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Balancing innovation and internationalization activities for SMEs growth: An empirical analysis on Italian and Spanish SMEs

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Summary

Nowadays more and more SMEs have to face pressures imposed by the globalization which limit their capability to grow. To overcome such liability, SMEs are called to innovate in order to introduce new products on new markets. However, threats imposed by shorter product life-cycle may render expensive and ineffective such strategy for the sustainability of SMEs business. In this vein, the capability of SMEs to excel into innovation and internationalization activities is gaining momentum in the agenda of scholars, practitioners and policy makers. The crucial dilemma affecting all these stakeholders is related with the complementarity existing between innovation activities, internationalization and firm performance (growth in particular for SMEs). In fact, despite the problems identified above, innovation may guarantee SMEs to enter market niches abroad more easily and to achieve a competitive advantage. At the same time, internationalization may enhance the product innovation capabilities of SMEs, thus sustaining business growth.

Despite the importance of such topic, literature has provided contradictory indications about the complementarity and the capability to balance innovation and internationalization activities for SMEs growth. Some literature has pointed toward the existence of a positive relationship between export, innovation and growth, implying that such activities should be pursued and balanced to achieve superior performance. However, more and more scholars are trying to question such link recognising it as problematic for SMEs, since it requires managers to

allocate properly scarce resources among very different activities which may end up in a drain of resources and a loss of managerial attention in other strategic activities.

Innovating and exporting are two activities which bring a number of benefits for SME performance when undertaken in isolation. (e.g. superior market and product knowledge, superior productivity). However, operating into international markets and developing new products entail also significant costs and organizational problems for SMEs. For these reasons, in this thesis, we analyse the relationship existing between internationalization, innovation and SMEs growth to explore the conditions enabling the balancing of such activities to achieve superior growth. In doing this, this work aims to answer two main questions, namely "if" and "how" SMEs can benefit from the contemporary balancing of internationalization and innovation endeavours.

To explore these issues, this work analyses the relationship between internationalization, innovation and growth in the context of SMEs through the development of three empirical studies in different settings (Italy and Spain). To understand "if" the contemporary undertaking of those two activities could be beneficial to growth - after reviewing previous literature on the effect that international activities, innovation and their interplay have on SMEs growth - this work explores the relationship existing between internationalization, innovation and growth using a domain ambidexterity framework. In detail, it testes empirically the relationship existing between exports, R&D activities and growth showing that their balancing limits SMEs growth.

To explore "how" SMEs can balance such activities to achieve growth, some conditions which may limit or boost the conjunct effect on growth of innovation and internationalization and some activities which may simplify their contemporary development are tested. In detail, this thesis investigates the role that innovation collaborations with universities and research centres, international experience and firm's age have in moderating the impact of innovation and internationalization activities on SMEs growth. Specifically, we highlight that young firms are constrained if they try to balance such activities. However, "adolescent" firms are more able to balance them to grow. Moreover, empirical models show that being open to innovation partners as universities and research centres, or having some previous experience in international markets allows firms to successfully combine innovation and internationalization activities to sustain

their growth. Finally, to provide a finer grained contribution the thesis deepen the exploration of the "how" question through the exploration of another way of internationalization (imports, rather than exports) in which firms are involved. Firms can be engaged not only in outbound international activities (i.e., selling products abroad through exports), but may also be involved in international operations through import activities. Despite the different finality that import and export have, importing requires anyway a commitment and an exploration of international markets to identify solutions viable for firm's business and may complement the development of innovation activities. In this vein, the same managerial problems identified above may arise even when firms are engaged in import activities, but imports may enable SMEs to pursue more successfully exports and innovation, thus suggesting that it can be a relevant factor influencing the capability of firms to balance export and innovation to achieve growth. This work shows how SMEs can balance imports, exports and innovation to sustain growth. In this vein this research advances that imports should be an antecedent of innovation and export strategies. Several contributions are offered and discussed in relation to SMEs, international business, strategy and organization science literatures.

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Chapter 1

Introduction

1.1 Introduction to the Ph.D. thesis

Nowadays, to operate in a scenario where competition is increasingly global rather than local, small and medium enterprises (SMEs) are forced to continuously strive for growth and – thus - to increase revenues streams. For this reason, more and more SMEs rely for their growth ambitions to the development of new strategies and business models, especially through new recombination of resources (Moreno and Casillas, 2008). Among the avenues that SMEs have to compete in this complex scenario, they may rely to two main activities to gain advantage toward competitors, to survive and to grow: introducing new innovative products through the extension of their product portfolio and selling their products in foreign markets.

In the perspective of this work, introducing new innovative products on the market refers to pursue a product diversification strategy. This strategy may help SMEs in being more competitive with respect to other firms and to compete against their larger counterparts, which have usually a resource advantage compared to them (Peteraf, 1993). On the other side, selling products in foreign markets concerns with the market diversification strategy which allows firms to increase their revenues streams through an increased demand coming from the new potential buyers that are reached.

Although internationalization is a topic which have been largely studied by previous research, especially in the context of multinational firms (e.g. Geringer et al., 1989) - since they have been in the past the kind of firms more prone to undertake internationalization endeavours - the evolution of the competitive environment which has taken place in the last thirty years has lowered the entry barriers to international markets also for SMEs. Such lower barriers have been promoted mainly by two elements: first, the development of information and communication technologies which have eased the search of new partners and customers abroad and the communication with them; second, the drop of trade tariffs and the entry in the nineties and in the new millennium of emergent countries - as India and China - as WTO members, which have provided firms the possibility to access a larger customer base. For this reason even SMEs more and more relied on international operations. The relevance of these activities for SMEs is well represented in Europe. According to a recent study of the European Commission (EC, 2015), about 30% of SMEs plans or is involved in export activities, another 33% plans to be involved (or is already involved) in import activities, while only the 6% of SMEs operates foreign direct investments. However, although external conditions have been favourable to promote international activities among SMEs, internal resource constraints still play a crucial role in making difficult the process of internationalization, especially when it is undertaken together with innovation endeavours. SMEs, in fact, are limited in financial resources (Kiss et al., 2017) and have many difficulties in accessing loans which could simplify both their innovation and internationalization activities. Moreover, SMEs are limited in relation to their managerial structure (e.g. managerial teams are usually very small and not very skilled) and are often characterized by an ownership structure which is familiar (especially in some countries as Italy, Spain, Finland; Bugamelli et al., 2012). These characteristics render more difficult both the approach to foreign markets and the development of new innovations since managerial, ownership and resource constraints limit the strategizing capability of SMEs which would allow them to perform such activities. Moreover, international operations play a crucial role in SMEs engaged in innovation activities, especially when these firms operate on small domestic markets with a limited growth potential. This may be a common situation for SMEs operating in market niches in many European countries. Only a few business customers characterize the domestic market of SME's positioned in the upstream stages of value chains, and foreign customers represent an avenue of growth, but also pose new challenges for their product innovation programs, given the diversity of the requirements of their markets and institutional environments

(e.g. laws, norms and technical standards). Because of this necessity, internationalization can require changes in the competency base of SME's in both the technological and market domains (Branstetter, 2006).

For firms involved in innovation, although participating in international markets could provide some benefits (e.g. Golovko and Valentini, 2011), a contemporary engagement in innovation and internationalization may not have any positive effect on the growth of SMEs, due to their financial and human constraints (e.g. Filipescu et al., 2013; Kumar 2009), and due to some managerial attention problems (Chen and Nakardni, 2017). Moreover, many SMEs have the tendency to centralize decision-making processes (Macri et al. 2002) and they lack effective coordination between the sales, marketing and product development functions (Palmiè et al., 2015) which limit the possibility of combining successfully innovation and internationalization activities. For these reasons, exploration activities in both the market and the product domains (i.e., seeking for new customers abroad and developing new products) could imply an overwhelming leaning process for an SME.

Irrespective of the sector, internationalizing requires an intensive exploration phase aimed at finding prospective customers, analysing their needs, building relationships with local distributors and suppliers, understanding the local institutional and regulatory framework and implementing a supply chain management strategy to serve each local market. For an SME, such a market exploration may reduce the availability of the managerial and technical resources required for technological exploration and for R&D endeavours that have a long-term horizon, and can make the coordination with the technical product function too complicated, especially when this function is engaged in the exploration of new technologies or new product architectures.

Pursuing both these two activities is common and relatively easy for large firms (Kafouros et al., 2008), and is becoming more and more common even for SMEs. For instance, a recent report (EC, 2015) highlights that internationally active firms are used to introduce more product innovations than non-internationally active (32% vs. 22%). Although this evidence highlights the relevance of the relationship between the two activities, it does not explain the causality between them and, finally, their effect on SME performance. In the case of SMEs, combining product diversification with market diversification could not be very easy since it poses some managerial and financial problems which small firms may strive to overcome (Kumar, 2009) and may – thus – create some

attrition. In fact, despite the benefits that international activities and innovation activities may generate on SMEs growth and survival as standalone activities, a central question both in literature and among practitioners is related to *if* and *how* SMEs can combine innovation and internationalization activities in order to grow (Love and Roper, 2015).

The aim of this thesis is to explore this issue. With a set of three studies this work explores empirically the relationships, the strategic issues and the contextual factors (Porter and Siggelkow, 2008) enabling a successful balancing of international activities and innovation to foster SMEs' growth. The challenging feature characterizing the analysis of this topic is that it stands at the intersection of multiple literatures which sometimes advance different views and perspectives about SMEs innovation and internationalization activities. More specifically, this thesis draws from international business (IB), strategic management and organization science literatures and theories. Our aim is to contribute to both theory and practice by reconciling theories which (sometimes) are distant, to apply them in explaining the strategy process of SMEs combining innovation and internationalization endeavours; and to explore the factors which may guarantee superior performance to SMEs willing to grow. For this reason we build and test a set of theoretical models arguing that innovation and internationalization activities are difficult to be reconciled due to domain ambidexterity problems (Voss and Voss, 2013) and that a way to reconcile them is to develop asset orchestration capabilities (Teece, 2014) which, as dynamic capabilities, can support the balancing of such activities (Zimmerman and Birkinshaw, 2016). Moreover, we also explore the knowledge spillovers arising from performing internationalization and innovation activities (De Clercq et al., 2008) to search for the evidence that they can help SMEs in mitigating the tensions arising from the combination of internationalization and innovation activities. Therefore, with this thesis we provide some contributions both to theory and to practice. First, we contribute to the organization science literature by advancing that combining innovation and internationalization poses domain ambidexterity problems (Voss and Voss, 2013). Second, we highlight how developing specific dynamic capabilities can enable SMEs to overcome constraints limiting their performance (Teece, 2014). Third, we show up that knowledge spillovers arising between internationalization and innovation activities are not sufficient to make such activities complementary and therefore to render their contemporary undertaking favourable to SMEs growth. However, we also suggest another strategy SMEs may adopt to balance all the three activities: namely to sequentially adopt them. In this vein the main

theoretical contribution of this work resides in the reconciliation of different perspectives and results that have been advanced by previous literature (e.g. Golovko and Valentini, 2011; Kumar, 2009; Filipescu et al., 2011).

1.2 Framework of analysis

The interplay between innovation and internationalization activities has been analysed in literature adopting different theoretical lenses. The most widely acknowledged theories and frameworks rely on two main issues. First, the complementarity framework (Milgrom and Roberts, 1995) has been used to assess if contemporary innovation and internationalization activities enable superior performance in SMEs (e.g. Golovko and Valentini, 2011). Second, the RBV has been used extensively to analyse the factors limiting and enabling the contemporary pursuing of innovation and internationalization activities (see Love and Roper, 2015 for a comprehensive review).

Despite both frameworks are informative about the different performance effects of innovation and internationalization on SMEs performance, they rely to the strategic decision of firms to undertake one, another or both activities to achieve superior performance. In other words, they contribute specifically to the strategy domain in the tentative to explain the heterogeneity of firm performance owing to innovation and internationalization antecedents and configurations. However, a comprehensive view explaining how firms combine innovation and internationalization activities is still lacking in literature (Love and Roper, 2015). In this vein, to explore the interplay between innovation and internationalization, in this thesis we adopt an ambidexterity lens. Ambidexterity refers to the contemporary capability of firms to manage two conflicting objectives that are referred at two different knowledge domains: exploration and exploitation. In its seminal work, March (1991) identified exploration as "[*the] things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation*" while exploitation as things referred to "*refinement, choice, production, efficiency, selection, implementation, execution*" (p.71). In firms, the contemporary combination of explorative and exploitative activities has been demonstrated effective for performance but difficult since one tends to drive away the other (Holmqvist, 2009). This is because most of the exploitative activities are tied with short-term benefits, while most of the exploratory activities with long-term benefits (Turner et al., 2013).

Innovation and internationalization activities may represent both exploratory and exploitative activities for SMEs. For instance, innovation endeavours may entail the adoption and development of new competences and technologies which represent a far departure from the core capabilities of the firm in order to design a completely new product (product exploration). At the same time, the firm may leverage competences and capabilities already in the hands of the firm to design a product which is closer to the technological domain of the products already developed by the firm (product exploitation).

Similarly to (product) innovation, internationalization activities may entail explorative and exploitative features. For instance, a firm addressing a completely new market is pursuing an explorative endeavour in the tentative to enlarge its customer base with new customers from new contexts. Conversely, firms increasing the current foreign customer bases (e.g. trying to better penetrate a foreign market already served) try to exploit the customer base already acquired to increase the number of units sold.

Owing to the fact that product innovation and internationalization belong to two different domains (product vs. market), in this thesis we theoretically adopt the domain ambidexterity framework (Lavie et al., 2010; Voss and Voss, 2013) to explore the interplay between innovation and internationalization The domain ambidexterity framework reports exploration and exploitation features to two distinct domains, one related to the product and one to the market. In the product domain, exploration is close to the development of new product architectures (Henderson and Clark, 1990), or to the deployment of radical technological innovations in product features, while exploitation essentially regards the refinement of existing product performance through incremental innovation. In the market domain, the exploration is the development of marketing programs that aim to attract new customers in market segments that are unexplored for the firm, while exploitation refers on “marketing programs designed to retain and increase purchases from current customers” or to attract new customers in their established market segments (Voss and Voss, 2013; p.2).

When firms attempt to balance exploration and exploitation in market and product domains, they may have to manage three different kinds of ambidextrous strategies, depending on how they combine product and market with exploration and exploitation: such combination may originate ambidexterity within, between or across domains (Voss and Voss, 2013). When firms attempt to pursuit contemporary pure explorative or exploitative strategies in two different domains

(i.e., market exploration and product exploration) they deal with ambidexterity between domains. When firms attempt to pursuit contemporary exploration and exploitation in a single domain (i.e. product exploration and product exploitation) they deal with ambidexterity within domains. Finally, firms can undertake cross-domain strategies by exploring new product capabilities that target an established customer base (the product development strategy) or by exploiting current product capabilities with the goal of entering new market segments (the market development strategy), being in that way ambidextrous across domains.

However, combining innovation and internationalization may originate a tension since SMEs may not have the necessary resources and capabilities useful to deal with the two activities (Ahuja et al., 2008; Voss et al., 2008). Our crucial question, namely *if* and *how* SMEs can balance innovation and internationalization activities, therefore relies with the ambidextrous capability of SMEs to balance innovation and internationalization activities across different domains.

To enrich our comprehension of the relationship between the development of SMEs of ambidextrous capabilities needed to balance innovation and internationalization activities, we deepen our analysis by digging into the contextual factors which may influence the complementarity between the two activities (i.e. the capability of firms to be ambidextrous and to balance them). In this vein, Porter and Siggelkow (2008) suggest that while "the contextuality of activities is an important phenomenon; […] it is important to explore even the contextuality of interaction to understand the sustainability of competitive advantage" [emphasis added]. In other words, the capability to balance innovation and internationalization activities may be contextual to other conditions which enable SMEs able to develop such capabilities only under certain specific conditions. In fact, the nature of the relationship between innovation, internationalization and growth in SMEs may not be an inherent and universal relationship, but a function of other decisions taken by firms (Porter and Siggelkow, 2008). For this reason, the domain ambidexterity framework employed in this thesis is enriched with the further study of how other contextual variables enable the development of the ambidextrous capabilities to successfully manage innovation and internationalization. In detail, we enrich our framework with the analyses of a contextual variable (i.e. age) and three strategic decisions (i.e. to collaborate in innovation projects with universities and research centres, to develop international experience and to undertake import activities beside export and innovation activities). In doing this further exploration, we complement the

ambidexterity theory with other management theories supporting the idea according to which age, innovation sourcing, international experience and inflow trade activities are contextual and strategic factors shaping the ambidextrous capability of firms to balance innovation and internationalization activities for SMEs growth. In detail - drawing from the Organizational Lifecycle Theory (OLT; Chandler, 1962; 1964) - we advance that age might represent a contextual factor which influences the capability of firms to properly balance innovation and internationalization activities due to problems as the liability of newness and smallness which characterize SMEs (e.g. Bruderl and Shussler, 1990). As a firm ages – in fact - the flexibility of the routines used for market and technological exploration, its reputation and the availability of the marketing assets needed to bring product innovation onto the market, as well as the complexity of the management systems deployed to govern a diversified portfolio of innovation projects are likely to change.

Moreover - integrating within the ambidexterity theory the dynamic capability perspective (Teece et al., 1997; Zimmerman and Birkinshaw, 2016; Birkinshaw et al., 2016) – we advance that the capability of SMEs to balance innovation and internationalization activities to growth might be function of the development of other capabilities through the integration of activities as the collaboration in innovation processes with universities and research centres, and the development of international experience. Ambidexterity and dynamic capability perspectives are complementary since ambidexterity clarifies the strengths and weaknesses of different organizational arrangements chosen by executives to sense and seize opportunities and to reconfigure their internal activities (Birkinshaw et al., 2016). Thus, the development of dynamic capabilities can contribute in sustaining firms in exploration across different functional domains (innovation and internationalization), given their role in sustaining firms in sensing, seizing and transforming opportunities that are available in the firm's technological and market environment (Teece et al. 1997) and given their role in supporting firms in combining and integrating knowledge of different kinds and sources (Verona and Ravasi 2003). As advanced above, the creation of dynamic capabilities through the collaboration with innovation partners from universities and through the development of experience in international markets may, thus, enable firms to develop contextual factors (Porter and Siggelkow, 2008) able to change the way innovation and internationalization activities interact and are balanced in the context of SMEs.

