboration with universities and research centres may help SMEs incur fewer problems of monetising their contemporary effort in R&D programmes and reputation enhancing actions on foreign markets. As such, collaboration with universities and research centres can positively moderate the negative effect on profitability resulting from the combination of R&D intensity and export intensity shown in past research on SMEs (Battaglia et al. 2018; Booltink and Saka-Helmhout 2018). For these reasons, we posit that:

H1: The depth of collaboration of SMEs with universities and research centres in R&D endeavours positively moderates the negative interplay that R&D and export intensity has on their profitability.

The relevance of the second-order dynamic capabilities that have been outlined above implies that the prior knowledge and experience of SMEs in international markets may also play a significant role in reducing the costs and complexity of combining foreign sales with intensive R&D processes. Specifically, experience on foreign markets may allow SMEs to reduce the costs associated with integration and coordination with foreign distribution partners (Di Gregorio, Musten and Thomas 2009), and to increase their ability to access the knowledge about foreign markets and institutional regimes that is crucial for product innovation (Hsu, Chen, and Cheng 2013). However, a recent study has recalled that firms that have more experience on international markets by inertia can enact self-imitation of previous choices and routines of entry on foreign markets (Albertoni, Elia, and Piscitello 2018). Such inertial mechanisms increase the likelihood of learning myopia in detecting and absorbing new relevant foreign market knowledge, and this limits the innovation capability of the firm, and thus lowers the returns of its R&D spending (Albertoni et al. 2018). This evidence has also been highlighted by some studies that have shown the existence of an inverted S-shaped relationship between international experience and export performance (Cieślik, Kaciak, and Thongpapanl 2015). However, such inertial problems can be less salient when entry onto foreign markets occurs through partnerships with local distributors, as is the case of the majority of SMEs (Sousa and Bradley 2009). Market-based, rather than hierarchy-based, choices require more adaptiveness, due to the frequent changes in partners and distribution contract clauses. Such changes reduce the possibilities of applying past routines and knowledge to the present initiative and require more adaptiveness to the routines and processes used by each local distributor. As such, SMEs with long-lasting internationalisation experience may identify the best practices that were responsible for the success of the past entry modes, and adapt them to the new initiatives, as theorised in the dynamic capability approach (Teece 2014). In particular, in a context of high R&D intensity and a large presence of

foreign markets, internationalisation experience may help SMEs to sense, seize and transform emerging opportunities, as we advocate in the following paragraphs.

A long-lasting experience on international markets may enable SMEs to develop **sensing** capabilities, since, in these circumstances, SMEs are more likely to benefit from a knowledge spillover from their foreign suppliers and distributors, and can more easily search the local market for complementary technologies. Similarly, a long presence on international markets is a sign of the reliability of the product sold to customers. Such a signal increases the market reputation and credibility of a firm. Moreover, it helps an SME to maintain its competitiveness through the **transformation** of some intangible assets and to decreases the need for resources in the market domain to build and legitimate such a standing (Stuart 2000; Zhao and Aram 1995), especially with regard to new products. In other words, a new foreign entrant on the market has a lower reputation and less credibility in launching a product innovation on such a market, compared to domestic rivals and foreign competitors with a longer track record (Teece 1986). This implies that the investments in R&D and the export activities carried out by an SME with limited experience on foreign markets are harder to capitalise on to obtain superior profits.

We thus contend that, despite the inertial effects on learning that long-term international experience intensity may entail (Albertoni et al. 2018), the two mechanisms advanced above enable a superior asset orchestration through the reduction of the resources needed to perform R&D activities and international operations, which - in turn - favours the combination of R&D and export activities.

On the basis of these arguments, we may expect that SMEs with longer international experience are more likely to obtain profit advantages from combining high spending in R&D with export intensity than those with more limited experience. This happens since international experience provides more valuable information input to the R&D process and enhances the reputation needed to sell a new innovative, and not tried before, product on a foreign market. Hence, we posit:

H2: International experience intensity positively moderates the negative interplay that R&D and export intensity has on the profitability of SMEs.

The effectiveness of an SME in developing R&D programmes for foreign markets may also depend on when the firm operates on multiple and diverse foreign markets and the diversity of the covered market regions. This happens since exposure to different cultures, customers' behaviour and needs, institutional environments and technical norms, increases the variety of experiences that a firm has to face during international operations. Such a variety of market situations and experiences increases a firm's rate of problem-solving capabilities in the R&D activities that are needed to adapt a product to each local market (Barkema and Vermeulen 1998). Albertoni et al. (2018) referred to this type of situation as a 'mindful repetition' of entry modes, since it entails the company adapting its market capabilities from the past context to the present new one. More specifically, firms that deal with a high diversity of market situations in their international experience enact a mindful and more complex learning process to approach each foreign market. Such mindfulness is based on more frequent and in-depth interactions with local knowledge sources, such as customers, suppliers and distributors (Zahra, Ireland, and Hitt 2000). Moreover, exposure to different foreign market situations broadens a firm's capabilities of **seizing** opportunities in the product-market domain thanks to its involvement in broader distributor, manufacturer, competitor and technology provider networks located abroad. Broader networks may – in turn - increase the learning on new technologies (Zahra et al. 2000), markets (Johanson and Vahlne 1990) and local suppliers, distributors and technology partners.

Moreover, firms operating on multiple foreign markets are believed to be more able to **transform** - at a lower cost - market opportunities into new products that meet the country-specific needs that characterise a new market abroad. This may occur since firms that deal with higher market complexity are subject to more significant pressure to design their products as platforms in order to cope with the information overload that stems from a broad presence on diverse markets, and to

introduce modular innovations which may reduce the product refinements (and the related costs) needed to address the preferences of customers on each local market (Jones 1999). From a dynamic capability point of view, this equates to a superior capability of orchestrating the assets needed for R&D and foreign market sales.

For these reasons, in situations of a higher diversity of international experience, SMEs may experience less negative returns on their profitability, due to combining internationalisation and high R&D investments, thanks to the superior adaptiveness of their market strategies and product architectures to changing market conditions, and to their broader access to complementary external resources located abroad. Hence, we propose:

H3: International experience diversity positively moderates the negative interplay that R&D and export intensity has on the profitability of SMEs.

A summary of the main effects and the mechanisms hypothesised above is reported in Table 1.

INSERT TABLE 1 ABOUT HERE

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4. *Data and methods*

Our data were taken from a survey administered between June and July 2014 on a population of innovative Small and Medium hi-tech Enterprises operating in Italy, in the Piedmont region. Over the last decade, the European Innovation Scoreboard and the Regional Innovation Scoreboard have classified the Piedmont region as being a 'Strong Innovator' about various measures pertaining to firms' investments in R&D and to the initiatives of local institutions to support innovation and internationalisation activities[3]. The choice of this research setting has two advantages for our

[3] A complete discussion on the innovation categories through which the European Union classifies regions can be found in Hollanders et al., (2012).

purposes. First, by operating in the same institutional conditions, all the firms here studied have the same opportunities in relation to international development, R&D and product innovation. Therefore, we can limit the interference in our analyses of the confounding factors that may change the nature of the relationship between R&D investments, export activities, technological/scientific collaborations and international experience.

Furthermore, a cluster of local technical and scientific universities exists within the Piedmont region and in its proximity, which covers broad fields of research in STEM disciplines and is very active in technology transfer towards SMEs (Battaglia, Landoni, and Rizzitelli 2017). These enterprises were selected according to the hi-tech requirements indicated by OECD (2009) and operate in several fields of manufacturing and advanced services. Moreover, they were also selected on the basis of the existence of specific innovative requisites in their operations over the three years preceding the survey (that is between 2011 and 2013). Thus, the firms included in the population frame had to have accomplished at least one of the following tasks in the aforementioned period: i) the realisation of research projects funded by the European Community, ii) the realisation of research projects funded by national and regional measures, iii) at least one patent filed, iv) settlement within local incubators, science parks, or special acceleration programmes sustained by local public agencies and institutions. A total of 1,203 firms were identified as being suitable for the survey. The architecture of our survey was based on the conceptual framework used in the Community Innovation Survey (CIS) promoted by the European Commission.