Finally, due to the importance of the age of SMEs in dealing with the tensions between innovation and internationalization (and the ambidextrous capabilities required to manage them), we complement the domain ambidexterity view by offering a new position on the way SMEs may manage such activities and how they may implement balancing between innovation and internationalization. More specifically, previous literature has advanced that firms may manage tensions between exploratory and exploitative activities by adopting three different strategies (contextual balancing, structural separation and temporal separation). Owning to the fact that SMEs strive to adopt temporal and structural separation for resource problems, the solution identified by literature – until now – to manage tensions in this context is represented by the contextual balancing, namely though the behavioural integration of exploration and exploitation activities by managers. With this research we introduce a possible alternative strategy which is represented by the sequential adoption of activities, namely a strategy which combines temporal separation with behavioural integration and contextual management. We explore and develop this issue by combining the knowledge based view of the firm (e.g. Kogut and Zander, 1992) with the resource dependency theory (Pfeffer and Salancick, 1978) to present the sequentiality existing in SMEs with reference to the adoption of internationalization (i.e. import and export) and innovation activities.

1.3 Empirical settings

This thesis adopts three empirical studies to investigate the relationship between internationalization and innovation activities and SME growth. The first two empirical studies use a dataset (*Osservatorio Imprese Innovative,* hereafter *OII)* which is the result of a survey of high-medium tech manufacturing SMEs in the Piedmont region, in Italy, conducted in 2013. There are several reasons pointing toward the suitability of Piedmont as context to empirically test the relationship between innovation, internationalization and growth.

First, the Piedmont region is characterized by a significant industrial tradition in manufacturing sectors where both large and small and medium enterprises co-exist. This factor allowed the development and integration of SMEs into relevant value chains in which they assumed an important role in terms of innovativeness.

Second, Piedmont is one of the most important regions in terms of research, development and innovation thanks to the strong ecosystem which can support the development of firms operating there (EU, 2018). In fact, as said before, large firms - with their research and development laboratories - and the presence of important universities as the Politecnico di Torino and the University of Turin have created a valuable context which over performs in terms of scientific publications, R&D investments and high skilled jobs both Italy and Europe.[i]

Third, the high presence of manufacturing firms allow Piedmont to be - by nature - more open toward international operations since manufacturing is usually a sector which is integrated in global value chains (Goracinova et al., 2017).

Forth, in Piedmont (as well as in Italy) there is a large presence of SMEs which makes this region a suitable context for our exploration.

The second dataset is the ESEE dataset, which consists in a repeated survey of a stratified sample of Spanish firms which spans from 1990 to 2013. We use this dataset to test the empirical relationship existing between import, export and innovation presented which will be presented at the end of the thesis. This dataset is useful for our purpose since it overcomes many of the shortcomings that the OII has. For instance, being the ESEE a repeated survey it may allow establishing more clearly causal relationships between the variables under scrutiny. Moreover, it may allow exploring different contextual factors thanks to the different design of the survey.

Despite data coming from the ESEE dataset are form a different country with respect to the OII (i.e. Spain vs. Italy), there is interest in comparing the results between the studies carried out in the two contexts. In fact Spain is characterized by an industrial ecosystem similar to Italy where the presence of SMEs is strongly comparable (Hall et al., 2009). The fact that the first two studies use a sample of innovative SMEs from the Piedmont region as empirical context may arise the doubt that identified effect may not hold in other contexts (for instance where there are less knowledge intensive firms). The fact that, despite the many similarities with Italy, Spain is a country with an average lower industrial intensity may help us in ruling out this concern, thus providing superior reliability to the contents of this thesis.

1.4 Thesis structure

The discrepancy existing between the benefits that internationalization and innovation activities may bring to SMEs growth when analysed in isolation or together requires an in-depth analysis of the problem. In doing so, this thesis is organized as it follows.

Following the introduction, Chapter 2 and Chapter 3 offer a survey of the relevant literature about growth strategies that SMEs may pursue through internationalization and innovation activities. These chapters offer a background to the reader, providing motivations to the analysis of internationalization and innovation strategies and the most relevant literature. In developing these chapters, we move from general to specific concepts. In particular, Chapter 2 presents the more general view dealing with the motivations and the reasons of product and international diversification as SMEs growth strategies. In detail, we characterize product and international diversification as well as their relationship with firm performance. Then, we analyse and extend the theoretical model advanced by Bowen and Sleuwaegen (2017) depicting the relationship between product diversification, international diversification and firm performance (profitability and growth). Finally, Chapter 2 offers a deepening on the relevant role played in this content by firm's internal resources under the form of experience.

In Chapter 3, we deepen the relationship existing between product diversification, international diversification and firm growth by characterizing the diversification strategies as innovation and internationalization activities and narrowing the focus on the context of SMEs. As in the previous chapter, in this chapter we present the literature from the general view toward the particular. In detail, we present - as first step - the internal and external enablers of SME growth, which lead to the identification of innovation and internationalization as factors shaping the performance of SMEs. Then, in the next sections we analyse how innovation and internationalization activities contribute, in isolation, to firm growth. This chapter then contextualizes the ambidextrous strategies that SMEs can adapt to deal with innovation and internationalization activities, and the research gap we aim to fill with this thesis. In particular, we show that although the literature about the conjunct effect of internationalization and innovation activities and SME growth is relatively thin, it presents some contrasting views

about their joint effect, with some studies pointing toward a positive effect and others toward a negative effect.

Chapter 4 is the first empirical investigation offered in this thesis. This work explores the relationship existing between internationalization, innovation and growth using a domain ambidexterity framework (Voss and Voss, 2013; Lavie et al, 2011). In doing this, in Chapter 4 we theoretically extend the domain ambidexterity framework to the international business literature in order to provide a consistent theoretical framework for studying the interplay between internationalization and innovation in SMEs. The main objective of this section is to understand *if* - in the context of SMEs – undertaking contemporary innovation and internationalization could be beneficial or detrimental to growth. In this vein, we test empirically the relationship existing between exports, R&D activities (as proxy of innovation) and revenue growth and the structural conditions which may limit or boost the conjunct effect of internationalization and innovation on growth (e.g. firm's age).

Chapter 5 – the second empirical study - is dedicated to the exploration of the boundary conditions enabling a successful combination of international activities and innovation. In particular this section explores some activities which may simplify their contemporary development, in order to provide an answer to *how* SMEs can combine internationalization and innovation activities to grow. In detail, this chapter explores the role that Open Innovation (OI) strategies (Chesbrough, 2006) and international experience (Eriksson et al., 1997) have in moderating the impact of innovation and internationalization activities on SMEs growth. Theoretically, we root the idea that firms may develop capabilities to solve the tension between innovation and internationalization activities and to balance them (Zimmerman and Birkinshaw, 2016) under the dynamic capability view (Teece et al., 1997; Teece, 2014). In detail, we argue that both OI activities and international experience allow SMEs to perform an efficient resource orchestration between internationalization and innovation activities which enables firms to grow.

Finally, the third empirical study (Chapter 6) is dedicated to deepen the relationship between innovation and internationalization by introducing import as another way of internationalization in which firms are involved, and analysing its interplay with innovation. Firms can be engaged not only in outbound international activities (i.e., selling products abroad through exports), but may also be involved in international operations through import activities. Despite the

different objective of imports and exports, imports may act as a knowledge enabler both for export activities and innovation activities. In fact, an international presence through import may simplify the presence abroad in terms of export - lowering the frictions arising in serving foreign customers and in gathering market and internationalization knowledge – and may bring new technological knowledge to firms which could enable new innovations. Again, this chapter contributes to the development of this thesis by exploring other mechanisms through which SMEs may combine innovation and internationalization activities to grow (thus it contributes to the *how* question).

The last chapter presents the overall conclusion and limitations. We summarize major findings of the preceding chapters as well as the managerial and policy implications of the empirical results. We also report limitations in this PhD thesis and future research directions that would advance SME strategy, innovation and internationalization theory and empirical studies.

1.5 Results Dissemination

As previously highlighted, the main aim of this work is to explore the relationship existing between innovation and internationalization activities in sustaining SMEs growth. In doing this, a specific objective is to reconcile different theories which may lead to different conclusion about this empirical phenomenon. For this reason, the contents presented in this thesis have been discussed and presented to the academic community during the Ph.D. years. In particular, the theoretical building about domain ambidexterity and the empirical results presented in Chapters 4 have been presented in two conferences[ii] and have been incorporated in a paper which is forthcoming in Management Decision[iii]. Similarly, contents included in Chapter 5 are part of a research which has been presented in an international conference in 2016[iv] and that has evolved to a scientific article which has been invited for submission for a special issue in an international journal. The article is currently under review.

Finally, Chapter 6 is part of a research project developed during the visiting period I spent at IESE Business School in the third year of my Ph.D. An early draft of this work has been presented at the Strategic Management Society (SMS) conference in Houston in October 2017[v].

Chapter 2

Product-market strategies, product diversification, international diversification or both? At the roots of the strategic dilemma for SMEs.

2.1 Introduction

In the context of Small and Medium Enterprises (SMEs), although innovation and internationalization are two key strategies aimed at pursuing superior performance, literature has mainly studied strategic moves of such firms from a broader perspective (Bowen and Sleuwaegen, 2017). In particular, the combination of internationalization and innovation activities responds to the strategic intent of firms to diversify their business for growth, both on the market and the product domain. In this vein, the diversification-performance link has been one of the most studied topics in strategy, but it has also been extensively analysed by fields as economics, accounting or finance (Ahuja and Novelli, 2016). The crucial intention of all these streams of research is to understand whether and how diversification affects performance. The interest in this strategic decision is straightforward: in day-by-day routines, managers are continuously challenged by

quests which point to diversification decision. To provide an example, we can think about merge and acquisition decisions (M&As). When managers have to decide if the firm has to buy or not another company, they are implicitly deciding if pursuing a product/business diversification strategy (related or unrelated) or not. Even in the strategic management literature, some theories are implicitly grounded on the diversification dilemma. For instance, the dynamic capability framework (Teece et al., 1997) strongly emphasize that firms have to develop dynamic capabilities to reconfigure and retransform their business assets to be ready to respond to changes in the business environment in which they operate (Teece, 2014). Even in this case, the implicit assumption is that the firm should be able to diversify its business in order to anticipate the competitors and to be able to generate profits.

The relevance of diversification decisions is very high for firms since it requires the investment of significant resources (Ahuja and Novelli, 2016). Moreover, its importance becomes fundamental for those firms who strive in acquiring, developing and maintaining resources (e.g. SMEs). In the case of SMEs, in fact, diversification could be a "one-shot" decision which is not reversible and that, if wrongly evaluated, is very likely to push them toward failure.

Due to this relevance, we need therefore a specific framework supporting managers in taking their decisions and, given the complexities of diversification, clearly describing contingencies and trade-offs that diversification entails (Ahuja and Novelli, 2016).

To respond to this issue, this chapter is intended to represent a background section for the topic analysed in this thesis and aims to offer an overview of the relevant topics about product-market strategies by presenting their origin and the relevant literature at the intersection between product and international diversification. In the first section it is presented the theoretical origins and the concept of the diversification as a growth strategy, which can be traced back to the study of Ansoff (1957). Traditionally, innovation and internationalization tended to be considered as alternative growth options (Ansoff, 1957). In the past, literature has explored the diversification-performance relationship mainly in two directions: on one side there has been huge exploration of the link between product diversification and performance; on the other side, diversification has

been explored in relation to international business (the so called international diversification)[vi]. These two consolidated streams of literature have been developed extensively and arrived to substantial findings (even if not unanimous, see Ahuja and Novelli, 2016; Cardinal et al., 2011). However, nowadays, international performance plays a crucial role for firms, but also innovation has been identified as an important element for firm success. Therefore, innovation and internationalization are increasingly seen as proactive, sustainable strategies for large firms and for SMEs. More specifically, they are sometimes viewed as specific sources of competitive advantage (Onetti and Zucchella 2008). However, the literature on diversification entailing both product and market diversification is less developed and sparse than those specific on product or international diversification. For these reasons in the third and fourth sections, we move to explore more formally what is the relationship between product diversification, international diversification and firm performance (sections 2.3 and 2.4)[vii].In section 2.5 we discuss an adaptation of the formal model by Bowen and Sleuwaegen (2017), taking into consideration the relationship between product diversification, international diversification and firm performance to illustrate the relationship between product-market diversification and firm performance. In particular, we show how the relationship between product-market diversification changes according to the measure of performance used. In section 2.6, we turn then to discuss the role that learning and previous experience could have in product and international diversification by shortly reviewing the most relevant literature. All in all, this chapter provides a background for readers to approach the core topic of this thesis (i.e. the relationship between internationalization, innovation and performance in SMEs) which will be addressed from chapter three onwards.

2.2 Linking strategy to growth: Ansoff's strategies

Igor Ansoff (1965), proposed various types of corporate-level strategies aimed at explaining the growth of the firm. In his seminal work, Ansoff identified corporate strategy as the set of rules for decision making that are oriented toward the growth of the enterprise. Traditionally, this set of rules and norms have been studied in relation with diversification, merges and acquisitions, alliances, joint ventures and so forth. However, corporate strategy may also be extended more generally to each strategic decision that most organizations take when they consider the option of broadening the set of products offered to their current market or even to move into a new geographic market (Moreno and Casillas, 2008; Johnson and Scholles, 1984). Moreover, although corporate strategy has

been widely used to refer large companies and multinationals, it can be also useful to analyse and describe even the growth and development of smaller firms, as SMEs (Gibbons and O'Connor, 2005; Mitchell, 1988). In this vein, Ansoff's model is used as a basis for this research to describe how firms can achieve growth. There are two main reasons for this choice. First, several other models may fail in linking firm's strategy with firm's growth and evolution. For instance, some studies in literature use Porter (1980) typology - which makes distinction between cost-leadership and differentiation-leadership - to explain the growth of small and entrepreneurial firms (e.g. Dess et al., 1997; Baum et al., 2001). Others use Miller's (1986) distinction between the strategies of differentiation in marketing and differentiation in innovation – a model akin to Porter's strategies – to explain how firms grow and the root of their strategies (e.g. Durand and Courderoy, 2001). However, the strategies of leadership in cost and differentiation have the aim of creating sustainable competitive advantage for the firms pursuing them. Pursuing sustainable competitive advantage has the main aim to bring the firm to obtain abnormal (or exceptional) levels of profitability rather than to act on firm's growth (Moreno and Casillas, 2008), making inefficient the use of such frameworks.

Second, these strategies may fail in meeting the boundary conditions that SMEs have. Moreover, both these models are based on a different (and someway old) paradigm in which SMEs – especially in the more advanced economies – may decide to compete with other firms on costs or differentiation. However, with the rise of the globalization era, more and more SMEs in these economies have to compete on differentiation rather than on cost leadership – which is left to firms operating in more emerging countries (Leitner and Güldenberg, 2010; Mudambi, 2008). In this vein, SMEs in the more advanced countries (e.g. Italy, Spain, and France) are used to pursue niche strategies - which entail large innovation investments, hiring high skilled employees, engaging in partnerships and implementing new innovation processes to carry out new products (Mousa and Chowdhury, 2014; Nohria and Gulati, 1996). All these things require a high need of investments which can be hardly recovered by selling the products in the local and domestic niches.

Ansoff's model overcomes the main issues of Porter and Miller models and for this reason is well suited to describe product-market strategies for SMEs. This

tool has been developed by the scholar Igor Ansoff (1957) to describe the growth strategies that firms have. It can be used as an ex-post assessment tool to analyse the growth strategy undertaken by a firm, as well as an instrument for managers to plan future growth strategies. According to Ansoff's idea, there are four basic growth alternatives a firm may choose. All these alternatives are based on different combinations of product and market strategies, in which the firm decides to combine different product and market activities. This combination originates four postures (and strategies) a company may use to grow: a market penetration strategy, a market development strategy, a product development strategy or a diversification strategy. Figure 2.1 reports a graphical representation of Ansoff's product-market strategies.

Market penetration is a product-market growth strategy in which the firm extends the selling of a product already developed in a market already served (see the bottom-left quadrant of Figure 2.1). In other words, the firm adopts this strategy to grow using its existing offerings in terms of products and services in existing markets, trying to increase its market share in the current market scenario.

Market development is a product-market growth strategy in which an existing product is used to serve a new market (see the upper-left quadrant of Figure 2.1). Often, before the product is ready for the new market, it receives some very small refinements in order to raise its appeal for new customers. However, such refinements do not alter significantly the functions of the product. This strategy is used by firms to gain more market share by broadening the consumer base and is typically pursued through the extension of the number of customers segments addressed, or through the extension of the geographic markets addressed.

Product development is a product-market growth strategy in which the firm serves the existing market, but through the introduction of a new or significantly improved, product (see the bottom-right quadrant of Figure 2.1). This strategy entails a radical change of the product already sold which usually stems into far departures from established products sold into the market in terms of technologies or in terms of product idea.

Figure 2.1: Ansoff's product-market strategies

Finally, diversification is a product-market growth strategy in which a new product is developed to serve a completely new market. Pursuing the diversification strategy, the firm combines contemporary product and market development strategy (see the upper-right quadrant of Figure 2.1). For this reason, diversification is the riskier strategy for firms since it entails an exploration of both new markets and new technologies. Such diversification might be full (a new product for a completely unknown and new market) or backward and forward (i.e. the firm decides to vertically integrate some activities which are at the preceding or later stage of the current product sold).

By entailing exploration on both the product and the market dimension, diversification strategies are those pursued by firms trying to contemporary innovate and internationalize. However, despite the potential benefits of this strategy, it also entails significant costs, and its direct relationship with

performance remains questionable. This topic will be explored in detail in the next section.

2.3 The link between product diversification and performance

There are several reasons behind the decision of a firm to diversify the set of products offered. First, product diversification is a strategy largely used by firms to increase their performance. The resource-based view (RBV) provides explanation of the reasons supporting this idea. RBV (Penrose, 1959), in fact, suggests that firms diversify in order to employ their excess capacity of resources having multiple uses (e.g. capital, labour) but subject to market failure (Wernerfelt, 1984; Peteraf, 1993). In this vein, diversification allows firms to access strategic assets which would be hardly accessed through the market (Markides and Williamson, 1996). In practical terms, firms enhance their performance through the sharing of assets or activities across multiple products. This favours the emergence of economies of scope and scale taking origin from the sharing of core resources across business and products that do not transact with each other across time or over time (Ye et al., 2012). Moreover, apart from economies of scope and scale, firms may benefit from economies of learning (i.e. the reduction of the average variable cost as cumulative production increases), from convenience / cost savings for customers, or from information economies emerging from the provision of several products to customers willing to pay for complementary goods (Puranam and Vanneste, 2016).