We sent the questionnaire to 1,203 SMEs, and the targeted respondents were CEOs. We received answers from 364 of them, thus obtaining a response rate that was in line with surveys on SMEs (30.26 per cent). We combined the survey data with financial data from Aida, a database published by the Bureau Van Dijk, which includes financial information on all Italian firms. After matching and considering only firms that provided full information for the main variables under

investigation in this study, we obtained a final dataset of 221 usable observations. The here analysed sample is composed of firms with less than 100 employees, which allowed us to reduce the research bias due to dimensional effects (Crick and Spence 2005).

As presented in Table 2, the sample includes manufacturing companies operating in automotive and machinery industries and includes a strong representation of software companies for industrial application. There are also some companies operating in medium-low tech sectors which have been sampled following the stringent innovativeness criteria outlined above.

INSERT TABLE 2 ABOUT HERE

4.1 Measures and construct validation

Dependent variable

As a measure of profitability, we considered the Return on Assets (ROA), which was computed as the ratio between the pre-tax operating income and the average total assets in 2014. ROA constitutes a comprehensive indicator of the overall operational profitability of a firm and may reflect effects of revenue growth and of repositioning towards value chain stages with higher unit profit margins that SMEs typically target when they export innovative products.

Independent Variables

R&D investments. Research and development investments were operationalised as the ratio between R&D expenditures in 2013 and the total revenues of the firm for the same year.

Export intensity. This measure was taken from the survey, where we asked firms to express their export intensity as the percentage of revenues originating from export activities in 2013.

Moderators

Depth of collaboration with universities and research centres. On the basis of the CIS survey and previous open innovation literature (for example, Laursen and Salter 2006), we asked the CEOs to indicate - on a Likert five-point scale – with what intensity they collaborate with universities and research centres.

Experience on international markets: According to Cadogan and colleagues (2002), we measured the two components of experience that a firm has on international markets as:

-*Intensity of international experience*. This measure was computed as the logarithm of the number of years of stable export activities the firm had achieved. This type of measure, pertaining to experience, was used extensively in the previous literature as a proxy of international experience (for example, Hultman, Katsikeas, and Robson 2011).

-*Diversity of international experience.* According to Cadogan et al. (2002), this variable was created through the computation of an aggregate index that measured the weighted number of geographical regions (Africa, Asia, Central and South America, Europe, the Mid-East, North America, Oceania) addressed by the firm through export activities. Being a weighted index, this variable considers not only the number of geographical regions addressed by each firm but also their distance from the firm's headquarters (that is, Italy). This computation is based on the idea that the farther away the addressed market is, the more difficult it will be for a firm to obtain the knowledge necessary to serve it (Kaynak and Kuan 1993).

Control Variables

We added several firm-level measures to control the regression. In short, we incorporated effects related to a firm's size (*Employees*), expressed as the logarithm of the number of employees, and age (*Age*), expressed as the number of years since the firm's creation. Industry effects on the firm's profitability were controlled by considering the munificence (*Munificence*) and the level of competition (*Competition)* of the industry. The perceived munificence reflects the degree to which respondents reported that the availability of resources in the operating environment was growing (or declining). This is indicative of the extent to which the environment supports the industry actors with

stability or growth (Sutcliffe and Huber 1998). In this way, we used scales, such as the degree of technological maturity on the market, the breadth of market opportunities and the degree of stability of the demand, to take into consideration the market opportunities for profit, whereas the latter scale was operationalised using established scales that took into account the respondents' perceptions about the market dimensions, entry barriers and the market concentrations.

We also included the position of the firm along the industry's supply chain by collecting data about the sales revenue mix from manufacturers of components (*Component Sales*), subassemblies and end customers or distributors (*End Users' Sales*). In this way, we checked whether a firm was prevalently positioned in an upper or lower position in its supply chain.

Finally, we also included a dummy variable to consider whether the firm belonged to a high or medium-tech industry (*Hi-tech – Medium tech Sector*).

4.2 Model specification

4.2.1 Quantile regression

In order to test the hypotheses, we used Quantile Regression (QR). QR provides information about the dependent variable and the regressors at different points of the conditional distribution of the outcome (Cameron and Trivedi 2009; Koenker and Bassett 1978). This choice is adequate in studies when firm's performance is the dependent variable since performance distributions are typically characterized by right-skewness and high variance in dependent variable. In such situations, it is preferable to consider a robust regression, such as QR, which allows one to work on every single point of the distribution and to make inferences at different quantiles (Li 2015). In this way, the estimated coefficients are not sensitive to the outliers on the dependent variable (Buchinsky 1998). In so doing, this technique can show more nuanced relationships that link the independent variables with the dependent variable by providing estimates in different levels of the conditional distribution (Li 2015). In our analyses, this was done by performing the regressions at the 25th percentile, at the median and the 75th percentile of the distribution of SMEs' profitability.

4.2.2 Endogeneity issues

Strategic management literature has highlighted that the relationship between strategic choices (such as exports and R&D investments) and performance might be subject to self-selection problems (for example Leiblein, Reuer, and Dalsace 2002). Self-selection problems complicated the estimation of our results in two ways. First, in standard OLS models, self-selection problems are solved by calculating, at the first stage, the Inverse Mills Ratio (IMR), which is determined on the basis of a probit regression that models the choice of whether to undertake a specific decision (Heckman 1979). However, this was not possible in our specific case, due to the employment of quantile regression models at the second stage. To deal with this issue, we used the approach proposed by Buchinsky (2001). Buchinsky suggested estimating the selection equation (first stage) to model the choice to undertake a specific strategy through the Klein and Spady (1993) semiparametric maximum likelihood estimator (SML), then to calculate the IMR and, finally, to include power series of order two of the IMR as regressors of the second stage quantile regression to correct for self-selection.

Second, at the same time, we had to deal with multiple variables that depicted strategic choices whereby firms may self-select to achieve superior performance (R&D activities, export activities and the joint pursuit of such activities). A straightforward empirical approach would be to estimate IMRs separately for each decision, thus, to manage the choice to perform R&D investments, exports and joint R&D and export activities as independent choices. However, it has been underlined in the literature that innovation and internationalisation activities are not independent choices and are highly correlated (Love and Roper 2015). Despite this recent evidence, a unanimous view about the sequence of entry into innovation and internationalisation activities has not been reached in the literature (see, for example, Cassiman and Golovko 2018). It is thus not clear whether firms first engage in innovation activities, then in internationalisation and finally in joint internationalisation-innovation activities or – alternatively - they first undertake internationalisation, then innovation and

finally joint innovation and internationalisation. This lack of a unanimous view does not provide a clear indication of the empirical strategy that should have been used to manage the self-selection issue in our context.

In order to deal with this problem – and following the discussion about innovation and internationalisation activities started by Golovko and Valentini (2011) - we hypothesised that SMEs undertake innovation and internationalisation activities according to the following sequence: (i) innovation; (ii) exports; (iii) joint innovation and exports[4]. Empirically, we relied on a recursive model akin to the one developed by Antonelli and Colombelli (2015) in investigating the role of internal and external knowledge in creating new technological knowledge. Thus, we controlled for selection problems by using a procedure that considers, at the first stage, the decision of firms to engage sequentially in R&D activities, export activities and joint R&D and export activities. First, we estimated -through the Klein and Spady (1993) SML estimator- the binary choice of performing R&D activities. We used the results of this model to construct an $IMR_{R\&D}$, corrected for the self-selection of SMEs in R&D activities. We included the variables *Employees, Hi-tech -Medium tech industry, Age, Munificence, Competition, Components Sales and End Users sales* as predictors in the SML model. We also included, as an exogenous instrument, *R&D funding,* which is a dummy variable that takes on a value of one if, in the previous three years of operations (since the survey), the firms had received public funds to sustain R&D activities, and zero otherwise. Therefore, it should be related to our independent variable (*R&D intensity*), because firms are more likely to perform R&D

[4] According to Golovko and Valentini (2011), we set the sequence of choice between the three different activities firms may undertake beginning from innovation. This choice is consistent with the literature that sustains that most innovative firms reach higher productivity and then self-select them into export activities (Bernard and Jensen 1999). Moreover, the nature of the SMEs analysed in our study (that is, from manufacturing sectors) suggests that innovation is required before foreign markets are addressed (Cassiman and Golovko 2011). Then, we considered the possibility of integrating export as a further activity that firms may undertake. This second choice was conditional to the first choice of undertaking R&D activities and followed the idea according to which firms with higher productivity (reached through innovation) obtain further advantages from having operations abroad (Salomon and Shaver 2005). Finally, we modelled the decision to perform joint innovation and internationalisation activities.

if subsidised by grants (Beck, Lopes-Bento, and Schenker-Wicki 2016), but it is theoretically unrelated to profitability.