Product diversification may also occur since coordinating strategies across markets provide benefits for firm competitiveness (Baum and Greve, 2001; Li and Greenwood, 2004). First, firms may obtain benefits related to mutual forbearance and reduced competition through coordination with competitors operating in multiple markets (Li and Greenwood, 2004), which in turns may increase barriers to entry into the product markets. Second, firms may cross subsidize one product through the cash flows generated with the other. This may allow firms to apply predatory pricing which can stamp out competition in one product market, generating therefore superior performance (Meyer et al., 1992). Third, product diversification may enhance performance through increased competitiveness thanks to the creation of "market power benefits" (Ahuja and Novelli, 2016) which may realize through the increase in size and reputation.

A third reason bearing a positive link between product diversification and performance is related with business risk (e.g. Dimitrov and Tice, 2006). Diversification provides opportunities to reduce risks that cannot be accessed by shareholders on their own (Lewellen, 1971). More specifically, firms can mitigate business risk related with the investment in a single line of products through the diversification into multiple lines. In this vein, it mitigates the total revenue streams but, if products or businesses are sufficiently negative correlated (or at least unrelated), the firm may realize lower bankruptcy risk through safer cash flows.

In general, diversification has been demonstrated to be correlated with a number of performance measurements as profitability, risk, risk-adjusted returns. In relation to growth measures the literature is more scant than for other performance measures, but provides some interesting insights. First, profit growth has been demonstrated to be positively influenced by diversification related with the current product/business rather than with distant products/business (Palepu, 1985). This means that firms willing to increase their profits have to operate as close as possible to their competency domain to exploit economies of knowledge to diversify into new products. However, recent studies have advanced that product diversification within the industry (that does not depart very much from the competency domain of firms) has a U-shaped performance effect on sales growth, which implies that firms should point to low or to high levels of product diversification to obtain benefits for their performance (Zahavi and Lavie, 2013). In particular, excessive product relatedness generates negative transfers effects at high levels of diversification. In this vein, firms have to critically assess if they are better to keep the level of diversification low, in order to avoid the emergence of such negative transfer, or to keep the level of diversification high in order to compensate negative transfers with economies of scope (Zahavi and Lavie, 2013).

In sum, although the literature is very mixed, providing a number of different evidence about the form of the effect of product diversification on firm performance (e.g., linear, U-shaped), scholars generally agree on the overall positive effect of diversification through innovation on performance. A result which partially confirms Ansoff's idea, namely those firms may utilize this strategy to grow.

2.4 International diversification strategy and performance link

2.4.1 Firm's international diversification options

The last thirty years have been increasingly characterised by the globalization phenomenon which has brought firms to extend more and more their operations beyond domestic borders (Mudambi, 2008). Accordingly, as more and more firms approached new foreign markets, since the '80s, scholars have started to pay attention to the geographical diversification phenomenon. Historically the first firms able to internationally diversify were – mainly – large corporations that, thanks to the possibility of a large resource endowment in international operations, tried to extend their activities into new geographical markets. Since '90s and especially in the new millennium, however, the fall of trade barriers and the development of information and communication technologies have favoured also SMEs in approaching new geographical markets (Karagozoglu and Lindell, 1998).

The way firms approach foreign markets depends on endogenous factors (as potential results that firms hypothesize to achieve), but also on exogenous factors (as the industry in which the firms operate). Different forms of entry lead firms to achieve different results. The most common taxonomies distinguish three fundamental groups of modes of entry which firms can pursue: exporting modes, contractual modes and investment modes (Wach, 2014).

The first group - exporting modes - is related with international trade, mainly with reference to export and import activities. Importing raw materials or final product's components from abroad, is usually a preliminary activity to the export of products abroad. This is because imports usually entail low risk. Through imports the firm get in touch with foreign markets and start to learn and understand the requirements needed to perform international operations. As natural consequence of growth export activities usually come as first outbound international operation and occur when the firm - after reaching all its customers in the domestic market, an appropriate volume of production and a surplus production (Bernard and Jensen, 2004) - aims to continue expanding its market. While import can take the only form of direct import from a firm located abroad, export activities can take various forms, including indirect export, direct export, as well as cooperative export. In indirect export modes the manufacturer uses independent export intermediaries located in its own country, so that the

manufacturer does not have a direct contact with international customers or partners, and the transaction is treated as a domestic one (Neirotti and Paolucci, 2015). Through direct export, instead, the firm takes direct contact with customers in the foreign market. This may be realized in several ways, as using a foreign agent or a foreign distributor acting as foreign intermediary with firms, or using a representative office or a own foreign distribution network. Finally, firms may engage into exporting modes through the adoption of cooperative strategies and, in particular, through export consortia (where firms voluntary build a network to promote their products and then overcome the large cost barriers they would have to face by entering foreign markets alone), or through "piggybacking" (where a carrier carries out business in a foreign country by offering to a rider the sharing of its own distribution network).

The second group of entry modes relates to cooperative relations implemented through contacts with foreign partners. These modes include activities as international licensing, international franchising and international subcontracting. International licensing is a contractual agreement between a domestic licensor and a foreign licensee (licensor usually holds patents, technological know-how, trademarks, or a strong brand which is provided to the foreign licensee) (Cullen and Parboteeah, 2010). International franchising is similar to licensing, but concerns the sphere of trade and distribution in the wider services sector. International subcontracting, instead, is a knowledge-based service that is built between a domestic firm and a foreign partner. This kind of agreement is usually related with the provision of a specific service and rarely applies to firms producing manufacturing products, but it is quietly developed among service firms.

The third and last group is represented by the investment and consists in setting up foreign branches or foreign subsidiaries (partially or fully depended) of firms. This mode of entry is based on foreign direct investments (FDIs). The reason behind the large diffusion of such entry mode is that it provides firms lower production costs, but also a direct presence in the foreign market. Foreign investments can rely to two typologies, namely: brownfield investments, which relate to Merges and Acquisitions (M&As) of local firms, or greenfield investments, which relate to the completely new investment of firms in a foreign market to create a new branch or subsidiary.

Each entry mode presented above has its own set of advantages and disadvantages which affect the criteria for its selection by firms. Firstly, firms select their international entry mode based on five elements (Katsioloudes and Hadjidakis, 2007): (i) the scope of capital commitment; (ii) the scope of management commitment; (iii) the scope of control; (iv) the scope of risk; and (v) the scope of input costs. In this vein, SMEs are used to adopt as entry mode in foreign markets the *exporting modes,* since they entail lower entry costs, a moderate financial risk and low staffing requirements. Obviously, the drawback is that transaction profitability is reduced; that transport costs risk being very high; and that the selling risks to be limited due to potential trade barriers. However, this modes allow the firm to appropriate almost all the surplus generated through the selling, for instance in comparison to contractual models. The latter, in fact, are entry modes that, although they may entail low capital commitment and relatively low risk, are used to bring low value added to the firm which, in turn, strive in achieving both an economic and a knowledge result from the transaction (for instance it is difficult that the firm will increase its knowledge about the foreign market conditions). Finally, investments modes (as FDIs) entail significant entry costs as well as entry risks which may overcome the benefit related with the full control that the firm may exert on its international operations, for instance in the form of high profits.

Although entry mode through FDIs is largely adopted by multinationals rather than by SMEs, there are some of them – which have been labelled by international business literature as micro Multinational Enterprises (mMNEs) – that prefer to enter foreign markets with equity investments in foreign countries rather than through more flexible (and cheaper) exports. Dimitratos et al. (2003, p.165) define the mMNE as a "*small- and medium-sized firm that controls and manages value-added activities through constellation and investment modes in more than one country*". mMNEs are, therefore, small firms adopting foreign market entry modes which are more complex than export and that allow them to grasp more opportunities abroad. Entering foreign markets through direct investments allows mMNEs to offer superior customer service levels and a superior understanding of foreign market conditions (Lu and Beamish, 2001). Such firms are characterized by an entrepreneurial attitude (Jones et al., 2011), through which mMNEs are able to achieve higher control levels on international activities and, in some cases, superior performance (Prashantham, 2011). Moreover mMNEs are characterized by a superior risk-taking propensity and by superior networking capabilities which makes them more prone to enter into equity investments in foreign markets with respect to exporting firms.

Although the literature about mMNEs is relatively thin, the existence of mMNEs has been already detected about twenty years ago in countries as Italy, which is characterized by a significant presence of SMEs operating foreign markets (Mariotti and Mutinelli, 2003)[viii]. However, although mMNEs is an emerging topic in international studies, in this thesis we will not refer to them when we will discuss about international diversification as mMNEs represent a particular case of internationalization which is moderately diffused in Europe. Moreover, in contexts where there is a large presence of SMEs and where economies of proximity and agglomeration play an important role (as in the case of industrial districts, which are widely diffused in Europe), it has been demonstrated that the development of mMNEs is limited by lock-in mechanisms preventing an enterprise to take advantage of the opportunities offered in other contexts than those in which they were born (Mutinelli and Mariotti, 2005). For this reason hereafter we will refer to internationalization by considering only exporting modes, which are those largely pursued by SMEs (EC, 2010).

2.4.2 Firm's international diversification and performance

The relevance of internationalization activities has immediately turned scholars to question the existence of an international diversification-performance link. Despite Ansoff (1965) describes international diversification as a growth strategy for firms, and despite the widespread phenomenon, scholars struggled in finding a common view about the internationalization-performance link, ending in an endless debate about the kind of relationship existing between the two (Benito-Osorio et al., 2016).

This lack of convergence can be easily understood by looking at all the advantages and disadvantages that international diversification entails for firms. More specifically, international diversification entails several positive features which may favour firm performance but - at the same time – it may also let firms incur into business risk and resource drain. Diversifying into new geographical markets may be positive for firm's performance for at least eight reasons. First, entering multiple foreign markets allow firms to exploit market imperfections, as the use of specific firm-specific assets in new market abroad (Lu and Beamish,

2004). This in turn allow firms to establish leader positions in new markets through the exploitation of their dynamic capabilities (Teece, 2014). Second, a greater presence abroad allow firms to access and arbitrage cheaper inputs (for instance capital and labour), which – in turn – may favour superior margins and profits (Contractor, 2007; Lu and Beamish, 2004). Third, entering multiple markets abroad allow firms to reinforce their bargaining power over suppliers, distributors and customers thanks to the creation of multiple options for firms for trading goods (Contractor, 2007; Lu and Beamish, 2004). Forth, entering multiple markets abroad puts the firm in contact with multiple different sources of knowledge which, thanks to experiential learning (Kogut and Zander, 1993), enhance their knowledge base (Zahra et al., 2000). Fifth, multiple geographic diversifications provide further knowledge to firms about how to do it. This, in turns enables the accumulation of international experience (Johansson and Vahlne, 1977). Sixth, operating in multiple international markets allow firms to realize global economies of scale and scope (Porter, 1986; Caves, 1996; Lu and Beamish, 2004). Seventh, international diversification is strictly linked with risk diversification since operating in multiple geographic markets lowers the risk firms may be damaged by political instability, fluctuations in exchange rates or economic cycles (Contractor et al., 2007). Finally, firms internationally diversified benefit from superior ability for scanning potential competitor and markets which – in turns – can offer new potential sources of profits (Contractor et al., 2003).

As remarked above, however, undertaking international diversification may entail superior costs for firms. Liability of newness and foreignness (Johansson and Vahlne, 1977; Zaheer, 1995) – for instance - require firms to invest significant resources in gathering information about new markets abroad and the ways they have to operate in. In particular, large investments are required to understand and adopt cultural and institutional norms which are likely to vary country by country (Ghoshall and Bartlett, 1990). Moreover, addressing multiple markets abroad entails significant coordination costs due to the diversity of the environments addressed (Contractor et al., 2003), and this has to face the limited cognitive capability of managers to operate in a further different foreign market (Contractor et al., 2007). At the operational level, superior international diversification entails higher transportation costs and raises the probability to incur into further tariff costs (Contractor et al., 2007). Finally, Hennart (2007) has demonstrated that firms internationally diversifying do not achieve a sufficient decrease in unsystematic risk, which compensates systematic risk. These evidence have been proven for MNEs, but they can be easily extended to SMEs if it is

considered that many SMEs operating internationally are bounded into small niche markets for which international diversification is almost a mandatory activity.

The number of theoretical topics related with benefits and costs of international diversification has lead scholars to advance controversial theories about the question of whether international diversification has a bearing effect on performance. Most studies have advanced that international diversification is positive for firm performance since the incremental costs associated with superior levels of international diversification were outweighed by the incremental benefits associated (Contractor, 2007; Contractor et al., 2003). However, other scholars have more and more started to recognise that international diversification can lead to risks and even business failure (e.g. Bausch and Krist, 2007), advancing that international diversification can yield to marginal decreasing returns which, at a certain level of diversification, could become negative and could undermine performance. Among the constellation of theories about the international diversification-performance link, scholars have theorized that the effect could be not linear, advancing that it can have a U-shape or inverted U-shape slope. Theoretical considerations in favour of the U-shape model sustain that international diversification is initially detrimental for firm performance but, after a certain level, its effect becomes positive since the incremental benefits substantially outweigh the incremental costs. Several studies supported this view (e.g. Gaur and Kumar, 2009; Ruigrok and Wagner, 2003; Kistruck et al., 2013) which implicitly sustains that costs associated with international diversification are mainly start-up costs which can be easily climbed by firms. Conversely, inverted U-shape models, theorize that increasingly expanding international presence in multiple markets leads to positive results up to a certain level, but that has a detrimental effect on performance since transaction costs outweigh marginal benefits of further internationalization.

2.4.3 SMEs and international diversification: difficulties and performance effects

Although the specific literature on the international diversification-performance link about SMEs is quietly scant (Benito-Osorio et al., 2016) the

mixed evidence reported above can be extended to the case of small and medium enterprises. International markets represent an attractive opportunity for SMEs since they can be a source for superior growth and survival in a globalized scenario (Quian, 2002) and, therefore, positive (Bausch and Krist, 2007; Pangarkar, 2008), negative (e.g., Geringer et al., 2000),U-shaped (e.g., Lu and Beamish, 2001; Ruigrok and Wagner, 2003), inverted U-shaped (e.g., Chao and Kumar, 2010; Hitt et al., 1997) and S-shaped (e.g., Contractor et al., 2003; Lu and Beamish, 2004) effects of internationalization on performance have been proved also in the context of SMEs.

These mixed results can find an explanation in the fact that the level of internationalization of SMEs is very heterogeneous due to several problems they have to face. A study of the European Commission (2010) showed that small firms tend to be less internationalized than medium or large enterprises due to different endowments of resources and management systems (Fisch, 2012; Pangarkar, 2008). The main problem that SMEs face in internationalization is related with the lack of financial resources and the paucity of specific managerial skills which can greatly simplify coordination and communication among units. For instance, Karagozoglu and Lindell (1998) recognised as main problems of US SMEs the limited managerial expertise and competence and the lack of information about foreign markets. Moreover, the heterogeneity in the internationalization performance link is emphasized by the fact that SMEs – due to the resource constraints they have- usually internationalize through exports, since it is the less demanding form of internationalization, and concentrate overseas activities in fewer locations than larger firms (Yang and Driffield, 2012). This idea is supported by evidence of the European Commission (2010) which indicate that micro enterprises report export activities to a significant smaller number of regions (or countries) than SMEs which - in turns- report less geographical markets than MNEs. More specifically, the problems SMEs face in internationalizing are related with the fact that growing into international markets entails for them a constellation of activities which are required to be carefully managed across the whole firm departments and which require managerial commitment to be properly pursued (D'Angelo et al., 2016). In fact, selling abroad requires firstly to analyse customer needs and to find prospect customers in foreign markets. This activity is usually performed in large firms by a team of market specialists which analyse preferences and tastes of potential customers. At the same time, the firm is required to understand the local institutional framework which may differ from one country to another. This is relevant since product features may not respect the local laws and therefore products may need to be

refined to address such requirements. These activities are usually pursued in large firms by the legal department and by the technical department, which is also in charge to adapt the products to be sold abroad in line with the specifics received about foreign customer tastes. Finally, selling abroad products entails also the development of a network of suppliers and local distributors, as well an international supply chain. If such activities can be managed more easily by large firms thanks to their departmentalization, it appears clear that it is not the same for SMEs. In fact, in the context of SMEs, building a specific marketing team assessing foreign customer preferences is often difficult due to the scarce resources (but also due to the low competences available), and rarely SMEs have a legal department which can help firms to assess the institutional environment abroad. All these things are likely to undermine the successfulness of the product refinements introduced by the technical departments. Even in the cases in which specific teams can be created to deal with international markets, coordination between them is required and SMEs usually lack both strong coordination forms between teams, as well as managerial resources which can deal with these tasks (Palmié et al., 2016). Moreover, the way SMEs are called to perform international activities sometimes follows other patterns than those presented above. It is not rare, in fact, that SMEs perform their activities under the specific requirement of a lead customer. One example can be easily found in the automotive industry, where OEMs (e.g. FCA, FORD) have their production dispersed all around the World and sell their products in many different countries. Tier 1 suppliers are, therefore, required to follow specific instructions given by the OEM and to adapt the product to the in line with the specifics identified by the OEM. If on one side this internationalization path reduces the need to assess customer preferences and legal pitfalls, it also avoids firms to exploit economies of scale in other international contexts since the product is not standardized but is customized with reference to the specific inputs and needs of the OEM.

In sum, the constellation of difficult tasks SMEs have to face pursuing internationalization activities renders difficult to establish a clear effect between internationalization and performance. In fact, international operations are, for such firms, harder than for their larger counterparts due to managerial and financial constraints which limit the possibility of exploitation of foreign markets. However, considering the several entry modes that firm have, we may infer that overall international diversification has a positive impact on SMEs performance,

since they endogenously chose (e.g. Benito-Osorio et al., 2016) the entry mode they expect to be most beneficial for their performance. In other words, small firms are more likely to enter through exports into more familiar markets (maybe few or very few) than their larger counterparts. For this reason the performance gains due to international diversification can be recognised as positive.

2.5 Diversification through internationalization and product innovation: theoretical considerations

Paragraphs 2.3 and 2.4 have provided a brief summary of the main findings linking international and product diversification with firm's strategy and performance. However, recent developments in this line of research are more and more considering the interdependence between product and international diversification, arguing that they can hardly be considered as isolated strategies (e.g. Bowen and Wiersema, 2007). These points raise a crucial question for both managers and practitioners, namely if product innovation and international diversification depict a complementary or substitute relationship for firms (Bowen and Sleuwaegen, 2017).