Second, we again used the SML estimator to compute the IMR_{export} related to the decision of SMEs to engage in foreign activities. In doing this, we modelled the binary choice of participating in export activities by including the same predictors as before (except for *R&D funding*), the $IMR_{R\&D}$ to correct for the previous decision of firms to perform innovation activities and the exogenous variable *Participation in internationalisation courses*. This dummy variable takes on a value of one if the firm had participated in specific training programmes that introduced internationalisation strategies in the three years before the survey, and zero otherwise. This variable should therefore be related to our independent variable (*Export intensity*), because firms are more likely to perform exports if they are aware of the strategies necessary to enter foreign markets (Samiee and Walters 1999), but it is theoretically unrelated to profitability.

Finally, in order to deal with the self-selection of firms in joint R&D and export activities, we used the SML estimator to compute the $IMR_{R\&D+export}$ related to the decision of SMEs to engage in both R&D and export activities. As in the previous cases, we included the usual predictors, the IMR_{export} to correct for the previous decision of firms to perform foreign activities (which was already comprehensive of the correction for the decision of undertaking innovation activities) and a specific exogenous variable -*R&D_FDI*- that takes on the value of one if the firms have a subsidiary that performs R&D activities abroad, and zero otherwise. This variable should be related to our independent variable (*R&D int. X Export int.*), because firms that perform R&D activities abroad should be more incentivised to use such activities to refine and develop products which address the preferences of foreign customers, but it is theoretically unrelated to profitability as its presence per-se does not guarantee superior performance, if it is not associated with favourable levels of investments in joint R&D and export activities. The $IMR_{R\&D+export}$ estimated at the latter stage was

then used as a correction term for the main quantile regressions. Figure 1 graphically reports our econometric approach.[5]

INSERT FIGURE 1 ABOUT HERE

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5. *Results*

5.1 Descriptive statistics

The descriptive statistics and the correlations among the variables are shown in Table 3.[6] The firms in the sample are on average small (about 22 employees), and they invest about 10 per cent of their revenues in R&D activities. Their exports on average accounts for 25 per cent of the firms' total revenues. About 50 per cent of the sample exports a proportion of their revenues of more than 15 percent. The firms in the sample on average had a ROA equal to 5 percent in 2014. The R&D and export intensity is negatively correlated (ρ= - 0.118; p<0.1), which is preliminary confirmation of the critical assumption of the paper, that is, of a substitutive effect between international activities and R&D activities. International experience intensity and diversity are negatively correlated. This evidence, albeit admittedly weak, suggests two important things. First, having been abroad for many years does not guarantee a diversified portfolio of markets addressed abroad (that is of having high international experience diversity). The second implication is related to the test of our hypotheses. The fact that international experience intensity and diversity are negatively correlated would seem to

[5] Robustness tests were also conducted with reference to different specifications of the self-selection into R&D and export activities. Such alternative specifications are: (i) a separate specification of the IMR for R&D activities and exports and their joint use as a correction for the self-selection into joint R&D and export activities, and the use of the IMR of joint R&D and export activities to correct the quantile regression at the second stage; (ii) a fully unrelated specification of the three IMR (R&D activities, exports and joint R&D and export activities) and their use at the second stage of the regression. The obtained results were qualitatively similar to those reported in the paper and are available from the authors upon request.

[6] Multicollinearity does not represent a problem for any of the variables as the VIF is largely below the suggested threshold of 10 (Hair, Black, Babin, and Anderson 2010).

suggest the possibility of a diverse impact of such experience dimensions on moderating the negative interaction between R&D intensity and exports on ROA. We thus proceed in the following section to test the hypotheses.

INSERT TABLE 3 ABOUT HERE

5.2 Regression Results

Table 4 shows the results of the first stage of the regressions conducted to model the sequential decision of participating in R&D, exports and joint R&D and export activities. As expected, the industrial conditions under control, munificence and competition intensity, as well as different firm-level variables, contribute to the self-selection of firms in all three activities. Moreover, the instruments we included in all three models have a positive and significant impact on the self-selection of SMEs in the three activities, thus suggesting they are good predictors of the reasons behind firms undertaking R&D and internationalisation activities. Finally, we note that the IMRs in both Model 2 and Model 3 are positive and significant, thus suggesting that self-selection occurs through a chain that first encompasses R&D activities, then export activities and finally the combination of R&D and export activities.

INSERT TABLE 4 ABOUT HERE

The second stage regression results (Table 5) show the results of the quantile regression models that tested the baseline effect of R&D and export activities on SME profitability (Models 1,2 and 3), as well as their combined effect (Models 4,5 and 6). The results reported in the baseline models (1-3) show that exports contribute positively and significantly to SME profitability for low, medium and high performers. By contrast, R&D activities coefficients report a negative impact on SMEs

profitability, although the coefficient at all the levels of the profitability distribution are not significant. Turning now to the baseline effects of combined R&D activities and exports on profitability, models 4,5 and 6 in Table 5 show that combining endeavours in the product domain (that is, performing R&D activities) and in the market domain (that is, selling products abroad through exports) has a detrimental effect on ROA for the SMEs in our sample. In particular, the second-order interaction between R&D intensity and export intensity is negative and significant at the 25th level of the conditional ROA distribution, while the effect is still negative, but not significant for firms with higher levels of profitability (that is in the 50th and 75th percentile of the conditional distribution of ROA). An important point worth mentioning is related to the self-selection of firms in R&D and export activities. The insignificant IMR included in all the models indicates that – despite the self-selection of firms in subsequent R&D and export activities - this problem is not relevant with reference to the profitability of our sample of SMEs.

INSERT TABLE 5 ABOUT HERE

Table 6 shows the results of the quantile regression models that were used to test the moderation effect of the depth of collaborations on innovation and internationalisation endeavours with universities and research centres on ROA.

INSERT TABLE 6 ABOUT HERE

We predicted, in hypothesis H1, that a close collaboration with universities and research centres in R&D initiatives helps SMEs to mitigate the tension between exports and R&D intensity on their performance. As far as the findings from the baseline models are concerned (Table 5), we thus should expect a positive moderation effect of collaborations with universities and research centres on

the effect of combining investments in R&D activities and exports for low performers (that is, the SMEs belonging to the 25th percentile of the profitability distribution). However, our analyses show that this moderation effect is positive but not significant for firms in the 25th percentile of profitability. Thus, firms that experience a tension between export and R&D intensity do not see a mitigation of this effect under circumstances of collaboration with universities. Nevertheless, Models 2 and 3 depict a situation in which medium and high performers benefit from combining R&D activities and exports when they collaborate with universities and research centres by obtaining a superior profitability (b_{50}=0.130; p_{25}<0.10; b_{75}=0.338; p_{50}<0.05, respectively). Models 1, 2 and 3 confirm the picture emerged in the baseline models, that is, the negative second-order interaction effect between R&D investments and exports being significant only for low performers. Finally, the lack of significance in the coefficients for the second-order interaction effects between R&D intensity and university collaboration, and between export intensity and university collaboration, underlines that collaborating with universities does not affect profitability when only one out of the two conditions under analysis -high R&D intensity or high export intensity- occurs.

In sum, these results do not show that university collaborations mitigate the negative interaction between R&D and export intensity, thereby not supporting Hypothesis H1. The results rather highlight a slightly different phenomenon. Such forms of collaboration allow to magnify the effects of combining R&D and export intensity in medium and high performers, that typically do not experience the tensions in combining these two types of activities.