International business literature has firstly recognised product diversification through innovation as a moderator of the relationship existing between international diversification and performance (e.g. Hitt et al., 1997). This empirical evidence has been supported by theoretical arguments as cost and revenue complementarities due to size effects, economies of scope or economies of scale. The evidences about this effect have been very mixed in literature with some authors pointing to a complementarity effect, and others to a substitution effect (see Bowen and Sleuwaegen, 2017 for a review). Although the mixed arguments raised by previous literature can be explained with a number of conjectures (e.g. different empirical settings, different empirical specifications, different theoretical frameworks), the formal economic theory can help to disentangle the relationship between product and international diversification and their effect on firm profits (Bowen and Sleuwaegen, 2017).

Assuming that international diversification and product diversification through innovation are variable under the choice of a firm, and that the objective of firms is to pursue superior profits, it is possible to study the relationship existing between them.

Displaying firm's total costs and total revenues in terms of international diversification and product diversification through innovation it is possible to obtain the curves depicted in Figure 2.2. The structure of the curves is drawn according with classic microeconomic theory. In particular, we set decreasing marginal revenues and increasing marginal costs for product diversification through product innovation (hereafter product diversification), as international diversification increase. Product diversification costs are drawn explicitly for fixed level of product diversification (namely PD* and PD***). Figure 2.2 depict clearly a situation where increasing the level of product diversification from PD* to PD** lowers the total cost of product diversification at all the levels of international diversification. This can be easily noticed by looking at the shift between C (PD*) and C (PD**) in Panel A and at the raise of total profits in Panel B. This happens because higher economies of scope and learning are realized (Teece, 1980; Hitt et al., 1994) with superior products in firm's portfolio. What is immediately noticeable is that as far as the level of product diversification increases (and its cost falls), the total cost of international diversification changes. This evidence is also reflected in the shift of the profit function, which implies a shift of the international diversification from ID* to ID**. All in all, these results imply interdependence between product diversification and international diversification. In other words, the optimal choice managers do regarding product diversification has an impact on their optimal choice of international diversification. Previous research has argued that both international diversification and product diversification are responsible for the enhancement of the profitability of firms. This happens since economies of scope and resource leverage over new geographic and product markets can be leveraged (Hitt et al., 2006; Palich et al., 2000). The straightforward consequence of this element is, therefore, that higher product market scope and higher geographic scope can create synergies (i.e. complementarities). However, between internationalization and innovation may hold also a substitute relationship. This is because pursuing greater geographic and product market diversification may result in higher costs. For instance, as far as the firm diversifies, its management costs may increase disproportionately in relation to coordination and control (Hutzcgenreuter and Horstkotte, 2013). Moreover, further diversification may also require product and organizational adaptation (Sleuwagen, 2013), which in turns could undermines revenues and profitability.

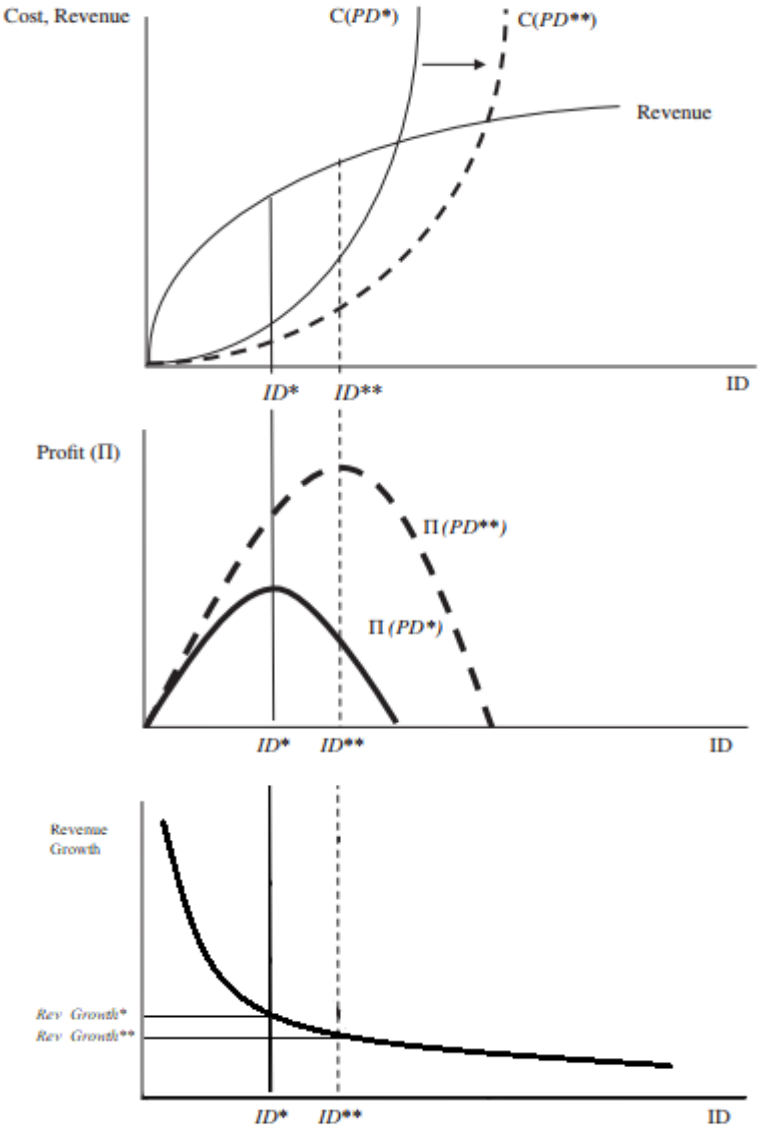


Figure 2.2. Relationship between product diversification cost, international diversification cost and revenues (Panel A), profit-maximizing choice of international diversification and product diversification (Panel B) and product and international diversification and revenue growth (Panel C).
Note: The dashed line represents the situation in which the firm moves from a level of product diversification to a superior level of diversification. Adapted and integrated from Bowen and Sleuwaegen (2017).

Although the considerations above could be generalized for each kind of firm in the market, for SMEs it may not apply. SMEs may have different objectives rather profits or, at least, profits might not be their only objective. For SMEs, in fact, the likely objective is to obtain viability (then growing) rather than sustaining viability (then generating profits). More specifically, firms might be in the situation in which they have to trade off profit objectives with growth objectives. This means that firms may have as objective the growth (of revenues, of employees, etc.) but they always operate under a constraint which is to generate a minimum level of profit (Baumol, 1959). This feature is extremely important since it is related to survival (Lee et al., 2012), implying that SMEs that fail in growing enough are susceptible of failure. Therefore, if the SME sets its level of product differentiation and market differentiation based on profit maximization it may incur in lower revenue growth with respect to a situation in which the firm reduces the level of product differentiation (i.e. in a situation in which the firm sets a PD*** so that PD***< PD*<PD**). This reasoning is sustained by the evidence brought by Panel C of Figure 2.2. As far as the firm increases the level of product differentiation, the profit curve shifts and therefore a new level of international diversification is set, the revenue growth decrease, originating problems of survival and viability in the case of SMEs.

A crucial assumption in all these models is that firms operate under resource constraints and set their product diversification *a-priori.* This does not represent an unreal assumption, since SMEs are often subject to resource shortage in terms of human and managerial capital (Hollenstein, 2005), and to financial and liquidity constraints (Ughetto, 2008).

Clearly these considerations hold when firms optimize their choices related with product diversification and international diversification with the objective of growing. We acknowledge that firms may alternate periods where their objective is to grow, with other periods where their objective is to profit from the investments into growth. In general, the process of optimization of international diversification and product diversification is likely to be dynamic over the lifecycle of the firm. For example, it is not unusual to see firms moving away from less profitable foreign markets or to reduce their product portfolio with the aim of increase their profits (Seifert et al., 2016). In general, in the short term there is a weak link between revenue generation and profits of firms, suggesting

that increases in growth will not have - in this temporary window - an effect on profitability and viceversa (Roper, 1999) and, thus, implying that firms should alternate periods of growth with periods of profits. For this reason, we believe age to be a key factor in studying the relationship between product and international diversification on firm growth. In fact, it is more likely that when firms are young (and small) their main objective is to pursue growth, while when they age and become older, their main objective shifts from growth to profits. In this vein, we expect that the relation presented in Figure 2.2 and discussed in this chapter may hold for younger firms rather than for older firms.[ix]

All in all, the considerations above provide us mainly two insights. First, literature has provided mixed evidence about the relationship between product and international diversification due to the adoption of different theoretical frameworks which allowed for the consideration of different outcomes and assumptions. Second, in the case of SMEs, although increasing product diversification could be prone to increase profits, it could have a negative consequence on the strive of the firm to obtain viability, which, in turns, may lower revenues growth and undermine survival. One way to escape from this situation (and therefore pursue superior revenue growth and superior profits), could be for SMEs to find a way to relax the constraints they have in resource allocation. In this vein, we will discuss in the next two sections the ambidextrous strategies SMEs could rely to deal with product and market diversification, as well the role that experience could have in balancing both activities.

2.6 How to balance product-market diversification in the context of SMEs.

Managing contemporary product-market differentiation (i.e. innovation and internationalization) is not trivial for SMEs. As previewed in the introduction and in the last section, their combination is likely to generate tensions limiting firms' performance. This problem arises from the fact that product and market diversification entails at the same time to invest resources and capabilities owned by firms in exploration and the exploitation activities (March, 1991). To solve such a kind of problems, the literature has explored the strategies that firms may adopt to combine divergent activities in order to benefit in terms of performance.

Up to now, the ambidexterity literature (e.g. Raisch and Birkinshaw, 2008) has identified four models for effectively managing the tensions generated by exploration and exploitation activities. In particular it has proposed the following solutions: the temporal separation, the domain separation, the organizational separation and the contextual management. Temporal separation entails that firms should deal with the exploration-exploitation paradox continuously switching from periods of exploration to periods of exploitation periods (Lavie and Rosenkopf, 2006), in order to keep their focus on one typology of activity at a time.

The domain separation solution encourages firms to separate exploration and exploitation in different domains and to pursue exploration and exploitation activities exploiting the benefits arising from such separation (Lavie, Stettner & Tushman, 2010). The benefit of domain separation compared to other separation forms is that there is not any trade-off arising when organizations try to balance exploration and exploitation, only because the domain is divided, even if this is a less efficient method compared to others (Lin et al, 2007).

Similar to domain separation is the organizational separation solution which allows the firm to pursue contemporary exploitation goals and exploration challenges by dividing the two activities in two physically different units which do not have any communality (Thusman & O'Reilly, 1996).

The last solution advanced by literature to solve the paradox arising when exploration and exploitation activities are combined is to balance both activities. In such cases ambidextrous competences lie in managerial capabilities of balancing investments and in routines development. Such balancing is hardly reachable adopting a bottom up approach and requires to be promoted as a top down solution, which means that such strategy should arise from the management team. The management team may use its leadership to stimulate the whole internal environment in dealing with the coexistence of paradoxical activities reporting to exploration and exploitation. Thus, contextual ambidexterity finds the paradox solution by combining elements in the organization such as stretch, discipline, trust and support (Gibson & Birkinshaw, 2004), in a way that leads organizational members to move towards shared ambitions and collective identity (Ghoshal & Bartlett, 1994).

In the context of SMEs managing product-market diversification activities may not result in an easier endeavour and not each ambidextrous strategies presented above may be applicable. SMEs, in fact, are well known for their resource limitations (e.g. Kiss et al., 2017), which constraint the possibility to use financial, human, and managerial resources to deal with the two activities. In the light of ambidextrous strategies, therefore, separation solutions (i.e. structural, temporal or domain) seem to be rather inapplicable in solving the paradox between innovation and internationalization. Structural separation, in fact, requires SMEs to manage exploratory and exploitative projects in different business units or places which are not in touch one with the other (Jansen et al., 2009). For instance, firms adopting such strategies are well known to use different R&D teams to manage innovation endeavours directed toward radical departures from the current technologies adopted and refinements to the current set of products offered. In this case, firms are required to duplicate resources for each unit (Van Looy et al., 2005); as well they need to build a work environment which does not allow any kind of contamination between different teams. Moreover, different functional managers are required to manage each unit and ambidexterity is achieved at a higher level, where a top manager balance the exploration and exploitation endeavours. Clearly, such structure is rather difficult to be adopted in the context of SMEs for human, financial and managerial problems. More feasible approaches seem to be represented by the temporal and the domain separation, since they require fewer investments of resources and a lower risk to duplicate efforts and activities between different functional units. However, both situations have severe shortcomings which render rather inapplicable such strategies in the context of SMEs. For instance, temporal separation by alternating periods of exploration with others of exploitation may determine the loss of opportunities in the dimension not considered (O'Reilly et al., 2009). This problem is important in the context of larger firms, but becomes essential for SMEs, for which capturing a valuable opportunity in the market may make difference between survival and failure (Crick and Spence, 2005). Domain separation, instead, is a solution which could fit with the situation of SMEs but that, at the end, does not solve completely the problems arising due to the tensions. In fact, by dividing exploratory and exploitative activities in physically different domains still requires more resources to be managed and, at the same time, risks not to solve completely the tension between exploration and exploitation. For instance in the case represented by exploratory and exploitative tensions in product-market domains, SMEs may decide to divide product market functions to solve cross-domain problems, but within ambidexterity between explorative and exploitative activities belonging to

the same domain would be still required. Conversely, if product-market exploratory activities are grouped together and product-market exploitative activities are grouped together to avoid the coexistence of within tensions, firms might be subject to product-market fit problems (He and Wong, 2004).

In sum, separation strategies are very seldom appropriate for managing exploration-exploitation tensions in the context of SMEs. The more viable solution seems to be the contextual management of activities, i.e. a balance between the exploration exploitation activities which can be enabled by managers at the highest hierarchical level (Zimmerman and Birkinshaw, 2016). In this case, innovation and internationalization as both exploratory and exploitative activities should be balanced by SMEs to achieve the optimal configuration enabling them to reach consistent performance. However, as explored in this thesis this configuration might be not appropriate for SMEs since they lack managerial routines appropriate to balance such activities (i.e. the management team has a low level of behavioural integration which limits the capability to balance such activities; Simsek, 2009) but also the proper managerial capabilities are scarce since the ownership of SMEs (especially in countries similar to Italy) is familiar, which typically have low level management practices (Bugamelli et al., 2011; Bloom & Van Reenen, 2007).

2.6 The role of experience in balancing product-market diversification

The trade-off SMEs are subject to when they combine international and product diversification may be mitigated by prior experience in one of the two activities (Kumar, 2009). Both the resource-based view (RBV; Barney, 1991) and the transaction-costs theory (TCE; Williamson, 1975) can provide fundamental basis to sustain this idea. First, RBV proposes that firms diversifying into new product markets can leverage resources and capabilities across multiple markets (e.g. Penrose, 1959; Geringer et al., 2000). Second, TCE argues that resource allocation can be improved by firms through the exploitation of internal capital markets (Williamson, 1975). These arguments point in favour of interdependence between product and international diversification, but also to the need of a balance between the factors that favours the exploitation of resources across established product-market boundaries and those limiting opportunities (Kumar, 2009).

Previous literature (e.g. Zhou, 2011) has questioned the benefit of increasing both market and product diversification since they entail greater complexity and coordination cost. These marginal coordination costs are likely to be substantially higher than the marginal synergic benefits, and empirical studies in the US context have demonstrated this (Kumar, 2009). Coordination costs may arise due to several reasons. First, knowledge is hardly transferable and firms, especially SMEs, are characterized by bounded rationality (Cohen and Levinthal, 1990) and managerial resource constraints which reduce their absorptive capacity (Zahra and George, 2002) and their capability to be engaged in further international and product diversification (Vermulen and Barkema, 2002). Second, knowledge is characterized by causal ambiguity (Rivkin, 2001) which limits the fungibility of resources in new contexts. All in all, this makes though for SMEs to pursuit strategies encompassing both international and product diversification.

However, prior experience on strategic behaviour (Arrow, 1962) has been widely recognised as central to the development of organizational capabilities which, in turn, may enable SMEs to leverage resources in new settings (as new product-markets). Quian et al. (2011) found, for instance, that firms can leverage prior experience in addressing new markets since it gives a survival advantage. In general, research has established that firms are used to benefit not only from specific experience in the same domain, but also from experience in different domains (Xia et al., 2009). Firms who had experienced product diversification, for instance, have been found more able to develop managerial capabilities which sustain the development of further units in countries abroad (Hitt et al., 1997).

According to Mayer, Stadler and Hautz (2015) there are three main reasons explaining why experience in product or in market diversification can favour the integration and the growth of the other activity. First, experience in one domain enables the development of resources and capabilities which are close to those of the other domain. For instance, Collins et al. (2009) demonstrated that developing experience in acquisitions (regardless if they are international or domestic) has a direct impact on further international acquisition. Although the challenges a firm has to face in a challenge in one domain are expected to be not identical from the same challenge it may receive from the other domain, it is likely they will be sufficiently similar, to benefit from their experience in the other domain (e.g. working by analogy; Gavetti et al., 2005). Second, gaining experience in managing multi-markets in international contexts (e.g. addressing multiple foreign countries) or in managing product portfolios composed by different products allows the development of allocation capabilities which enable a proper internal

resource allocation between products. This enables the reduction of resources' waste and lowers governance costs related to managing different tasks on different domains. Third, greater experience in diversification (at least across one domain) is likely to increase the managerial capabilities (Kor and Leblebici, 2005). The ability of managers to coordinate and manage contemporary activities on different domains, shifting continuously from a setting to another (e.g. from the market to the product) is likely to increase as far as the managers have similar experience in coordinating similar institutions.

In sum, previous experience of the firm (or of its managers) in product and international diversification can significantly influence in a positive way further diversification activities.

2.7 Conclusion

This chapter has provided a background for the exploration of the relationship between internationalization and innovation activities. From a theoretical standpoint, this relationship can be traced back to the strategic decision of firms to adopt a diversification strategy related to both the product domain and the international domain. To sum up previous literature on product and international diversification, we may conclude that such activities may originate different evidence according to the several specific factors and contingencies (Ahuja and Novelli, 2016), but they positively contribute in sustaining firm performance.

We then turned out to explore the relationship existing between product diversification and international diversification. More specifically, we illustrated what means adopting a diversification strategy by showing how this topic has been tackled by Ansoff (1965). We also depicted a stylised formal model putting into relation the product diversification choice with the international diversification choice and we illustrated the implications that such choices may have for SMEs performance. Theoretically, we advanced that in the context of SMEs, where firms are resource constrained, setting a certain level of product diversification with profit maximization as objective function has negative implications for revenues growth. Although theoretical arguments would point to a negative effect on performance in terms of revenue growth we theoretically

identified learning and previous experience as possible firm level factor that can shape the relationship between international and product diversification, an argument which we explore in detail in Chapter 5.