INSERT TABLE 7 ABOUT HERE

In hypothesis H2 we posited that the longer the international experience of an SME was, the lower the negative effect on profitability, due to the interplay between R&D and export activities. Table 7 reports the models that were used to test this hypothesis. The third-order interaction effect between the intensity of R&D, exports and international experience is negative and significant in the

50th percentile of the conditional distribution (b_{50}=-0.145; p_{50}<0.10). Furthermore, we even found negative (but not significant) moderation effects at the other levels of the conditional distribution of ROA at which we tested the moderation effect (25th and 75th percentiles). These results do not support hypothesis H2. It is worthwhile noticing that the second order interaction between export intensity and international experience takes on negative and significant values at all three levels of the conditional distribution of the ROA. Taken together, these results suggest that a condition of R&D intensity is per se ineffective to overcome the negative effects seen on profitability by more experienced exporters.

INSERT TABLE 8 ABOUT HERE

We posited, in hypothesis H3, that the broader the international diversification was, the lower the negative effect on profitability, due to the combination of R&D and export intensity. Table 8 reports the models that were used to test this hypothesis. The third-order interaction effect that considers the moderating effect of international experience diversity is positive and significant for firms with an ROA in the 25th percentile (b_{25}=0.267; p_{25}<0.05), but not for those in the 50th and 75th percentiles (b_{50}=0.141; p_{75}>0.1; b_{75}=0.232; p_{75}>0.1). This result supports the hypothesis H3 for low performers.

In short, the situation depicted by the models in Tables 5,6,7 and 8 provides a detailed view of the negative effect on SME profitability due to the combination of R&D and export activities. First, we found that this negative relationship is only inherent to low performers. Second, we only found full support for hypothesis three, but not for hypotheses one and two. In other words, we found evidence of the idea that low performing SMEs may benefit from their international experience diversity to increase their profitability. Conversely, we found that collaborations with universities and research centres and international experience intensity do not positively moderate the negative impact of R&D and export intensity on ROA for low performers. A complementary and interesting result

regards the positive third-level moderation effect we found for collaborations with universities and research centres for medium and highly profitable SMEs. If considered in contrast to the results obtained for the moderation of international experience diversity, these results provide a nuanced view about the possible strategies firms may adopt to profit from the combination of R&D and export activities. In particular, these results show that low performers should rely on strategies based on international market diversification rather than on risky product exploration activities. In short, our results show that international experience diversity could be a viable strategy to recover from weak profitability under conditions of simultaneous R&D and export activities. Collaborating with universities and research centres, instead, makes it possible for SMEs to use contemporary R&D and export activities to strengthen their profitability level when they already are in situations of medium or high performance.

5.3 Robustness checks

To corroborate our results regarding the moderation of universities and research centres, international experience diversity and international experience intensity on the effect on the profitability of a contemporary engagement in R&D and export activities by SMEs, we conducted several robustness analyses. First, we adopted a different measure of profitability with reference to our primary analyses: the Return on Sales (ROS)[7]. At a first glance, the results seem to be in line with those presented in the primary analyses and point towards a substitution effect between exports and R&D activities, as well to a positive moderation effect of international experience diversity and a negative, but not significant moderation of international experience intensity. However, our robustness checks have shown that collaborations with universities and research centres are not a significant moderator of the negative interaction between R&D and export activities as far as ROS is concerned for medium and high performing SMEs. We have put this result down to a condition SMEs

[7] The results of the presented models in which the Return of Sales (ROS) for 2014 was adopted as a profitability measure, are available upon request to the authors.

may incur when collaborating with universities and research centres, that is, the greater effort necessary to explore technology or design alternatives with universities and research centres can increase the R&D costs, and the price applied to the product cannot fully cover this extra cost. In these circumstances, the positive effect we have seen on ROA might stem from the fact that the same or lower unit operating profit margin is applied to a larger revenue base.

Second, we employed an alternative dimension of diversity of international experience. The Cadogan's measure that we used in our primary analysis is based on the assumption that the farther the foreign market is, the harder it will be to gather information and acquire knowledge to serve customers. However, this measure does not take into consideration cultural and institutional factors which may mitigate or even change the difficulty of operating abroad with multiple countries (Beugelsdijk, Kostova, Kunst, Spadafora, and van Essen 2018). Both geographic and cultural distance may deter SMEs' international operations, but they operate through different mechanisms (Ojala and Tyrväinen 2007). This may imply that firms with advantages in overcoming geographical distance may suffer problems in overcoming cultural distance (Li, Zhang, and Shi 2019). For this reason, it could be argued that our measure of experience diversity encompasses only the geographical aspects of managing international operations, but not the cultural aspects. We thus performed a robustness test to consider not only the geographical diversity of experience, but also the cultural diversity of international operations.[8]

To measure international experience diversity taking into account cultural distance, we used Hofstede's measures of cultural diversity (Hofstede 2011). We adopted the procedure developed by Kogut and Singh (1988) and we computed an index aggregated to the level of the five geographical regions. This measure of cultural distance (*CD diversity*) has a correlation of 0.154 (*p-value*<0.1) with Cadogan's measure. The results of this regression models are presented in Table 9 and show that the positive moderation effect of international experience diversity is confirmed for low performers.

[8] We thank an anonymous reviewer for raising this point.

Moreover, using this new conceptualisation of international experience diversity, the results of the regression show a positive moderation effect, even for medium performers (that is firms in the 50th percentile of the conditional distribution). In short, these results support and confirm the evidence that emerged in the primary analyses.

Third, as our data were taken from a single year survey, we also performed robustness checks with reference to ROA and ROS for 2015, thereby considering a two-year lag effect. Our results are in line with those reported for ROS 2014, and show that, despite the positive moderation of international experience diversity and the negative (and insignificant moderation) of international experience intensity on ROA 2015 and ROS 2015, the positive moderation effect due to collaboration with universities and research centres vanishes and turns into a negative (albeit insignificant) effect.[9]

Finally, as literature has shown that the relationship between international diversification and performance may follow an inverted U-shaped relationship, we checked whether this effect was visible in our sample and could have a confounding effect for the relationship under study. We did not find any support to this relationship.[10]

INSERT TABLE 9 ABOUT HERE

5.4 Additional analyses to validate the mechanisms

[7] For the sake of space, the results are not reported but are available upon request from the authors.

[8] Previous studies that explored the relationship between the degree of internationalisation and the financial performance of firms have highlighted either an inverted U-shaped (Gomes and Ramaswamy 1999) or an S-shaped relationship (e.g. Contractor, Kundu, and Hsu 2003; Lu and Beamish 2004). This evidence could imply that after a certain threshold of internationalisation, the impact of international diversity on performance may become negative, due to a rise in the coordination costs. These arguments could assume crucial relevance in our case as, if an inverted U-shaped effect holds, SMEs should also pay more attention to the degree they diversify their international activities in order to avoid worsening the negative impact of conjunct R&D and export activities on profitability. For this reason, we performed multiple tests to control for a possible inverted U-Shaped effect, but the results did not point to this relationship (results are available upon request to the authors).

We proceeded by conducting some post hoc analyses to provide further evidence in order to corroborate the idea at the core of our article, namely that SMEs that collaborate with universities and research centres and those with a high level of diversity in their international experience are more able to capture value (and thus profit) from the contemporary combination of R&D and international activities.

Using a dynamic capability perspective, we referred to the mechanisms described in the formulation of hypothesis one that SMEs that collaborate with universities and research centres incur fewer problems of converting their combined effort in R&D and exports into superior profitability. The positive moderation we propose is due to the superior opportunities firms have of exploring and validating the application of radical technologies to their products or processes (sense and seize of opportunities) when they collaborate with universities and research centres. We have also used the argument that this collaboration process in an SME can follow the technical specs dictated by the SME's customers, as occurs in the automotive and aerospace sectors. Finally, we also posited that such collaboration provides a better reputation for the firm when accessing foreign markets, which is a key market asset to capitalise on the outcome of R&D programmes (equivalent to a reconfiguration of market assets in the direction of gaining reputation). An empirical test of these mechanisms is offered in the regression models reported in Table 10.