In sum, based on the evidence above we may expect both internationalization and innovation to be two kinds of activities which contribute to the performance growth of SMEs, but that, if balanced, would put forward problems and issues for business sustainability and survival. In the next chapter we will turn to explore in detail the relevant literature dealing with a specific theme of diversification - namely the one entailing innovation, internationalization and their relationship with SME performance - to present the gaps in literature and the missing points that are required to be explored by research in order to depict a nuanced relationship between innovation, internationalization and growth in the context of SMEs.

Chapter 3

Literature review and research question

3.1 Introduction

The increasing competitive forces which are nowadays shrinking SME growth and performance emphasize the importance of export and innovation for SMEs competitiveness (Harris and Moffat, 2011). More and more firms have to face pressures imposed by the globalization and the emergence of global value chains (Mudambi, 2008), but also threats of competition imposed by shorter product life-cycle or by new ventures entering markets. In this vein, the capability of SMEs to excel into innovation and internationalization activities is gaining momentum in the agenda of scholars, practitioners and policy makers (Love and Roper, 2015). The crucial dilemma affecting all these stakeholders is related with the complementarity existing between innovation activities, internationalization and firm performance (growth in particular for SMEs). Although much SMEs literature has pointed toward the existence of a strong relationship between export, innovation and growth (e.g. Golovko and Valentini, 2011), more and more scholars are trying to question such relationship addressing the combination of such activities as problematic for SMEs, since managers have to allocate properly scarce resources. Indeed innovating and exporting are two activities which bring a number of benefits for SME performance (Becchetti and Trovato, 2002). Such benefits can be recapped as knowledge augmenting benefits (e.g. superior market and product knowledge) and operational performance augmenting benefits (e.g.

superior productivity). However, export and innovation entail also significant costs and organizational problems for SMEs (Stinthcombe and March, 1965).

The aim of this chapter is to review the literature on this topic. Although the researches explicitly addressing the internationalization-innovation-performance link in SMEs are relatively few, a large number of researchers have explored the causal links and the mechanisms between innovation, internationalization and performance in search of a source of explanation for their interplay. In this chapter – therefore- we present such elements as it follows. First, we explore the relationship between the internal and external enablers of SME performance to provide evidence of the fact that innovation and internationalization are only two of many elements which may shape SME performance. More specifically, such section allows the understanding of the constellation of elements which concurrently contribute in shaping SME performance and, more importantly, it provides evidence of the multiple interdependences among these elements. The relevant issue emerging from this section is that, although we believe the innovation-internationalization-performance link as very relevant for SMEs - such relationship should be always contextualized to some boundary conditions, and empirical studies addressing it should carefully consider a number of controls in testing this relationship.

Second, we move to explore the specific relationship between innovation, internationalization and growth. In doing this we try to follow the same path that literature historically had. Therefore, we explore - as first step – the relationship between innovation and growth. Then, we move to investigate the relationship between internationalization and growth. Lastly, we present the more recent evidence on the interplay between innovation and internationalization, providing evidence of the causal relationships among these activities. To preview the results, we show that literature has converged toward a common view about the direct effect of innovation and internationalization as isolated activities influencing SME growth. More specifically, literature agrees on the positive contribution of such activities for growth, especially in the context of SMEs. However, such agreement is not unanimous if we consider the literature related to the analysis of the contemporary interplay between innovation, internationalization and growth. We show therefore that - given this not unanimous view - there is room for the analysis of such phenomenon to further dig into the black-box of the innovation-internationalization-performance link.

Before assessing the evidence on the innovation-internationalization-performance link it is worth to clarify that this review is not intended to fully cover the whole literature pertaining to such topics, rather it aims to make clearly emerge the complexity of the relationship between innovation-internationalization-performance among the constellation of activities and factors influencing SME activity[x]. Before turning to the review, we believe worth of clarification what we mean by "innovation", "internationalization, and how such terms are used in this section and in this thesis. The perspective of this chapter is deliberately broad and addresses the term "innovation" by embracing both incremental and radical dimension of product innovative activities. Where not specified differently- therefore – innovation pertains to new radical or incremental products. Being here addressing the issue related with the innovation-internationalization-performance link in the context of SMEs, when we refer to "internationalization" we use this word as synonym of "export" (which is intended as "outward international trade in goods and/or services, conducted either directly or through a third party" – Love and Roper, 2015, p.29). This is because export is the most common activity for internationalization since they hardly relate to foreign direct investments (FDIs) to sell their products abroad (EU, 2010; Johanson and Vahlne, 1977).

3.2 Drivers of SMEs growth

SMEs heterogeneity in performance – and in particular in growth - is a well-known phenomenon (e.g. Caves, 1998) which can be explained by several factors (Ipinnaiye et al., 2017) pertaining to elements under the control of the firm (i.e. internal factors) or out of their control (i.e. external factors). Among the internal factors there are firm-specific characteristics (e.g. structural) and firm strategic characteristics (e.g. entrepreneurial, strategic). This view is in line with famous theories, as the evolutionary theory of the firm and the resource-based view of the firm, which have addressed performance heterogeneity of SMEs explaining them through different levels of resources and capabilities among firms; through the way they are allocated among different business activities; and through the way they are used and exploited to respond to changes in the business environment and in the tentative to pursue competitive advantage with respect to other firms (Nelson and Winter, 1982; Lockett et al., 2009).

However, there are also other factors which may explain growth heterogeneity among firms. Macroeconomic conditions, for instance, may have a direct impact on SMEs performance, but may also influence the internal drivers of firm growth by modifying the way managers decide to allocate resources among activities (Ipinnaiye et al., 2017). Thus, macroeconomic conditions may be responsible of strategies adopted by the firm, of their particular impact on the output and on the way the firm evolves (e.g. influencing its characteristics, as size). More specifically, the external factors explaining SMEs heterogeneity in growth can be represented by macroeconomic conditions and by the external environment of firm (e.g. competition, munificence and dynamism). This situation is depicted in Figure 2.1 which synthetizes the internal and external drivers of firm growth as well as the existing relationships between them.

3.2.1 Internal drivers of firm growth

The way SMEs undertake strategic actions, the chronological moment and the resources they commit are all relevant choices to determine future growth. Firm performance, for instance, have been explained by previous research by factors as firm size, the initial level of productivity or the age of the company (Delmar and Wennberg, 2010; Coad et al., 2013). These variables are related with firm's initial quality level and seek to explain firm performance on the initial level of resources and capabilities held by firms. For instance, Coad et al., (2013) found that as the firm ages it has higher productivity. This turns out in superior profits, since the firm is more able to convert sales growth into profits and productivity, although it has – on average – lower rates of expected sales growth. Among others, Daunfeldt and Elert (2013) found that firm size is inversely related to growth, while Ipinnaiye, Dineen and Lenihan (2017) highlighted that the initial level of productivity at disposal of firms is responsible of superior growth in the future, positing that firms gain knowledge of their true efficiency only after their entry into a given industry, and then they adjust their sizes accordingly.

Another internal driver of firm growth is represented by the management team which is in charge of taking strategic decision. This can be represented by the entrepreneur, the ownership or the middle-managers employed by the firm (Storey, 1994). With regard to entrepreneurial characteristics, it has been

demonstrated that previous experience of the entrepreneurs/managers (both in same/similar industries, in international contexts, in innovation departments) has a

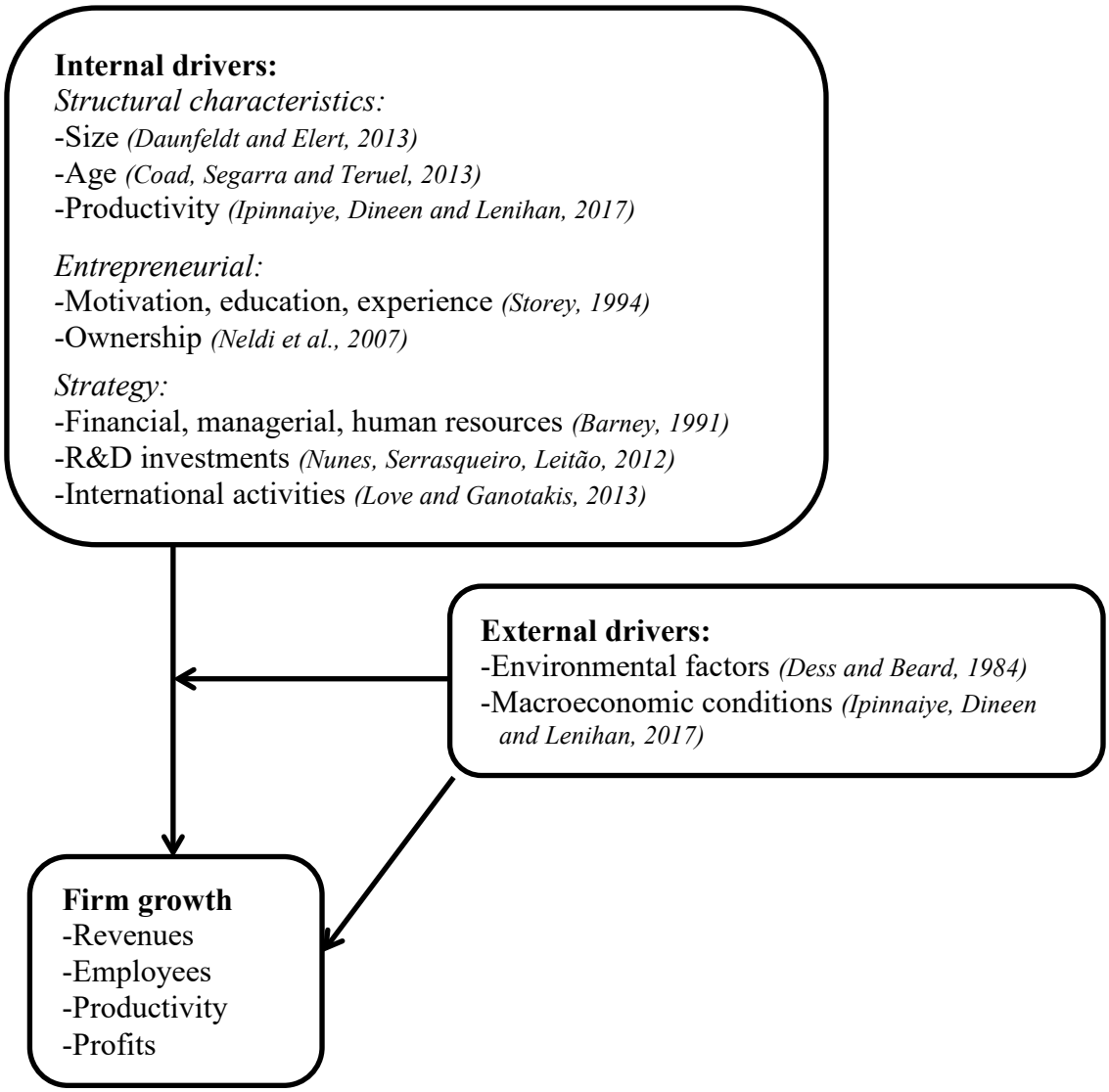


Figure 3.1: Internal and external drivers of firm growth and causal relationships between them.

positive relation with performance and, in particular, growth (Lubatkin et al., 2006). Moreover, not only the labour experience of managers is relevant for the performance of their firms, but also their education background (Soriano and Castrogiovanni, 2012; Lee and Tsang, 2001). Lee and Tsang (2001), for instance, demonstrated that firms employing managers and entrepreneurs with a superior level of education are used to grow more. However, they indicate that such effect is moderated by firm size, implying that in smaller firms such positive effect tend to vanish (and to became even negative), implying that education background of managers is not the only and main driver of firms growth.

Finally, the ownership of the firm plays also a relevant role in shaping performance. It is well known, for instance that family business are usually less risk oriented than non-family business (Naldi et al., 2007), thus preferring lower growth rates to high exposure to risky activities which may incur failure (Casillas et al., 2010)

Among the internal drivers of firm growth, previous literature has underlined not only the relevance of firm and managerial characteristics, but also of strategic variables. Investments in R&D, for instance, have been highlighted as booster for reaching superior performance in SMEs through the development of new products serving customer needs. Apart from their well-known role of favouring the introduction of new innovative products on the markets, which enable firms to gather competitive advantage and to grow in revenues and profits (Teece, 1986), they may enable firms to transform their internal capabilities (Artz et al., 2010) leading SMEs to extend the array of possible activities they can undertake and profit from.

In the last years, characterized by the phenomenon of globalization, also trade is gaining momentum as an important factor explaining SME growth. SMEs, in fact, benefit in terms of competitiveness, productivity and performance since they may learn from their export activities (Love and Ganotakis, 2013). However, the main feature of being involved in exports – for SMEs – is to gather access to global markets which, in turns, give them the possibility to extend their business to a larger customer base. Moreover, with reference to trade export is not the only responsible for SME growth. Also importing may be relevant, since they offer to firms the access to higher quality inputs (and to a wider range of them) usually at lower cost (Vogel and Wagner, 2010). This process, in turn, may lead to higher product quality and superior productivity.

3.2.2 External drivers of firm growth

Among the external drivers, we recall attention on environmental factors (Dess and Beard, 1984) and macroeconomic conditions (Ipinnaiye et al., 2017).

Clearly, industry factors as competition, munificence and dynamism may impact the way firms grow both directly and indirectly (e.g. driving strategic choices of managers). For instance, firms located in fast growing industries have been found to have superior employment and turnover growth compared to firms in low growing industries, which implies that the munificence of such industries and a lower competition level impact directly on firm growth (Delmar and Wennberg, 2010).

The high uncertainty related with firm performance is often not only in the hands of managers, but may strongly depend on fluctuations and exogenous conditions which can only be partially managed by executives. A straightforward example of such conditions is represented by the effect that macroeconomic events may have on firm performance. A period of recession (as the one in place during the recent crisis of 2008) or of recovery (the immediate following period, e.g. from 2012 onwards) may represent an external shock influencing the price of inputs, outputs levels, customer demand and the availability of resources, in particular of credit.

The literature on the influence of macroeconomic conditions on firm performance is dispersed (e.g. Coad and Rao 2008; Navaretti et al., 2014). Some authors, as Holly et al., (2013), have examined the relationship between gross domestic product (GDP) growth and sales growth rates, finding that responsiveness of firms to macroeconomic shocks is higher for firms experiencing lower growth rates, but only few have studied the way macroeconomic factors impact both directly and indirectly (e.g. shaping strategic decisions or changing firm characteristics) on growth. For instance, national competitiveness and the availability of credit are of crucial importance for SME growth, but also on how resources are allocated, and in particular on the specific tasks they are allocated. This importance can be easily understood by recalling Ansoff's growth strategies presented in Chapter 2. If the national competitiveness is very low it will be probable that the firm will pursue a product development strategy on the domestic market to reach growth rather than exploring new markets abroad. At the same time, if the national credit system is not well developed in the country – due to the credit constraints of SMEs – it will be difficult for firms to finance investments

aimed at growth through contemporary product development and market development strategies (i.e. diversification).

Although internal and external drivers of growth are of crucial relevance for firms, only internal drivers are of key interest for managers. In fact, firms – and especially SMEs - can be assumed as passive takers in the short-medium term with respect to external factors influencing their performance. This implies that such firms are not able to shape the external environment in order to influence it according to their necessity, but have to passively take the effect, trying to modify their decisions in order to achieve the business objective (growth in this case)[xi]. Despite this shortcoming, a key relevant point for SMEs is that the optimal level of individual activities (e.g. R&D investments) may depend on the level (and configuration) of other activities (e.g. exports), thus implying that the benefit is contextual (Porter and Siggelkow, 2008). The fact that exports and R&D /innovation are not generic and imitable activities that each firm can standardize through a routine (Helfat and Winter, 2011), implies that firms may leverage their configuration to implement an effective strategy able to provide them a competitive advantage (Porter and Siggelkow, 2008).[xii]

This idea is at the basis of the relevance that strategy has in firms. Through their strategic decisions, firms may decide how to modify internal drivers in order to achieve business growth. In particular, the focus of this thesis is on studying two specific internal drivers, namely R&D investments (and innovation) and internationalization.

3.3 The link between R&D investments, innovation and performance in SMEs

Firms in advanced economies are more and more facing global competition. To remain profitable and to compete with other firms in emerging markets, which may exploit local advantages, as low labour costs, firms must continuously strive in order to improve their productivity performance. One of the key ways of achieving this result is through innovation. Innovating represents the most promising, albeit risky, path to increase productivity and to gain sustainable competitive advantage in response to the competition imposed by other players

(Griffith et al., 2004). Grilches (1979) studied the knowledge production function linking investments in R&D with the stock of knowledge of the firm. In detail, he argued that investments in R&D are responsible for the increase of the stock of knowledge in a firm which, through innovation, improves firm's output through higher productivity. However, R&D investments do not lead only to superior knowledge and innovation, but also bear the risk that firms fail in their effort to realize superior and positive returns.

The link between R&D activities, innovation and productivity growth has been studied by a large stream of literature. In particular, a positive and significant relationship between R&D and innovation has been largely demonstrated. For instance, the seminal paper by Pakes and Grilliches (1984) has demonstrated that R&D expenditures and patent applications (used as proxy of innovation) are significantly correlated among US firms. In the European context, many studies have corroborated this result, in particular thanks to the exploitation of the Community Innovation Survey (CIS) which provided detailed firm-level data about innovation through a standardized and systematic collection. In detail, Crepon et al. (1998) clarified in their study that firm's performance (productivity) is influenced by the innovation output rather than by the input. This compelling result has been proved to hold across different contexts (e.g. see Lööf and Heshmati (2002) for Sweden, Janz et al. (2004) for Germany and Sweden, Griffith et al. (2006) for Germany, Spain, the UK and France, Parisi et al. (2006), and Conte and Vivarelli (2014) for Italy; Hall et al. (2009) for Italian SMEs, García-Quevedo et al. (2014) and Criscuolo (2009) for a comparison among 18 OECD countries). These results point to the fact that being an innovator is surely associated with the R&D intensity of the firm, but that there may exist some exceptions of firms investing in R&D and failing to bring innovation to the market (pointing to R&D as an intrinsically risky activity) and that, sometimes, also firms not engaged in R&D activities may bring new innovation to the market. This latter points may be linked to the Open Innovation (OI) paradigm (Chesbrough, 2006), which argues that the market for technologies is not limited to firms' domain but is open to external players, so that innovative projects may come from outside firm's boundaries or may span them to be sold to third parties instead of being implemented by the firm.