We used an ordered probit model in Model 1 to regress the level of collaboration with universities and research centres to the level of technological novelty of the sold products, as perceived by the key respondents of the survey[11]. We included the same control variables as the regression model specifications used to test our hypotheses as well as R&D spending and export intensity. According to the sensing mechanism illustrated in the formulation of Hypotheses 1, SMEs

[11] The considered firms were asked to choose the technological novelty of their products from among the following ordered items:
1) Our products follow the average technological evolution of the industry
2) Our products are technologically aligned with those of most of our technological competitors
3) Some of our products are technologically more advanced than those offered by most of our technological competitors
4) Our products incorporate radically more innovative technologies and are more advanced than those offered by our most technological competitors.

that collaborate with universities and research centres should show a higher technological novelty of their sold products since they can draw on a broader set of innovative knowledge than their counterparts. The results of the model are in line with this prediction and show that such SMEs have a higher degree of technological novelty in their products than those firms that barely or do not collaborate with universities and research centres (b=0.128; p<0.05).

In Model 2 in Table 10, we tested the seizing mechanism related to the idea that collaborating with universities and research centres allows SMEs to validate the sold product on both the product and the market domains through the testing and validation of the product. In order to test this mechanism, we adopted a probit model in which the level of collaboration with universities and research centres was regressed to a variable that measured whether SMEs were involved in the co-design of new products with customers (such as OEMs). The results show that collaboration with universities and research centres is positively correlated with such a type of partnership in product development and design (b=0.296; p<0.05). In short, it has been found that the seizing mechanism allows SMEs to orchestrate better resources in the front-end validation of a new product and a market need, thus enabling superior profitability.

Model 3 in Table 10 tests the transforming mechanism illustrated in the formulation of hypothesis H1, which advocated a superior asset orchestration of SMEs through collaboration with universities and research centres, due to an increase in the reputation of the SME. One of the questions in our survey asked the firms involved in international operations (that is exporting) to what extent their reputation was a problem for the acquisition of new customer relationships abroad (scored on a Likert five-point scale basis). We used an ordered probit model to regress the level of collaboration with universities and research centres to this question. The results show that collaborating with universities and research centres does not lower the reputational problems of SMEs on foreign markets, thus suggesting that the advanced mechanism was not supported.

We further explored the mechanisms related to the third hypothesis advanced in this paper, namely that firms with superior international experience diversity combine higher levels of R&D with

export profit more than their counterparts. The seizing mechanism advances that exposure to a diversity of institutional contexts abroad broadens a firm's capabilities of seizing opportunities in the product-market domain thanks to its involvement in established networks of manufacturers and other technology providers which - in turn - may increase the learning about new technologies, new markets, and new suppliers, distributors and technology partners. Instead, the transforming mechanism is related to the idea that having experience in multiple and diverse markets may favour the modular design of products, which reduces the cost of the *ex-ante* reconfiguration required by the products before they are sold abroad.

In order to test the seizing mechanism, we regressed (using an ordered probit model) - on the same subsample of exporting SMEs - the international experience diversity to a question that asked the SMEs to what extent the problems they experienced when operating on foreign markets were related to their limited knowledge of foreign suppliers, customers, competitors and substitutes. A broader diversity of the international experience of firms should lower the problems of being involved in a network of suppliers, customers and competitors, thus suggesting that the possibility of firms experiencing vicarious learning is higher and – in turn –superior asset orchestration and profits are achieved. The results are reported in Model 4 and show that the higher the diversity of experience of SMEs is, the fewer difficulties they have in operating on foreign markets, due to network involvement, thus sustaining our seizing mechanism.

Furthermore, we tested the transform mechanism on a subsample of SMEs that export abroad. More specifically, we adopted an ordered probit model to regress the international experience diversity to a question included in our survey and asked SMEs to indicate the level of problems they entailed when addressing foreign markets due to inadequate technical characteristics of the sold product. As usual, we included the controls of the previous models. We expected that if our mechanism were supported, a higher diversity of experience would lower the level of problems faced by SMEs. The results are reported in Model 5 and show that firms with greater international experience diversity have fewer technical problems in selling their products abroad, thus suggesting

that the higher the diversity of situations encountered on foreign markets is, the higher the capability of firms of anticipating and lowering the attrition caused by the need to reconfigure products to serve foreign customers.

In short, the mechanisms outlined and tested above sustain our arguments related to the value of both collaborating with universities and research centres and developing international experience diversity.

INSERT TABLE 10 ABOUT HERE

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6. *Discussion and conclusions*

6.1 Key findings

This study has investigated the factors that enable SMEs to achieve superior profitability when they combine intensive R&D investments activities with a strong market presence abroad through exports. The key contribution of our paper resides in reconciling previous contrasting literature that explored the complementarity between innovation and internationalisation in SMEs, as previous studies provided mixed evidence about this point (Booltink and Saka-Helmhout 2018; Golovko and Valentini 2011). Our results are in line with some of the previous research that pointed out a detrimental effect on the profitability of SMEs as a result of the contemporary combination of R&D programmes and internationalisation endeavours (Battaglia et al. 2018; Kumar 2009). Specifically, we found that the combination of high intensity in R&D and exports produces a negative effect on SME profitability. This negative interaction effect becomes stronger for low performers but is attenuated when such firms rely on the diversity of international market experience. By contrast, -for low performers- the

depth of collaboration with universities and research centres does not mitigate such tension. It may be that low performers do not get any positive effect from collaborating with universities and research centres because the lack of a financial cushion (Kiss, Fernhaber, and McDougall–Covin 2018) – which often accompanies low performance – can hinder them to bring the outcome of collaborative research projects on the market through risky financial investments in industrialization. For these firms, our findings suggest that market diversification provides a more viable avenue to revert their negative profitability situation when they can rely on asset orchestration capabilities to seize further opportunities on foreign markets (Teece 2014).The second major finding was that the combination of R&D and export intensity produces a positive effect on profitability for medium and high-performing SMEs engaged in collaborations with universities and research centres. If read in contrast to the findings obtained on low performers, this result might suggest that medium and high-performing firms are better positioned on financial slacks to take advantage of product exploration strategies conducted through the collaboration with universities and research centres.

Taken together, these results suggest that international market diversification is a strategy that is not enough to bring firms at medium or high levels of competitive performance when they deal with conflicting activities like R&D and export (Lu and Beamish 2006). This is in line with the fact that globalisation puts SMEs in front of hyper-competitive markets where the lack of technological novelty in products can put firms, at best, in a situation of competitive parity with respect to their competitors.

Contrary to expectations, we found that the length of international experience does not mitigate the tension between R&D and internationalisation, and even worsens its effect on profitability. This evidence is in line with the presence of inertial learning that is associated with a more extensive international experience (Albertoni et al. 2018) and which may reduce the effectiveness of sensing processes as the firm ages (Love, Roper, and Zhou 2016).

6.2 Contributions and implications for theory and practice

The paper brings a contribution to the stream of studies examining internationalization dynamics of SMEs by theorizing that the construction of dynamic capabilities can allow SMEs to solve the tensions due to combining the intensity of foreign market presence with high efforts put on product innovation through R&D (Booltink and Saka-Helmhout 2018). Using dynamic capability as a theoretical lens leads to a vision centred on the asset orchestration mechanisms (Teece 2014) that are associated to sense and seize technological and market opportunities in a situation of complexity in information processing due to a broad presence on foreign markets. Whereas international business studies have typically concentrated their attention over the dimensions of complexity in dealing with new and uncertain foreign markets (for example George et al. 2005), they have rarely questioned the competencies and the processes that SMEs need to develop to develop when such dimensions of market complexity go hand in hand with product innovation paths that require a high intensity of R&D spending.

The way that paper generates a theoretical contribution linking SMEs' internationalization with dynamic capabilities is by showing that the depth of university collaboration and the diversity of international market experience are foundations that support the 'sense, seize and transform' processes conceptualized in general by Teece (2014) and, related – in the specific case examined – to the exposure to international markets demanding product innovation. In so doing, our contribution also lies in broadening the type of innovation outcomes favoured by dynamic capabilities (Teece 2012). Specifically, we show that by relying on the diversity of international market experience, SMEs are put in a condition of being better able to orchestrate the construction of assets, such as reputation, access to 'complementors' (distributors and other suppliers located abroad), and technology specialisation, which is needed to market new products abroad successfully. This equates to saying that dynamic capabilities play a role in mitigating the tensions on resource allocation choices between product development and market development abroad.

Our evidence about how performance is a crucial contextual variable for what SMEs can do to mitigate the tension between exports and R&D intensity indicates that, in these types of managerial

decisions, asset orchestration also has to do with the way firms are capable of finding opportunities to exploit their financial resources and reputation effectively. Specifically, assuming that high performance may capture situations of more abundant availability of financial resources and superior reputation, our results echo Teece's view (Teece, Peteraf, and Leih 2016; Teece 1986) on the importance of asset complementarity in reference to the fact that – due to this endowment of resources – high performers are better able to capture the value that comes from more radical product innovation. Conversely, low performers – in the absence of these resources – are in a situation in which collaborations with universities for radical product innovation do not lead them to create and capture value from these endeavours.

These results raise some important implications for the managers of SMEs who deal with the challenges of internationalisation and contemporary innovation. By showing that the variety of international experience plays a role in mitigating the effects on profitability due to combining R&D programmes with broad export intensity, the paper suggests that SMEs should accelerate their technology development rate when they have achieved enough familiarity with the complexity and the variety of situations associated with a diversified geographical presence. Moreover, our results on the negative moderating effect, due to the longevity of the international presence, show that, under these circumstances, SMEs are ineffective in combining high R&D spending with a broad market presence. Despite the fact that literature has highlighted the benefits for SMEs associated to a market concentration abroad on just few countries (Cieślik, Kaciak, and Welsh 2012), our result points to a possible trap for SMEs with strong export activity built over the years in geographical regions with limited market diversity. Under these circumstances, their sensing activities on new market needs is hindered by crystallisation of their market entry routines, and this may lead to poor returns from intensive R&D programmes when the market conditions abroad change dramatically or when the firm starts to diversify its international presence towards regions with strong market and institutional differences.

6.3 Limitations and future research

As this paper is a first attempt to investigate the moderators of innovation and internationalisation activities, the generalizability of the results is subject to certain limitation. For instance, the analysis just considered SMEs from the north-west of Italy and should be thus extended to other areas. A second type of limitation is linked to the lack of control on some of the mechanisms that we theorized to be associated to the presence of the factors for which we posited the presence of a positive moderation effect in the relationship linking SME performance with R&D and export intensity. Specifically, we showed how university collaboration and international market diversification are associated with some conditions that reflect superior capabilities to sense, seize technology-related opportunities and to reconfigure market and technical resources accordingly. However, the relationships we theorized refer to a more complex array of foundations that we could observe only to a partial extent.

In spite of these limitations, this work offers valuable insights and potential indications for future empirical studies on how the processes associated to dynamic capabilities might help SMEs in coping with the factors that are specific of their limited size that leads to difficulties in capturing value and higher performance from the combination of internationalization and product innovation.

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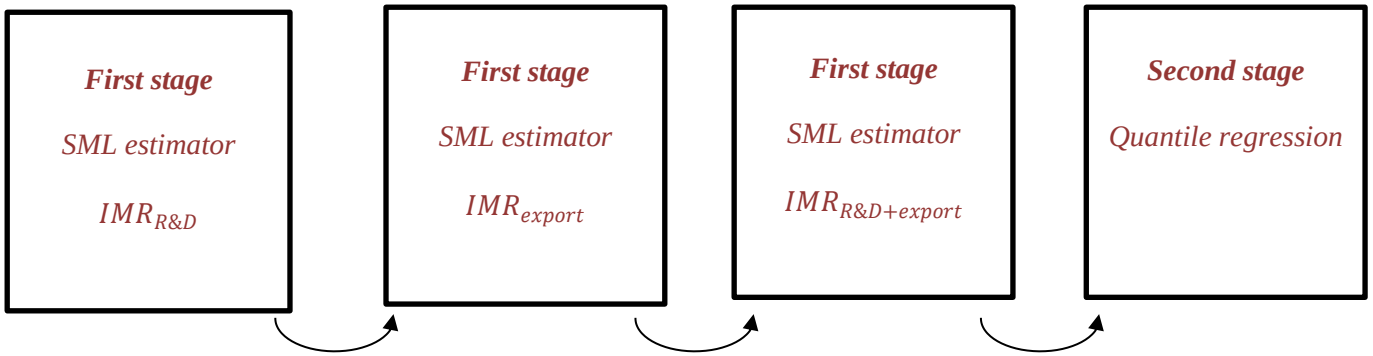

Figure 1

Econometric approach to endogeneity issues in relating R&D and internationalization choices to performance

Phases of the Dynamic Capability Process		**Sense opportunities** *"The capacity to recognise and shape opportunities and threats."*	**Seize opportunities** *"The capacity to capture opportunities."*	**Transform resources** *"The capacity to maintain competitiveness through enhancing, combining, protecting, and reconfiguring intangible and tangible assets within the firm's boundaries."*
Mechanisms that enable superior asset orchestration	**H1:** Collaboration with universities and research centres **(+)**	Scouting radical and complementary technologies	Validation and testing of technologies	Increased market reputation
	H2: International experience intensity **(+)**	Learning by exporting	-	Increased market reputation
	H3: International experience diversity **(+)**	-	Larger network of suppliers, customers, distributors and technology partners to access new resources and capabilities needed for product adaptation and market entry	Reduction of product refinement costs

Table 1
Underlying mechanism at the basis of the three developed hypotheses.

Panel A: Sample distribution by industry type, technological intensity and industry				
Industry type	**Technological intensity**	**Industry**	**Number of firms**	**Percentage of the sample**
Manufacturing	High tech	Manufacturing of computer, electronic and optical products	17	7.7
		Manufacturing of electrical equipment	13	5.8
		Manufacturing of chemicals and pharmaceutical products	7	3.2
		Manufacturing of advanced materials	5	2.3
	Medium-high tech	Manufacturing of fabricated metal products	25	11.3
		Manufacturing of machinery and equipment	61	27.6
		Manufacturing of motor vehicles, trailers and semi-trailers	4	1.8
		Manufacturing of rubber and plastic products	4	1.8
	Medium-low tech	Manufacturing of food and beverages	5	2.3
		Manufacturing of textiles leather and related products	4	1.8
		Furniture and other manufacturing	7	3.2
Services	IT and software	Computer programming, IT-related activities	58	26.2
	Professional and scientific services	Other professional and scientific services	11	5.0

Panel B: Class of employees		
	Number of firms	**Percentage of the sample**
Less than 11 employees	88	39.8
Between 10 and 50 employees	105	47.5
More than 50 employees	28	12.7

Panel C: Class of age		
	Number of firms	**Percentage of the sample**
Less than 11 years	63	28.5
Between 11 and 24 years	59	26.7
More than 24 years	99	44.8
Total	**221**	