Despite the results of Crepon and colleagues – however – R&D investments of firms is still considered one of the most important drivers for firm innovativeness (Hall, 2011). Peters et al. (2013) quantified the payoff of R&D investments in manufacturing firms operating in Germany. They estimated that

R&D investments increase significantly the probability of a product innovation and that past R&D investments are strong predictors of current R&D investments for medium and high-tech firms, pointing to a sort of path dependency of R&D activities, at least in terms of investments. Moreover, focusing on SMEs, Hall et al. (2009) reported that R&D intensity has a strong effect on the ability of carrying out product innovations, and that carrying out product innovation has a direct impact on SMEs performance, in particular productivity.

In sum, R&D activities are strongly linked to innovation performance (e.g. Becheikh et al., 2006; De Jong and Vermeulen, 200; Cohen and Levinthal 1989) and are indirectly linked to performance. Therefore, this implies that such activity is a key lever for SMEs managers in order to set their strategy. Firms must decide the amount of resources to commit to R&D activities in order to reach the innovativeness they think could help them to survive to competitors, gather further market shares and achieve superior profits with respect to competitors.

3.4 The link between internationalization and performance in SMEs

Internationalization represents for firms a process of development and growth which goes beyond the mere link with performance. Internationalizing, in fact, by involving the development of supply and market activities across domestic borders (Jones, 1999) represents a phenomenon of physical growth in the sense that it encompasses "an increase in size or an improvement in quality as a result of a process of development" (Penrose, 1959, p.1.). For this reason, although early research largely accounted for the internationalization-performance link in large enterprises (e.g. Dunning, 1988), recent literature is more and more paying attention to the link between internationalization and performance in SMEs.

The first element worth of attention is related with the performance measures related with internationalization. In the context of SMEs, performances affected by international activities are mainly two, namely growth (Davidsson et al., 2010) and productivity (Helpman et al., 2004). This is because for SMEs extending their business abroad consists usually of exporting their products in new countries. Therefore, they are less likely to increase their profitability since they can hardly

exploit local sources of cost advantage (as labour) which could be responsible of an increase in their margins. Conversely, operating abroad allow them to increase the volume of their sales as well as to gain knowledge and technological spill overs which can be exploited in the development of their product (therefore enhancing productivity).

Apart from the link between internationalization and the different type of performance, literature has concentrated in uncovering the factors driving or limiting internationalization of SMEs. In particular, great attention has been given to the characteristics of firm's ownership and management teams (e.g. Andersson and Wictor, 2003), of foreign and domestic environments (e.g. Karagozoglu and Lindell, 1998) or of the firm itself. Particular importance is gaining the research on inter-firm networks, which has demonstrated that networking can limit some liabilities associated with small firms facing the explosion of growth opportunities overseas through the reconfiguration of organizations and capabilities or that, more simply being involved in a network allow SMEs to identify more easily business opportunities abroad (Dana, 2001). More specifically, several studies addressed the direct relationship existing between international activities and SME growth. Yli-Renko et al. (2001) – for instance - studied the relationship existing between knowledge acquired from intra- and inter-organizational relationships and internationalization. They found out that such knowledge is a key driver of international growth in the context of technology based new ventures which, in turns, enables the growth of sales. Others (e.g. Zahra et al., 2000) showed that the acquisition and integration of technological knowledge from international activities has a positive impact, boosting firm growth. More specifically, such knowledge has a double positive effect. On one side, in fact, it enables the development of new entrepreneurial actions in new markets abroad (therefore favouring further internationalization). On the other, it allows firms to reach a broader array of customers abroad through the new knowledge which can be embedded into the new products used to penetrate the markets (Naldi, 2008).

The effect presented above is responsible not only of sales growth but may be linked also with increases in productivity brought by internationalization. Entering into international activities has a fixed cost which creates an entry-barrier for SMEs. Firms have to engage into market research, set up new supply-chains and negotiate with multiple stakeholders (as customers, partners and distributors) which can incur further expenses. Therefore firms operating in international markets are usually more productive firms (Helpman et al., 2004) self-selecting themselves into international activities. However, even international operations

have a positive effect on productivity allowing its growth (Ganotakis and Love, 2010). This may happen mainly for three reasons. First, stronger competition in foreign markets forces firms to improve processes and products to face pressures of other firms. Second, as anticipated before, firms may learn new process techniques which may - in turn - improve efficiency and productivity, especially when international operations are coupled with R&D activities or labour training (Aw et al., 2007). Third, economies of scale may favour productivity gains since fixed costs (as equipment, R&D investments etc.) may be recouped over a larger production (increased thanks to the international operations).

In sum, the literature has underlined two main contributions of international operations to SMEs performance. Specifically, internationalization enables superior productivity (Eliasson et al., 2012) and superior sales growth (Lu and Beamish, 2006). Although the focus of literature has been on such elements, there are still other features which deserve to be uncovered with relation to the internationalization-performance link. For instance, recently Esteve-Perez et al. (2008) advanced another positive gain that SMEs may have from engaging into international operations specifically, they showed that firms engaged into international markets have superior likelihood of survival than their non-internationalized counterparts.

3.5 The interplay between internationalization and innovation

In the previous paragraphs we have described the direct and indirect relationship existing between internationalization activities (in particular exports), innovation activities (in particular R&D activities) and SME performance. Although such activities can be considered in isolation (i.e. they can analysed singularly, without taking into account the effect of the other), they are very likely to be undertaken contemporary by firms, in particular by SMEs which face problems related to limited domestic niches to serve (and therefore seek for new market niches abroad) and to competition from larger players which pushes them to continuously innovate.

According to a study published by the EC (2015) over 26% of internationally active SMEs in Europe, introduced new and innovative products or service, while if non internationally active firms are considered this percentage drops to 8%.

Before turning to the interplay between internationalization, innovation and performance, however it is useful to pay attention on the direct link existing between innovation and internationalization activities.

Innovation and internationalization activities have been demonstrated by previous literature to be reciprocally linked and to cause each other. According to the seminal works of Vernon (1966, 1979) the internationalization process of products and firms moves from product innovations developed for the domestic market, to exports and finally to foreign direct investments. This chain, according to Vernon, holds especially for SMEs rather than for multinationals.

The chain represented by Vernon is very straightforward: firms develop innovations exploring and using resources and opportunities located in their local market. Then, they start to export in similar product markets as soon as they see that there is the opportunity to exploit the innovation in the foreign country[xiii].

According to this view, SMEs holding product innovations are likely to export not only to seek new opportunities for sales growth, but also to exploit their market power thanks to the superior technology held by them (Hirsch and Bijaoui, 1985, Hitt et al., 1997). Moreover, by investing more money in preparation to enter foreign markets, allow the firm to increase the product market fit, since it enables superior adaptation of the product to local tastes and new market preferences (Zahara and Covin, 1994). In this vein, innovation (and particularly product innovation) is responsible for an increase of the potential benefits from export activities. This, in turns, makes export activities more attractive for SMEs already pursuing innovation activities (Golovko and Valentini, 2011).

Innovation and internationalization activities are strictly linked also because developing new innovation may enhance firm productivity, explaining the self-selection of more productive firms into export (Cassiman and Golovko, 2011). More specifically, innovation may decrease the cost of export since the product may reach a quality and attraction level which does not entail further expenditures to adapt the product to the foreign market tastes (or firm production process) before the product is sold. Moreover, innovation may also increase productivity of firms, pushing them to exploit their superior performance in foreign markets.

Several empirical studies have supported the view that innovation activity plays a key role in explaining export behaviour (e.g. Basile (2001); Becker and Egger (2013); Bernard and Jensen (2004); Cassiman et al., (2010); Roper and Love (2002)). This stream of research focused its attention on the type of innovation leading firms to be more willing to export (i.e. product vs. process innovation). The seminal study of Bernard and Jensen (2004) – for instance - provided evidence about a higher probability of being involved into export activities of firms developing product innovations. At the same results arrived also Becker and Egger (2013) studying a sample of German firms. Cassiman and Martinez-Ros (2007) demonstrated that product innovation positively affects the decision of a firm to export, but not process innovation. Finally, the willingness of firms to be engaged into export activities has been proved to be linked also to productivity level. In this vein, Cassiman and Golovko (2011) demonstrated that successful product innovation enhances firm productivity, increasing the likelihood of firms to enter into exports.

The huge amount of literature on the link between innovation and export has also explored and studied an inverse mechanism linking export and innovation. Specifically, studies in this research area have labelled this effect as "learning-by-exporting" and emphasize potential learning outcomes associated with exports that may have a positive consequence on innovation performance. For instance, Salomon and Shaver (2005) have demonstrated that new technologies or further information related with new products acquired abroad are likely to be captured and converted into innovation output.

The positive effect of exports on innovation can be explained through two mechanisms, namely more intense competition in foreign markets which stimulates innovation; and knowledge spill overs due to collaboration with foreign partners (buyers and suppliers) having a superior technological level. This latter, in particular, allows firm to be in touch with new knowledge not available in their home country and to transfer it back home to be used for carrying out product innovations.

This learning-by-exporting have been confirmed by several studies in literature. For instance, Alvarez and Robertson (2004) show a positive link between exporting and the probability of carrying out new product innovations. Filipescu et al., (2013), using a sample of Spanish firms, show a positive effect on the number of product innovations and on the likelihood of introducing process

innovation. Analogously, Criscuolo et al., (2010) arrive at the same conclusion using a sample of UK firms. Conversely, Girma et al., (2008) demonstrate that the learning-by-exporting mechanism is limited to R&D activities and that there is not a strong direct link with product innovation. Consistently, MacGarvie (2006) arrived to an analogous result in the context of French firms. Findings show a transfer mechanism of knowledge (proxied using patent citations) is not significantly different between firms exporting and not exporting. More specifically, this research show that exporters are not likely to increase their number of patent citations compared with non-exporting firms, a result that implies that the learning-by-exporting mechanism is not in place.

3.6 Research gap: the effect of balancing internationalization and innovation on SMEs growth

The link between innovation, internationalization and performance is not new to literature. This topic has been studied under a multitude of perspectives. In particular, there are typically two ways of looking at this topic. On one side, innovation, exports and growth may be seen as a problem of complementarity/substitution (e.g. Golovko and Valentini, 2011) which concur to reinforce or diminish firm growth. On the other side, it may be analysed as a strategic decision which relies to the strategic choice of pursuing product and market diversification (Ansoff, 1967). Although these two lines of thought may seem unrelated, they finally belong to the same research question and, in particular, they try to answer to the quest of firms about indications on how to grow.

A substantial body of evidences has been advanced in both the economic and the management literature, but without achieving a unanimous position. Specifically focusing on SMEs, one of the largest studies has been carried out by the European Commission (2010). In the survey they proposed to 9480 SMEs in 33 European countries they found a strong and positive link between innovation and export, but unfortunately they did not investigated the nature of this relationship.

Between academics, however, there are mainly two contended positions that scholars have held. On one side, some scholars argue in favour of a complementarity between innovation and internationalization activities (e.g. Golovko and Valentini, 2011), while on the other some others point to a

substitutability (e.g. Kumar, 2009; Booltink and Saka-Helmhout, 2018). One of the most relevant research linking innovation, export and firm growth is the one of Golovko and Valentini (2011). Using a sample of manufacturing Spanish SMEs over a time span of 10 years, they demonstrated that innovation and internationalization are complementary to SME sales growth, underlining - therefore - that achieving superior performance cannot be limited to perform only one of the two activities (i.e. export or innovation), but only firms contemporary engaged in both activities can achieve superior sales growth. These results are also confirmed by several other studies in the economic literature, and in the management field. For instance, Love et al., (2010) reported a complementarity between innovation and export for firm performance by analysing firms operating in the service-sector. A similar result has been reached also by Cassiman et al., (2010) which demonstrated the link existing between innovation, export and firm performance (specifically productivity). However, in their research they showed that previous (past) product innovation is responsible for a weakening of the link between export and productivity.

On the other side, an opposite position is held by some scholars contending that innovation and export are substitute activities which limit firm growth. For instance, in a study on a sample of U.S. firms, Kumar (2009) has advanced that several firm level factors are responsible of a negative relationship between product diversification and market diversification. The underlying idea in Kumar's work is that the ability to exploit product and international diversification opportunities is bounded to the transferability of knowledge and absorptive capacity, which is usually scarce in SMEs. Several other factors limit the appropriability of returns due to international and product diversification. Among them the most relevant are represented by causal ambiguity (Rivkin, 2001; Martin and Salomon, 2003) which limits the possibility to leverage and exploit resources and capabilities in new contexts; bounded rationality (Zahra and George, 2002) and managerial constraints (Penrose, 1959) which reduce the absorptive capacity of a firm and therefore the possibility to extract rents from both the dimensions (product and market diversification) contemporary; managerial complexity, which grows with the intensification of activities on both the product and the market domain and makes more likely that marginal costs of coordination will overcome the marginal gains due to superior diversification (Zhou, 2011). All these elements point toward a relationship of substitutability

between innovation and internationalization which – in turns – limits performance.

Due to the discrepancy in the positions evidenced above, this thesis aims to fill this gap by reconciling similar strands of literature arriving at different conclusions. Such misalignment might be originated by at least two problems (Porter and Siggelkow, 2008). First, the relationship between internationalization and innovation might not be limited only at those two activities. The aforementioned studies just incorporated a limited number of complements and substitutes (namely proxing innovation and internationalization). However, both innovation and internationalization might be complements or substitutes to a third activity which renders complementary or substitutive the interaction between internationalization and innovation. This implies that it is crucial to identify the eventual role played by other activities in shaping this interaction.

Second, the complementarity/substitution between internationalization and innovation might hold only under certain exogenous conditions and may not pertain to the whole universe of firms belonging to a certain industry or country. This implies that external conditions should be carefully taken under consideration when dealing with innovation and internationalization activities to understand the contextual factors operating.

For these reasons, this thesis aims to answer to the following research questions:

- *Are innovation and internationalization complementary activities for SMEs?*
- *Under which conditions are they?*

Chapter 4

The role of R&D investments and exports on SME growth: a domain ambidexterity perspective

Premise

As remarked in the previous chapters, international sales are critical for the prosperity of Small and Medium Enterprises (SMEs), because of the limited size of their domestic market, but they can be difficult to attain for a number of reasons. Therefore in this chapter we investigate this topic using a domain ambidexterity framework to analyse *if* the relationship between R&D investments and export initiatives generates managerial tensions in firms operating in high and medium technology industries. In this chapter, we theoretically claim that R&D investments and internationalization can be conflicting objectives that entail a diversity of routines and managerial approaches limiting growth. This aspect is critical, especially when SMEs are in the early stages of their life cycle and are resource-constrained.

This issue is tested using multiple regressions on data collected through a survey that was conducted in 2014. The sample is composed of 221 SMEs operating in Italy in high and medium technology industries.

Our estimates show that combining contemporary high R&D investments and high export activities negatively affects the growth of revenues of SMEs. In detail, when exports over revenue are below 10%, R&D investments have a positive effect on revenue growth, whereas when exports over revenue are above 50%, the effect of R&D investments on revenue growth is negative. However, age acts as a moderator on this relationship, thus implying that the effect of combining these initiatives varies according to the lifecycle of a firm. In particular, combining R&D investments and export generates tensions that limit the growth of revenues in young SMEs (less than 10 years old). For firms aged between 10 and 25 years, the effect is positive, while the effect is positive but not statistically significant for mature firms (older than 25 years). These results demonstrate that the diversity of the organizational maturity in SMEs has an impact on their ability to combine activities that require different capabilities (technological vs. market).

This chapter offers a theoretical contribution to the literature on domain ambidexterity, as it shows that combining contemporary innovation-related activities with international activities may constrain the performance of SMEs, according to the age of the firm. It extends the theoretical framework of domain ambidexterity to international studies and it reconciles previous mixed evidence about the combination of innovation and internationalization activities of SME's.

4.1 Introduction

International sales play a crucial role in Small and Medium Enterprises (SMEs) engaged in Research and Developments (R&D) programmes, especially when these firms operate on small domestic markets with a limited growth potential. This may be a common situation for SMEs operating in market niches in many European countries. Only a few business customers characterize the domestic market of SME's positioned in the upstream stages of value chains, and foreign customers represent an avenue of growth, but also pose new challenges for their product innovation programmes, given the diversity of the requirements of their markets and institutional environments (e.g. laws, norms and technical standards). Because of this necessity, internationalization can require changes in the competency base of SME's in both the technological and market domains (e.g., Branstetter, 2006; Golovko and Valentini, 2011).

Despite the benefits of international markets for firms involved in innovation, a contemporary engagement in innovation and internationalization may not have any positive effect on the growth of SMEs, due to their financial capital and managerial attention constraints (e.g. Filipescu et al., 2013; Kumar 2009), their tendency to centralize decision-making processes (Macri et al. 2002) and the lack of effective coordination between the sales, marketing and product development functions (Palmiè et al., 2016). For these reasons, exploration in both the market and the product domains can imply an overwhelming leaning process for an SME.

Irrespective of the sector, foreign sales require an intensive exploration phase aimed at finding prospective customers, analysing their needs, building relationships with local distributors and suppliers, understanding the local institutional and regulatory framework and implementing a supply chain management strategy to serve each local market. For an SME, such a market exploration may reduce the availability of the managerial and technical resources required for technological exploration and for R&D endeavours that have a long-term horizon, and can make the coordination with the technical product function too complicated, especially when this function is engaged in the exploration of new technologies or new product architectures.

In this chapter, we show that the simultaneous combination of high R&D investments and an important presence on international markets, in terms of high export intensity, has a negative effect on the growth of revenues in the short term, since R&D endeavours and exports belong to different knowledge and functional domains that SMEs cannot easily extend simultaneously. In this vein, we use a domain ambidexterity lens (Voss and Voss, 2013) to provide a theoretical contribution to the rich and consolidated literature on internationalization in SMEs. We also posit that the difficulties in reaching this domain ambidexterity may depend on the age of the SMEs, as age is associated with differences in routines and complementary assets that are relevant to an ambidexterity capability.

The empirical setting of this study is a survey on a sample of 221 high and medium technology SMEs located in North-West Italy that operate in manufacturing, software and engineering service industries. The focus on this setting is of a multi-industrial type, due to the fact that SMEs operating in manufacturing, software, engineering and R&D services face the same challenges when they try to reconcile market exploration abroad with technology exploration (Vasilchenko and Morrish, 2011). Moreover, Italian SMEs seem to be an

interesting empirical setting to analyse the tension between R&D investments and market exploration, since the majority of these companies are family businesses, without the involvement of any external managers (Bugamelli et al., 2012). This managerial structure can weaken the capabilities of SMEs to conduct effective market and technological exploration, as the diversity of managerial experience and professional background available in a firm's management team can enrich its absorptive capacities (Lubatkin et al., 2006). As such, the lack of external managers may increase the tension that arises from the contemporary combination of R&D and internationalization endeavours.

With this chapter, we contribute to the well-established literature on internationalization in SMEs in two ways. First, we advance a novel explanation of the dynamics of the growth of SMEs. While past research has demonstrated the positive contribution of innovation and internationalization activities on SME performance by analysing them in isolation (e.g. Becchetti and Trovato, 2002), we explore whether their combination can have a negative effect on revenue growth, especially when firms are young and in the entrepreneurial stage of their life cycle. Second, in order to explain the negative consequence on firm growth, due to the combination of high export and a high intensity of R&D spending, we draw on domain ambidexterity arguments, and we show that situations of exploration in both the market and the product domains are likely to be detrimental for the revenue growth of SMEs, given their typical managerial traits. Under this perspective, we extend the seminal contribution on domain ambidexterity provided by Voss and Voss (2013) to a new empirical setting that is, of high and medium technology SMEs.

4.2 Internationalization and innovation in SMEs

4.2.1 State of the art and open points

The involvement in research and development endeavours is a predictor of superior SMEs' performance (e.g. Garcia-Manjon and Romero-Merino, 2012; Leiponen, 2012), since large R&D spending is considered to be an avenue for technology exploration and for a superior product diversification ability in the medium-long term (Penrose, 1959). However, firms' economic and competitive success does not depend only on innovation but also on market access. For this

reason, international market access acquires increasing importance for SMEs, especially when they operate in small niches and have a limited domestic market (Sapienza et al., 2006).

Although the importance that innovation and internationalization activities have for SME growth, literature has begun only in the last few years to analyse their conjunct effect on performance (Love and Roper, 2015). There are several elements in favour of a complementary effect that internationalization and innovation can have on SME's growth. This complementarity finds origin in the fact that firms need to innovate in order to compete in foreign markets (Roper and Love, 2002), at least to refine their products to address foreign customers' needs. Becker and Egger (2013), for instance, show for German firms the significant role of product innovation in enhancing SME productivity which – in turns - affects export decision (Cassiman and Golovko, 2011). Moreover, an international market presence may lead to innovation as a result of a learning process which brings new knowledge into the firms and promotes the development of new innovation (Branstetter, 2006; Cassiman and Golovko, 2011; Golovko and Valentini, 2011).

However, a stream of other studies has found that the contemporary engagement of a SME in innovation and internationalization has a negative effect on performance (e.g. Booltink and Saka-Helmhout, 2018) due to constraints that small firms typically have in financial capital and managerial attention, or due to their lack of reputation (i.e. the liability of newness) to approach foreign markets with new products, whose innovativeness - compared to the state of the art - is not proved or tested due to the lack of a lead-user. Because of this reason, SMEs are unlikely to be contemporarily engaged in diversification on both the product and the market domain (e.g. Kumar, 2009). Apart from the constraints in resources and reputation, the other reason why internationalization and innovation can be hardly combined in SMEs can be related to the entrance mode in a foreign market. Specifically, SMEs are likely to use export contracts with local intermediaries, since they are the simplest and less risky way to increase market penetration abroad (Johanson and Vahlne, 1977). However, the simplicity of export usually comes at the expense of a low appropriability for foreign sales (Johanson and Vahlne, 1977), limited learning opportunities on foreign markets and loss of strategic opportunities (Neirotti and Paolucci, 2015).

The debate on whether internationalization and innovation are complementary or substitute strategic decisions for SMEs in relation to their performance can be

probably reconciled by considering the age of SMEs as a missing link. In the literature on the life cycle of organizations (Sørensen and Stuart, 2000), age is the main variable capturing the availability of the resources. The conventional wisdom (Kiss et al., 2017) proposes that SMEs may be more prone to internationalization when they have accumulated a great deal of financial resources, their domestic market have been saturated, and new revenue opportunities can only come from entering new geographical markets. However, this type of reasoning and the greater availability of financial resources that can characterize an older and established SME exclude the fact that managing the duality between internationalization and innovation can be problematic even for SMEs in more mature stages of their life cycle and with more internal resources. Moreover, the other element coming from life cycle view of the organizations suggests that the greater maturity of management approaches and of organizational models make the combination of internationalization and innovation less problematic for more established and older SMEs. Such firms usually exhibit more formalized business processes and a more decentralized decision-making structure. These considerations pave the way to the fact that under certain organizational circumstances of "ambidexterity" (Raisch et al., 2009), companies can effectively combine conflicting goals and activities within the same organizational unit. However, these points are object of limited theoretical development and empirical exploration.

To bridge this gap, the chapter uses an ambidexterity lens to analyse under which conditions of an SME's life cycle a great effort spend on internationalization and innovation can represent a conflicting activity. Our focus is on R&D spending and exports, as the two main indicators of such efforts. The next section explains why a high level of effort over these dimensions can generate tensions and resource allocation problems that are typically of interest to the ambidexterity literature.

4.2.2 Export and R&D spending as indicators of the growth tensions of SMEs

Combining the international expansion of sales with radical product innovation falls into a situation of balancing resources on conflicting objectives, which is well documented in the rich literature on ambidexterity (e.g. He and Wong, 2006). In other words, the challenge of combining an expansion of sales overseas with R&D projects aimed at internalizing new technological competencies for an SME highlights a situation of ambidexterity across different functional domains (Voss and Voss, 2013; Lavie et al., 2011): the domain of applying "new" technologies to the products of the firm through R&D projects, and the domain of marketing products in a new, unfamiliar market. Although these challenges are often intertwined in the strategic agenda of a firm, they generate tension on how to orchestrate and balance financial, technical and managerial resources in exploration on both the market domain and the product domain (Zhang et al., 2016). Situations in which firms experiment a product that embodies a new architecture and/or a new technology entail an intensive coordination - and thus geographical proximity - with a lead user along the entire innovation process (from the front-end to the validation). As such, firms conduct exploration on the product domain more easily in situations of exploitation of their established market relationships, which, for SMEs, corresponds to a prevalence of local sales on their domestic markets. In other words, product exploration projects that exploit the domestic markets of SMEs (shown in the upper-right hand quadrant in Figure 4.1) require fewer technical and managerial resources than radical innovation projects that target new markets for SMEs (upper-left quadrant).

Pursuing a high intensity of both export sales (i.e., a high ratio of exports over sales revenues) and R&D expenditures may reflect two distinct situations of tension that have to be faced by SMEs when managing the product and the market domains. The first situation is depicted in the cell [1] in Figure 4.1, i.e., developing a radically new product for a new geographical market (pure explorative strategy).

The second situation may refer to being positioned contemporarily in two cells of the quadrant: developing a radically new product for the established local market (product development strategy - cell [2A]) and exploring new geographical markets with an established product or with incremental refinements of it (market development strategy - cell [2B]).

Each of these cells depicts a situation of cross-functional ambidexterity (Voss and Voss, 2013). Whereas the first situation requires managing an R&D project that is contemporarily complex as far as the technology and the market dimensions are concerned, the contemporary positioning of a project in cells 2A and 2B indicates a situation of complexity that pertains to managing a diversified R&D project portfolio, which includes both incremental and radical innovation projects that require a diversity of managerial and cultural approaches for the coordination with customers (Gibson and Birkinshaw, 2004).

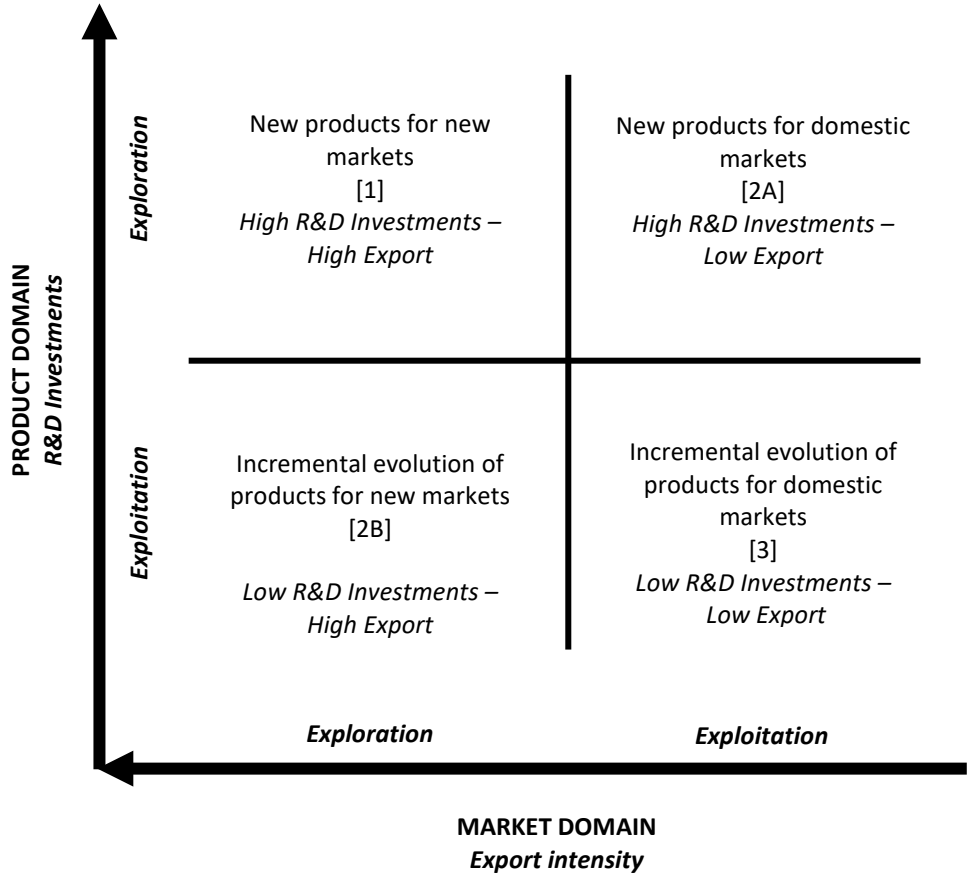


Figure 4.1: Exploration and exploitation in product and market domains

4.3 Hypotheses development

4.3.1 The tension between R&D investments and export

The contemporary exploration in the product and market domains represented in the combination of cells 2A and 2B or in the positioning of a firm in just cell 1 (Figure 4.1) is more critical in SMEs than in large firms. SMEs have a limited amount of managerial resources that can be used for the external search activities needed to explore the product and the market domains. Managers in SMEs generally spend a high percentage of their time on operational issues related to product refinement and production management, and a consequent limited time on the search and market intelligence activities that are needed for exploration (Volery et al., 2015).

SMEs with a broad market presence abroad may respond ineffectively to the need of innovation for their products, since they may have a limited ability to enact approaches of ambidexterity based on structural separation or on building contexts á la Birkinshaw and Gibson (2004), where employees are required to balance their efforts over multiple innovative projects. In this vein, separation, into distinct task forces, of the technological exploration for a new product that targets a foreign customer from the incremental innovation activities for the domestic market is not so feasible for an SME, due to the limited scale and the few resources available for the coordination between different R&D teams (Lee et al., 2001).

Contextual approaches can be sustainable, in terms of costs, since they do not entail any organizational separation of the teams that are engaged in different innovation projects. However, in a diversified R&D project portfolio situation (i.e. the contemporary position of a firm in the 2A and 2B cells), SMEs may make poor decisions on which projects they have to orchestrate their managerial attention as well as the time of their R&D and marketing teams. This occurs since the routines and systems used to prioritize and allocate efforts across different projects, such as stage-to-gate processes or agile project management in product development, are generally not common in SMEs (Hidalgo and Albors, 2008). The lack of prioritization may result in an “attention-allocation problem” (Koput, 1997) that leads firms to under-invest in each of their multiple innovation projects. In these situations, SMEs are likely to be slow in the time-to-market and in responding to customer’s requests for change, especially when customers are geographically and culturally distant. For example, a firm could be ineffective in

seizing the opportunity of revenue growth that stems from a radical product innovation on their domestic market when it is distracted by the need to introduce and market distinct incremental product refinements in order to adapt their established product to their multiple foreign markets (Chen and Nadkarni, 2016). The more markets are dynamic and competitive – such as in hi-tech sectors - the greater the risk of losing growth opportunities, due to an under-investment in R&D or marketing activities.

In short, the tension between large R&D investments and a high level of exports may manifest itself in SMEs in terms of a limited capability to seize the opportunity of revenue growth. Firms can thus fail to capitalize on the knowledge created at the front-end of their innovation projects to create new products and new lines of revenue. We thus posit what follows.

H1: The interaction between R&D investments and export intensity negatively affects the short-term revenue growth of SMEs.

4.3.2 Age and domain ambidexterity

The combination of innovation and internationalization activities and their balance in the context of SMEs is relevant for firms' growth and for their survival. However, as posited before, the balance of such activities may originate paradoxes in the context of SMEs when we take onto consideration the stage of development of the firm. For instance, with reference to innovation young firms have been proven to benefit more from proactive exploratory behaviours than older firms (Bakker and Josefy, 2018). In detail, when young firms enter new technological niches, they benefit more from pursuing innovation activities than older counterparts, but they start to get more engaged in such projects only in later stages of their life (Kotha, et al., 2011). In exploration-exploitation words, young firms typically benefit from exploratory technological projects in the early phase of their life, but they become more exploratory in later stages (Xie and O'Neill, 2014).

With regard to internationalization, the analyses on firm age revealed that it acts as moderator of performance implication of international expansion,

highlighting that that younger firms are more able to achieve higher rates of international growth rather than older firms (Carr et al., 2010; Autio et al., 2000).

These two caveats suggest that the combination of internationalization and innovation should be more inherent in young SMEs than in older. However, this potentially beneficial situation has to deal with the scarce stock of resources held by SMEs and with the resource-drain problem that such activities entail, questioning the capability of SMEs to properly balance R&D activities and exports. In his seminal work Sinthcombe (1965) put forward evidences about age dependencies in organizational death rates, advancing the idea of the "liability of newness" which claims for the structural problem of young SMEs in surviving. This concept has been further extended from survival to organizational growth (Bruderl and Shussler, 1990) and is informative about SMEs combining R&D endeavours and exports since it highlights the crucial role of their limited stock of resources and capabilities available for pursuing both activities together, and suggests that the capability to combine R&D activities and exports may vary according to SME's age.

A firm's age influences the flexibility of the routines used for market and technological exploration, its reputation and the availability of the marketing assets needed to bring product innovation onto the market, as well as the complexity of the management systems deployed to govern a diversified portfolio of innovation projects. In their seminal contribution to domain ambidexterity, Voss and Voss (2013) acknowledged the moderating role of age in influencing the relationship between ambidexterity approaches and performance. Analogously, multiple arguments have been put forward that may explain why the effect on revenue growth, due to combining high expenditures in R&D and high levels of export, may change according to an SME's age.

Young firms are more amenable to responding ineffectively to the tension generated by high export intensity and R&D intensity. This may happen in situations in which they have to manage a radical innovation project for a foreign market (positioning in cell 1) or when they have to manage, at the same time, a radical innovative project for their domestic market and some incremental product refinements abroad (contemporary position in cells 2A and 2B). In the first situation, the presence of a large customer abroad that requires radical innovation is likely to lead young firms to overlook growth options on their domestic market, as all the resources tend to be committed to the foreign customer. Moreover, as explorative innovation often needs the project times, costs and product

functionalities to be revisited, due to the higher uncertainty, young firms – given their weaker reputation - may be more vulnerable to the more intense coordination and re-bargaining that an explorative innovation project requires with a customer, especially in situations of size asymmetry and cultural and geographical distance from the counterpart. In the latter situation, the lack of formalization in the control and decision-making processes of innovation projects may lead to a poor implementation of contextual approaches to govern ambidexterity. In the words of Gibson and Birkinshaw (2004), young firms may thus have a lack of the "discipline" that is needed in the orchestration of time across multiple innovative projects. This is due to the long time and experience necessary to develop the complex management systems and processes required to foster system wide orientation toward exploration and exploitation (March, 1991). Moreover, obtaining subsequent benefits from financial performance requires an extended time frame, even after the contextual capabilities necessary for pursuing ambidexterity have been developed (Van Looy et al., 2005).

According to Voss and Voss (2013), larger and more mature firms are more likely to respond effectively to the tension triggered by domain ambidexterity, since they possess the knowledge, experience and time frame required to implement and benefit from contextual management approaches. Drawing on this insight, we may expect more mature firms to be more likely to respond effectively to the tension posed by high export intensity and high budgets spent on R&D programs. However, when age is taken into account in the case of SMEs, there can be a self-selection bias associated with older SMEs. In other words, these firms are more likely to be oriented towards and more capable of pursuing efficiency and stability - rather than business growth - otherwise they would already have become large enterprises over time. As such, older SMEs may employ more rigid and crystallized routines and may be less able to effectively conduct product and market exploration initiatives.

Following the same arguments, adolescent firms - i.e., those that have survived the initial critical years, but have not yet reached a mature phase where they feature well-established firms (Biggadike, 1979) - can exhibit the more favourable combination of contextual management systems, slack resources and flexibility in routines that is needed to pursue domain ambidexterity and which can express a high potential for revenue growth. For example, once these firms

have overcome the high pressure of cost compression and risk minimization associated with the earlier years of their life, the obtained mitigation in resource constraints allows them to hire new personnel that can then be involved in exploration. For example, the hiring of an experienced person in the managerial team or in the technical and marketing function can lead to a mechanism of "learning by grafting" (Huber, 1991), which can sustain exploration dynamics in adolescent firms.

In short, an ambidexterity capability in SMEs to combine international presence, through export activities, and exploratory R&D investments, can be more evident in firms of an intermediate age (namely that are in the adolescence phase). Thus we posit what follows:

H2: The age of SMEs moderates the negative interaction between R&D investments and export intensity on revenue growth in such a way that the negative interaction is less salient for adolescent SMEs.