Table 2
Sample characteristics

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	ROA	1															
2	R&D intensity	0.048	1														
3	Export intensity	0.296*	-0.118*	1													
4	Collab. technological actors	-0.001	-0.169*	-0.056	1												
5	Int. experience intensity (ln)	-0.001	-0.333*	0.550*	-0.038	1											
6	Int. experience diversity	-0.196*	0.227*	-0.686*	-0.041	-0.700*	1										
7	Employees (ln)	-0.029	-0.223*	0.306*	0.339*	0.563*	-0.380*	1									
8	Hi-tech – Medium tech industry	0.002	0.249*	-0.185*	-0.181*	-0.331*	0.202*	-0.163*	1								
9	Age (ln)	-0.023	-0.362*	0.328*	0.294*	0.722*	-0.411*	0.518*	-0.293*	1							
10	Munificence	0.126	0.236*	0.112*	0.146*	0.000	-0.085	-0.008	0.200*	-0.136*	1						
11	Competition	-0.151*	0.003*	0.142*	0.158*	0.185*	-0.193*	0.066	0.010	0.032	0.454*	1					
12	Component Sales	0.147*	-0.108	0.185*	0.066	0.266*	-0.229*	0.021	-0.173*	0.122*	-0.029	-0.010	1				
13	End Users' Sales	-0.052	-0.000	-0.086	-0.022	-0.290*	0.172*	0.080	0.020	0.117*	0.013	-0.020	-0.037*	1			
14	R&D funding	0.144	0.088	-0.086	0.161	-0.201*	0.145	0.016	0.070	-0.142	0.180*	-0.035	-0.081	0.017	1		
15	Participation in internationalisation courses	0.040	-0.160	0.122	0.051	0.189*	-0.247*	0.149	-0.031	0.106	0.134	0.289*	0.075	-0.061	0.069	1	
16	R&D_FDI	0.028	0.012	-0.090	-0.004	-0.001	-0.006	-0.029	0.083	-0.107	0.016	-0.011	0.082	-0.021*	0.042	-0.0441	1
	Mean	0.521	0.098	0.251	1.342	0.348	1.198	2.740	0.760	3.270	1.002	1.094	0.148	0.202	0.520	0.486	0.021
	Median	0.383	0.045	0.150	2.000	0.260	1.501	2.710	1.000	2.090	1.000	1.110	0.000	0.000	1.000	0.000	0.000
	Standard Deviation	0.759	0.152	0.286	1.421	0.180	0.644	0.949	0.428	3.157	0.216	0.265	0.290	0.318	0.501	0.501	0.141

**p-value < 1%*

Table 3
Correlation matrix and descriptive statistics.

VARIABLES	**Model 1** R&D participation	**Model 2** Export participation	**Model 3** R&D-Export participation
Employees (ln)	4.033***	1.744***	4.167***
	(0.00)	(0.00)	(0.00)
Hi tech – Medium tech Sector	0.599***	-0.701***	-1.728***
	(0.00)	(0.00)	(0.00)
Age (ln)	0.791***	1.948***	-0.941***
	(0.00)	(0.00)	(0.00)
Munificence	3.858***	2.681***	2.450***
	(0.00)	(0.00)	(0.00)
Competition	-1.740***	-0.642***	0.378***
	(0.00)	(0.00)	(0.00)
Component sales	-4.554***	-0.908***	-0.826***
	(0.00)	(0.00)	(0.00)
End Users' sales	-4.298***	-2.330***	-0.169
	(0.00)	(0.00)	(0.20)
R&D funding	0.184**		
	(0.10)		
Participation in internationalisation courses		2.483***	
		(0.00)	
R&D_FDI			5.413**
			(0.03)
$IMR_{R\&D}$		0.586***	
		(0.00)	
IMR_{export}			1.521***
			(0.00)
Observations	221	221	221
Dummies for industry	*Yes*	*Yes*	*Yes*

*Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table 4
SML modelling of R&D, Export and joint R&D and export participation

	Model 1 ROA 2014 *25th Percentile*	**Model 2** ROA 2014 *50th Percentile*	**Model 3** ROA 2014 *75th Percentile*	**Model 4** ROA 2014 *25th Percentile*	**Model 5** ROA 2014 *50th Percentile*	**Model 6** ROA 2014 *75th Percentile*
R&D intensity	-0.011	-0.025	-0.009	-0.080	-0.042	-0.013
	(0.05)	(0.03)	(0.07)	(0.05)	(0.04)	(0.09)
Export intensity	0.118*	0.166***	0.212**	0.066	0.153***	0.219**
	(0.06)	(0.04)	(0.09)	(0.05)	(0.04)	(0.10)
R&D int. X Export int.				-0.091*	-0.021	-0.007
				(0.05)	(0.04)	(0.09)
Employees (ln)	0.011	-0.181**	-0.174	0.001	-0.183*	-0.178
	(0.13)	(0.09)	(0.20)	(0.12)	(0.09)	(0.22)
Hi tech – Medium tech Sector	-0.028	0.054	0.063	-0.017	0.057	0.081
	(0.09)	(0.06)	(0.14)	(0.08)	(0.06)	(0.15)
Age (ln)	-0.022	-0.037	-0.060	-0.017	-0.038	-0.065
	(0.07)	(0.05)	(0.11)	(0.06)	(0.05)	(0.12)
Munificence	0.061	0.030	0.041	0.046	0.028	0.048
	(0.09)	(0.06)	(0.13)	(0.08)	(0.06)	(0.14)
Competition	-0.070	-0.105***	-0.158*	-0.065	-0.099***	-0.165*
	(0.06)	(0.04)	(0.08)	(0.05)	(0.04)	(0.09)
Component Sales	0.063	0.052	0.056	0.051	0.054	0.072
	(0.06)	(0.04)	(0.09)	(0.05)	(0.04)	(0.10)
End Users' Sales	0.091	0.068	0.060	0.083	0.065	0.067
	(0.07)	(0.04)	(0.10)	(0.06)	(0.04)	(0.11)
$IMR_{R\&D+export}$	-0.009	-0.015	-0.041	-0.021	-0.012	-0.037
	(0.05)	(0.03)	(0.08)	(0.05)	(0.03)	(0.08)
$IMR_{R\&D+export}$ squared	0.002	-0.001	0.001	0.003	-0.002	0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Constant	0.009	0.501**	0.408	-0.021	0.514**	0.412
	(0.33)	(0.22)	(0.50)	(0.29)	(0.22)	(0.54)
Pseudo-R2	0.148	0.187	0.263	0.167	0.187	0.263
Observations	221	221	221	221	221	221
Dummies for industry	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

*Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table 5
Baseline Regressions and first-order interaction models.

VARIABLES	**Model 1** ROA 2014 *25th Percentile*	**Model 2** ROA 2014 *50th Percentile*	**Model 3** ROA 2014 *75th Percentile*
R&D intensity	-0.072	0.017	0.043
	(0.05)	(0.04)	(0.08)
Export intensity	0.101*	0.181***	0.301***
	(0.05)	(0.04)	(0.08)
R&D int. X Export int.	-0.158***	0.010	0.054
	(0.05)	(0.04)	(0.08)
Collab. universities and research centres	0.007	0.062	0.143*
	(0.05)	(0.04)	(0.08)
R&D int. X Collab. universities and research centres	-0.003	0.058	0.204*
	(0.07)	(0.05)	(0.11)
Export int. X Collab. universities and research centres	0.013	0.057	0.106
	(0.05)	(0.04)	(0.08)
R&D int. X Export int. X Collab. universities and research centres (H1)	0.078	0.130*	0.338**
	(0.08)	(0.07)	(0.13)
Employees (ln)	-0.017	-0.227**	-0.196
	(0.12)	(0.10)	(0.20)
Hi tech – Medium tech Sector	-0.049	0.051	0.032
	(0.08)	(0.06)	(0.13)
Age (ln)	-0.026	-0.021	-0.045
	(0.06)	(0.05)	(0.11)
Munificence	0.046Z7	-0.012	0.085
	(0.07)	(0.06)	(0.12)
Competition	-0.085*	-0.084**	-0.188**
	(0.05)	(0.04)	(0.08)
Component Sales	0.074	0.021	0.034
	(0.05)	(0.04)	(0.09)
End Users' Sales	0.091	0.056	0.085
	(0.06)	(0.05)	(0.09)
$IMR_{R\&D+export}$	-0.018	-0.021	0.016
	(0.05)	(0.04)	(0.08)
$IMR_{R\&D+export}$ squared	0.003	-0.001	-0.003
	(0.00)	(0.00)	(0.00)
Constant	-0.062	0.553**	0.284
	(0.28)	(0.23)	(0.47)
Pseudo-R2	0.183	0.203	0.277
Observations	221	221	221
Dummies for industry	*Yes*	*Yes*	*Yes*

*Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table 6

Quantile regression for collaboration with universities and research centres.

VARIABLES	**Model 1** ROA 2014 *25th Percentile*	**Model 2** ROA 2014 *50th Percentile*	**Model 3** ROA 2014 *75th Percentile*
R&D intensity	-0.143*	-0.064	-0.110
	(0.08)	(0.06)	(0.14)
Export intensity	0.289***	0.276***	0.309**
	(0.07)	(0.05)	(0.12)
R&D int. X Export int.	-0.049	-0.205***	-0.267*
	(0.09)	(0.07)	(0.16)
Int. experience intensity	-0.245***	-0.187***	-0.259*
	(0.08)	(0.06)	(0.14)
R&D X Int. experience intensity	-0.111	-0.000	0.011
	(0.08)	(0.06)	(0.15)
Export X Int. experience intensity	-0.186***	-0.189***	-0.250**
	(0.06)	(0.05)	(0.11)
R&D int. X Export X Int. experience intensity (H2)	-0.026	-0.145*	-0.168
	(0.10)	(0.07)	(0.17)
Employees (ln)	-0.022	-0.088	0.003
	(0.12)	(0.09)	(0.21)
Hi tech – Medium tech Sector	-0.074	0.008	0.034
	(0.08)	(0.07)	(0.15)
Age (ln)	0.045	0.021	0.020
	(0.08)	(0.06)	(0.14)
Munificence	0.046	0.033	0.048
	(0.07)	(0.06)	(0.13)
Competition	-0.059	-0.103***	-0.160*
	(0.05)	(0.04)	(0.09)
Component Sales	0.027	0.006	0.043
	(0.05)	(0.04)	(0.10)
End Users' Sales	-0.021	0.023	0.071
	(0.06)	(0.05)	(0.10)
$IMR_{R\&D+export}$	0.063	-0.020	-0.037
	(0.05)	(0.04)	(0.08)
$IMR_{R\&D+export}$ squared	-0.004	0.001	0.002
	(0.00)	(0.00)	(0.01)
Constant	0.067	0.265	0.320
	(0.29)	(0.22)	(0.51)
Pseudo-R2	0.196	0.222	0.294
Observations	221	221	221
Dummies for industry	*Yes*	*Yes*	*Yes*

*Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table 7
Quantile regression for international experience intensity

VARIABLES	**Model 1** ROA 2014 *25th Percentile*	**Model 2** ROA 2014 *50th Percentile*	**Model 3** ROA 2014 *75th Percentile*
R&D intensity	-0.079	-0.016	-0.159
	(0.15)	(0.13)	(0.27)
Export intensity	-0.051	0.131	0.268
	(0.11)	(0.09)	(0.19)
R&D int. X Export int.	-0.396**	-0.222	-0.339
	(0.17)	(0.14)	(0.29)
Int. experience diversity	-0.094	0.028	0.028
	(0.10)	(0.08)	(0.17)
R&D intensity X Int. experience diversity	0.111	0.019	0.090
	(0.09)	(0.08)	(0.17)
Export X Int. experience diversity	0.099	0.044	-0.137
	(0.09)	(0.08)	(0.17)
R&D int. X Exp. X Int. experience diversity (H3)	0.267**	0.141	0.232
	(0.11)	(0.09)	(0.19)
Employees (ln)	-0.075	-0.089	0.027
	(0.13)	(0.11)	(0.22)
Hi tech – Medium tech Sector	-0.055	0.036	0.126
	(0.08)	(0.07)	(0.15)
Age (ln)	0.032	-0.042	-0.187
	(0.07)	(0.06)	(0.12)
Munificence	0.022	-0.013	0.027
	(0.08)	(0.07)	(0.14)
Competition	-0.070	-0.095**	-0.145
	(0.05)	(0.04)	(0.09)
Component Sales	0.053	0.015	0.124
	(0.05)	(0.05)	(0.10)
End Users' Sales	0.063	0.038	0.115
	(0.06)	(0.05)	(0.11)
$IMR_{R\&D+export}$	-0.051	-0.038	-0.102
	(0.05)	(0.04)	(0.09)
$IMR_{R\&D+export}$ squared	0.005*	0.001	0.007
	(0.00)	(0.00)	(0.01)
Constant	-0.000	0.365	0.316
	(0.30)	(0.26)	(0.53)
Pseudo-R2	0.199	0.209	0.292
Observations	221	221	221
Dummies for industry	*Yes*	*Yes*	*Yes*

*Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table 8
Quantile regression for international experience diversity

VARIABLES	**Model 1** ROA 2014 *25th Percentile*	**Model 2** ROA 2014 *50th Percentile*	**Model 3** ROA 2014 *75th Percentile*
R&D intensity	0.073	0.017	-0.059
	(0.06)	(0.06)	(0.13)
Export intensity	0.181***	0.181***	0.239
	(0.07)	(0.06)	(0.15)
R&D int. X Export int.	0.074	0.037	0.000
	(0.06)	(0.06)	(0.13)
CD diversity	-0.057	0.052	0.031
	(0.10)	(0.09)	(0.21)
R&D intensity X CD diversity	-0.162	-0.077	0.021
	(0.12)	(0.11)	(0.26)
Export X CD diversity	0.207**	0.000	-0.121
	(0.09)	(0.09)	(0.20)
R&D int. X Exp. X CD diversity	0.281**	0.205*	0.155
	(0.13)	(0.12)	(0.29)
Employees (ln)	0.029	-0.174	-0.213
	(0.11)	(0.10)	(0.24)
Hi tech – Medium tech Sector	-0.033	0.051	0.040
	(0.08)	(0.07)	(0.17)
Age (ln)	-0.015	-0.037	-0.075
	(0.06)	(0.06)	(0.13)
Munificence	0.067	0.015	0.041
	(0.07)	(0.07)	(0.15)
Competition	-0.067	-0.092**	-0.175*
	(0.05)	(0.04)	(0.10)
Component Sales	0.043	0.027	0.024
	(0.05)	(0.04)	(0.11)
End Users' Sales	0.068	0.037	0.070
	(0.05)	(0.05)	(0.12)
$IMR_{R\&D+export}$	-0.030	-0.039	-0.051
	(0.04)	(0.04)	(0.10)
$IMR_{R\&D+export}$ squared	0.004	0.001	0.001
	(0.00)	(0.00)	(0.00)
Constant	0.042	0.355	0.329
	(0.28)	(0.26)	(0.62)
Pseudo-R2	0.186	0.200	0.281
Observations	221	221	221
Dummies for industry	*Yes*	*Yes*	*Yes*

*Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table 9

International Experience Regressions (Second-order interaction: International experience diversity as Cultural Distance diversity)

	Sense	***Seize***	***Transform***	***Seize***	***Transform***
	Model 1 Technological novelty of products	**Model 2** Product Codesign (with customers)	**Model 3** Lack of reputation on foreign markets	**Model 4** Problems in addressing foreign markets due to limited market knowledge	**Model 5** Problems in addressing foreign markets due to inadequate technical characteristics of the firm's key products
R&D intensity	0.160***	0.180	0.311	-0.096	-0.122
	(0.06)	(0.12)	(0.21)	(0.01)	(0.14)
Export intensity	-0.234	-0.087	-0.464**	0.173	-0.587
	(0.32)	(0.20)	(0.16)	(0.50)	(0.45)
Collab. universities and research centers	0.128**	0.296**	-0.056		
	(0.06)	(0.13)	(0.16)		
Int. experience diversity				-0.716***	-0.628***
				(0.16)	(0.15)
Hi tech – Medium tech Sector	0.125	0.275	0.628***	0.090	0.073
	(0.19)	(0.20)	(0.20)	(0.12)	(0.15)
Age (ln)	-0.019	-0.276	-0.466*	-0.016	-0.044
	(0.26)	(0.21)	(0.24)	(0.16)	(0.16)
Munificence	0.281***	-0.146	-0.012	-0.014	-0.195
	(0.09)	(0.15)	(0.16)	(0.13)	(0.14)
Competition	-0.164**	-0.003	-0.452***	-0.240**	0.143
	(0.08)	(0.15)	(0.17)	(0.11)	(0.11)
Component Sales	0.009	0.063	0.266*	0.155	0.046
	(0.11)	(0.17)	(0.14)	(0.17)	(0.11)
End Users' Sales	0.041	0.045	0.062	-0.159	-0.236
	(0.10)	(0.17)	(0.19)	(0.12)	(0.14)
Constant		1.455			
		(0.89)			
Pseudo- R2	0.161	0.233	0.250	0.237	0.141
Obs.	221	221	148	148	148
Dummies for industry	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

*Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table 10

Test of the mechanisms for hypotheses one and three.