4.4 Research Methodology

4.4.1 The ideal research setting

The ideal setting for studying this issue would entail to study for each firm the set of innovation projects developed in a certain year to understand each project's orientation (i.e. explorative vs. exploitative), as well as each innovation project's target market (i.e. local vs. global). This configuration of data would allow us to determine for each firm its positioning within the matrix presented in figure 4.1, as well to create a set of exclusive dummy variables tracking at the firm level such positioning. Namely, we would be able to detect if the firm is pursuing only exploratory endeavours on the product-market domain (i.e. it is positioned in the upper-left quadrant of the matrix), if it pursues contemporary product-market exploration and exploitation (i.e. it is contemporary positioned in the cells 2A and 2B), if it pursues product ambidexterity with market exploitation (contemporary positioning in cells 2A and 3), if it pursues contemporary market ambidexterity with product exploitation (contemporary positioning in cells 2B and 3), or if it pursues single strategies (i.e. is positioned in cells 2A or 2B or 3). Since our main hypothesis is that SMEs are not ambidextrous to contemporary manage

exploratory and exploitative projects on the product and market domain, we could have used such exclusive dummy variables to test the effect of the punctual configurations adopted by SMEs and, adopting 2SLS as statistical model in order to account for endogeneity problems, to clearly rule out a causal relationship between the product-market exploration-exploitation relationship on SMEs growth. Unfortunately, project data are difficult to be obtained from firms (Poh et al., 2001), especially in the case of SMEs. For this reason we rely for our analyses to the data, the proxies and the methodology explained in the next paragraphs.

4.4.2 Sample and data collection

The empirical analysis is based on a survey that was administered in June and July 2014 on high and medium tech SMEs in the Piedmont region (Italy). Over the last decade, the European Innovation Scoreboard and the Regional Innovation Scoreboard have classified the Piedmont region as being a "Strong Innovator" in relation to various measures pertaining to firms' investments in R&D and to initiatives of the local institutions to support innovation and internationalization activities. Such institutional measures involve elements of the innovation ecosystem that encompasses the collaboration attitude of local universities and research centres with firms, the role that banks and venture capitalists have in providing financial capital for R&D initiatives, and the availability of qualified managers as a result of the offer of executive managerial education programs, etc. The "Strong Innovator" category is the most common throughout European regions. Some examples of these regions are the Bremen region in Germany, the Groningen region in The Netherlands and the East and West Midlands in the United Kingdom. Thus, the results obtained in this survey are potentially generalizable to many other European areas that fall into the "Strong Innovator" category, where firms are confronted with similar innovation ecosystems and thus with comparable conditions of access to the relevant production factors (i.e. human capital with managerial or technical competencies, financial capital and knowledge) for innovation endeavours.

The firms that have been analysed all belong to medium or hi-tech industries, as defined by OECD (2009). Automotive, aerospace, telecommunication, medical instrument, machinery and pharmaceutical industries have been included in the

sample frame. Software, engineering and R&D services have also been added to these sectors, since – despite the intangible nature of what the firms in these sectors sell - their technology and market exploration dynamics are similar to those of the manufacturing sectors with high technological intensity. More specifically, internationalization in the software sector, especially in the case of a firm's positioning on B2B markets, requires the firm to be present on the foreign market in order to effectively conduct analyses of the customers' needs, to test products and to coordinate with customers in these phases. The same type of presence is needed for firms in the engineering and R&D service sectors.

As the aim of the present research was to explore the effectiveness of the ambidextrous strategies adopted by SMEs, the selection criteria were chosen in order to capture a convenient sample made up of SMEs with a certain level of expected involvement in technological and market exploration endeavours. This condition is generally rare among SMEs, as their innovation focus is usually on endeavours with just an incremental innovation nature (Oke et al., 2007; De Massis et al., 2012). Therefore, to exclude firms that are only involved in particularly incremental and exploitative technology or market expansion projects, the firms included in the population frame had to have accomplished at least one of the following tasks that denote a certain level of technology or market exploration in the three years preceding the survey: i) R&D projects funded by European, national or regional public initiatives, ii) at least one patent filled, iii) their inclusion in local incubators or science parks; iv) the inclusion in special acceleration programs sustained by the local Chamber of Commerce and dedicated to entering new foreign markets. The architecture of the survey followed the framework used in the Community Innovation Survey (CIS), which has been used in several academic studies on innovation (e.g. Laursen and Salter, 2006).

The respondents were CEOs, and they were all contacted telephonically. Two rounds of recalls were conducted to avoid non response bias. We invited 1,203 firms to participate in the survey, and we collected answers from 364 SMEs (response rate: 30.26%). The survey data were integrated with financial data from the Aida database (published by Bureau Van Dijk), which includes the financial reports of all Italian firms. We obtained 221 observations with complete data for these analyses. The here analysed sample of 221 firms is composed of firms with fewer than 100 employees. Moreover, 43% of the firms included in the final sample belong to manufacturing industries, 33% are software firms operating on B2B markets through standard software packages, while 24% are firms that

provide advanced services related to engineering design or other R&D activities. All the firms in the sample operate Business-to-Business, and none of them sells products or services through e-commerce channels. We thus obtained a sample in which the contextual conditions imposed that the firms had to face market or technology exploration activities, with similar challenges at a managerial and organizational level. This implies having a sample made up of firms with comparable situations, in terms of ambidexterity capabilities.

4.4.3 Measures

Dependent variable. The revenue growth rate was measured in logarithmic terms and was computed between 2008 and 2013. The firm growth rate was adjusted to the growth rate of the overall sales revenues at the industry level, where industry was operationalized at the SIC second-digit level. In this manner, we measured the differential of growth compared to the overall trend of the industry and we were thus able to measure industry-specific effects.

Independent variables. R&D investments were measured as the ratio between R&D expenditures in 2013 and the total revenues of the firm in the same year. Exports were measured as the ratio between exports and sales revenues in 2013. Firm's age was included as the logarithmic value of the years since firm has been incorporated.

Control variables. Size effects related to the number of employees were incorporated as control variable. Moreover, we also incorporated a dummy variable to take into account whether the firm belongs to a high or medium tech industry. We also controlled for how respondents perceived a munificence and competition situation in their competitive environment. The perceived market environment can influence a firm's options of market growth, and/as well as the marketing and R&D initiatives enacted to pursue growth (Sutcliffe and Huber, 1998). For the same reason, we also looked at vertical forces of competition in the industry, by controlling for the position of the firm in their industry's vertical chain. We asked firms to state the percentage of their firms' sales dedicated to the manufacturers of components or subassemblies and the percentage related to the final customers or distributors.

Finally, consistently with the idea that family firms with no external managers deploy less effective managerial practices in innovation endeavours, we used a dummy variable to control for managerial teams that were made up of just family members of the main shareholders.

4.4.4 Statistical Modelling

We use the following regression specification (1) to test our hypothesis H1:

$$Rev.growth_i = \beta_0 + \beta_1 R\&D_i + \beta_2\, export_i + \beta_3 R\&D_i * Export_i + \beta_4 W_i + \varepsilon_i \qquad (1)$$

where W_i is a vector including all the control variables specified above and a set of industry dummies.

To test our hypothesis H2, we use instead the regression specification (2) which is analogue to Model 1 (1), but which includes a third level interaction between R&D investments, revenues from export, firm's age, as well as all the second level interactions between R&D investments and age, and revenues from export and age.

$$Rev.growth_i = \beta_0 + \beta_1 R\&D_i + \beta_2 export_i + \beta_3 age_i + \beta_4 R\&D_i * export_i + \beta_5 R\&D_i * age_i + \beta_6 export_i * age_i + \beta_7 R\&D_i * export_i * age_i + \beta_7 W_i + \varepsilon_i \qquad (2)$$

We employed multiple regressions with robust standard errors to test hypotheses. A common problem in using empirical data is represented by non-normality of residuals which may violate the basic assumptions of OLS. Then, we tested against non-normality of residuals using the Shapiro-Wilk W test and obtaining that we cannot reject the null hypothesis that our residuals are non-normally distributed (p=0.210). Another problem in empirical data may be represented by heteroskedasticity. Therefore, we tested against this possible concern using the White/Koenker test and we find that we cannot reject the null hypothesis of homoscedasticity ($\chi 2$=214.92; p-value=0.221). Finally we also checked for multicollinearity. Our results indicate that the VIF among our

covariates has at most the value of 4.42, so all variables have a VIF largely below the critical threshold of 10.

4.5 Findings

4.5.1 Descriptive statistics

The firms in the sample (see Table 4.1) show an average and a median number of 22 and 15 employees, respectively. The small number of employees is related to the fact that about 25% of the firms in the sample are less than 10 years old. The first and the third quartile, in terms of age, are 11 and 37 years, respectively. Firms that are more than 50 years old make up about 12% of the sample.

Despite the limited size of the sample, export was found to be common to 163 of the firms, and it occupies a non-marginal part of their revenue (on average, about 25% of revenues), due to the overall limited revenues. Specifically, for 15% of the sample, 80% of the revenues come from exports. The average expenditure in R&D is just below 10% of the sales revenues, and half of the sample invested about 5% of their revenues in R&D activities.

4.5.2 Regression results

4.5.2.1 The interaction between R&D investments and export

In Hypothesis 1, we posited that there is a negative effect on the performance of SMEs when these firms combine high spending in R&D with a strong foreign market presence through exports. As can be observed in Table 4.2, Model 1 exhibits positive and significant first-order effects of both R&D investments (β_1=1.887, $p<0.05$) and export intensity (β_2= 0.762, $p<0.05$) on revenue growth. These effects represent conditional effects that describe the effect of one predictor (e.g., R&D spending) on the dependent variable (i.e., revenue growth) under the condition in which the other predictor (e.g., export) equals zero (Aiken et al., 1991). This means that in situations in which firms are only engaged in R&D activities or only in export activities, they benefit from such activities, since they exert a positive effect on revenue growth. However, as the R&D*Exports interaction term reported a negative and significant value (β_3=-7.239, $p<0.05$),

revenue growth is lower when R&D activities and export are performed at the same time. In other words, the coefficient of the interaction term indicates the amount of change in the regression slope of the logarithmic value of revenue growth on R&D spending resulting from a one-unit change in the export activities (Dawson, 2014). The high relevance of this implication is also highlighted by the partial ω^2 we computed for model 1. More specifically, the quota of variance of revenue growth accounted by R&D spending is superior to the quota of exports (0.058 vs. 0.025), but they are both lower than the second-level interaction (R&D spending*Revenues from export), which explains more variance (0.069). This insight supports the idea that contemporary R&D and export activities are very relevant in explaining the revenue growth of SMEs.

To facilitate the interpretation of the interaction results, we use two complementary approaches. First, we test the effect of the interaction between R&D activities and export through an analysis of the marginal effect that R&D activities have on revenue growth at different levels of exports. Second, we perform a simple slope analysis (Aiken et al., 1991) to check the effect at high and low levels of R&D investments and export activities on revenue growth. Both the analyses we perform support the idea that pursuing strategies encompassing contemporary innovation and internationalization activities are detrimental to SMEs' revenue growth.

Studying the marginal effect that R&D investments have on revenue growth at different levels of export corresponds to estimate the partial derivative of Model 1 (1) with respect to R&D investments and to analyse the response function at different level of export intensity. Therefore, following the notation expressed in Model 1 (1) the marginal effect is:

$$\frac{\partial\left(Rev.growth_i(1)\right)}{\partial(R\&D)} = \beta_1 + \beta_3 export_i = 1.887 - 7.239 * export_i \qquad (3)$$

Figure 4.2 reports the estimated marginal effect of R&D investments at different levels of revenue from exports. It clearly emerges that R&D investments have decreasing marginal returns on revenue growth the more the revenues from export grow. From Figure 4.2, we can assess that at low values of exports (% of revenue from exports<10%) R&D investments have a positive and significant marginal effect on revenue growth (p-value <0.1), while at higher levels of exports (% of revenue from exports>50%) R&D investments have a negative and significant marginal effect (p-value <0.1), implying lower revenue growth.

Table 4.1: Correlation matrix and descriptive statistics

		1	2	3	4	5	6	7	8	9	10	11
1	**Revenue Growth Rate (ln)**	1										
2	**R&D investments**	0.222***	1									
3	**Exports**	-0.060	-0.118*	1								
4	**Employees (ln)**	-0.095	-0.223***	0.339***	1							
5	**Hi-tech – Medium tech Industry**	0.063	0.249***	-0.181**	-0.163**	1						
6	**Age**	-0.334***	-0.362***	0.294***	0.518***	-0.293***	1					
7	**Munificence**	0.134*	0.236***	0.146**	-0.008	0.200***	-0.136*	1				
8	**Competition**	-0.0499	0.003**	0.1576*	0.066	0.010	0.032	0.454***	1			
9	**Component Sales**	0.025	-0-0.108	0.066	0.021	-0.173**	0.122*	-0.029	-0.010	1		
10	**End User Sales**	0.083	-0	-0.022	0.080	0.020	0.117**	0.013	-0.020	-0.037***	1	
11	**Family**	-0.075	0.089	-0.042	-0.005	-0.033	-0.064	0.035	0.031	0.074	-0.014	1
	Median	-0.11	0.045	0.15	2.71	1	22	1	1.11	0	0	0
	Mean	0.045	0.098	0.251	2.74	0.760	26.43	1.002	1.094	0.148	0.202	0.167
	Standard Deviation	0.966	0.152	0.286	0.949	0.428	23.50	0.216	0.265	0.290	0.318	0.374

****p-value < 0.1%; ** p < 1%; * p < 5%*

Table 4.2: Regression results

	Model 1 Two – way interaction		**Model 2** Three – way interaction	
.	β (s.e.)	Partial ω^2	β (s.e.)	Partial ω^2
R&D Spending	1.887* (0.89)	0.053	10.616** (3.86)	0.097
% of revenues from exports	0.762* (0.35)	0.025	1.776 (1.54)	0.015
R&D * Exports	-7.239* (3.10)	0.069	-28.243** (8.97)	0.122
Age * R&D	-	-	-4.045* (1.58)	0.072
Age * Exports	-	-	-0.466 (0.44)	0.009
Age * R&D * Exports	-	-	9.845** (3.37)	0.084
Employees (ln)	0.067 (0.07)	0	0.039 (0.07)	0
Hi-tech. – Medium tech. Industry	-0.035 (0.16)	0	-0.003 (0.16)	0
Age	-0.297** (0.10)	0.029	-0.023 (0.19)	0
Munificence	0.055 (0.33)	0	-0.175 (0.35)	0
Competition	-0.404 (0.28)	0.005	-0.303 (0.27)	0.001
Component sales	-0.001 (0.25)	0	-0.030 (0.23)	0
End User sales	-0.455* (0.21)	0.02	-0.399* (0.20)	0.016
Family	-0.300 (0.18)	0.001	-0.249 (0.17)	0
Constant	2.008* (0.75)	-	1.550† (0.87)	-
Adj. R-squared	0.187		0.249	
N	221		221	

Notes: ***p-value < 0.1%; ** p < 1%; * p < 5%; † p < 10% (robust standard errors in parentheses).
Dependent Variable: Logarithmic growth rate of revenues
Industry effects controlled at the second digit of the SIC code. For each model, Partial ω^2 is the variance in the DV accounted for by one particular IV, with the effects of the other IVs partialed out.

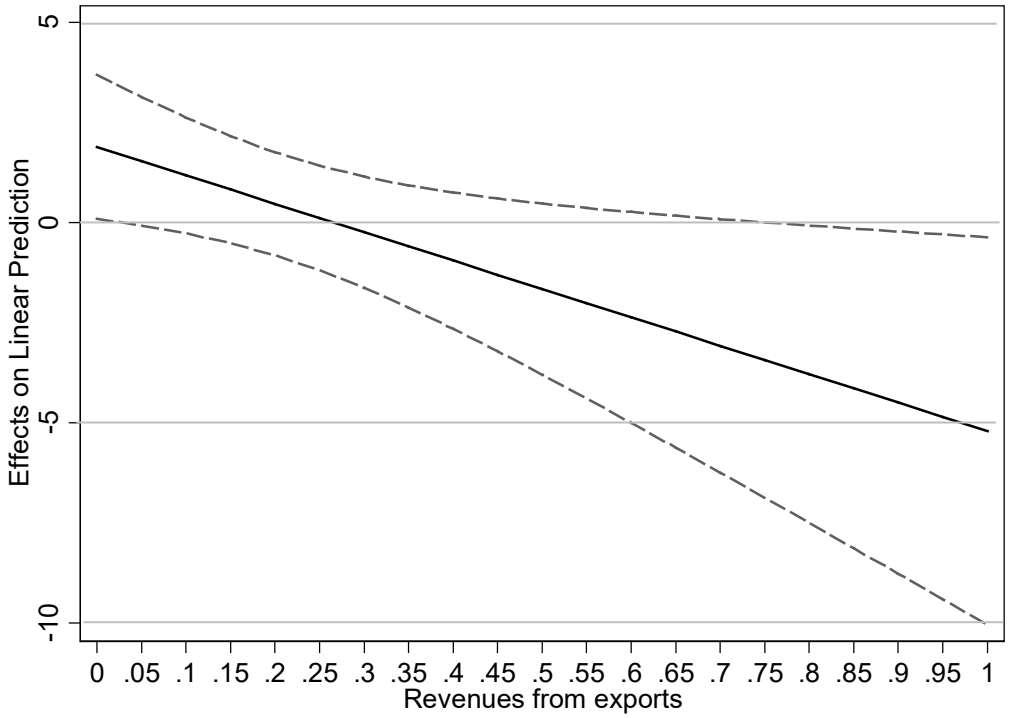


Figure 4.2: Average marginal effects of R&D investments over revenue growth with 95% CIs

Figure 4.3 offers an alternative graphical representation of the negative interaction effect between R&D investments and exports following the approach suggested by Aiken et al. (1991). In detail, we plotted revenue grow rates - as estimated by the regression model - at high and low values of R&D spending and revenue from exports (i.e., one standard deviation above and below the mean). This plot indicates that SMEs report superior growth in situations of high spending in R&D projects combined with a sales concentration on the domestic market, or when their spending in R&D is limited and their sales from exports are high. Conversely, a lower performance emerges for firms that contemporary combine high R&D spending with high revenues from exports. In sum, from these results we find support to our hypothesis H1 according to which combining high R&D investments with a high level of activities abroad hampers the growth of revenues.

4.5.2.2 Age moderation on the tension between R&D and export

In Hypothesis 2, we posited that age can be a moderator of the negative interplay between R&D spending and export intensity, and that the organizational tension, due to the balancing of these actions, can be less evident for firms that are neither too young nor too old. Model 2 reports that the interaction term between R&D spending, export intensity and age is positive and significant (β_7= 9.845, $p < 0.01$), thus suggesting that age may act as a moderator of the relationship that exists between R&D and export activities. Similarly to Hypotheses 1, we checked for the size effect of the independent variables of Model 2 with respect to SMEs' revenue growth rate. Such results are reported in the column "Partial ω^2 " and highlight that the third level interaction between R&D activities, revenues from export and age explains the 0.084 of the variance of the revenue growth rate, i.e. a

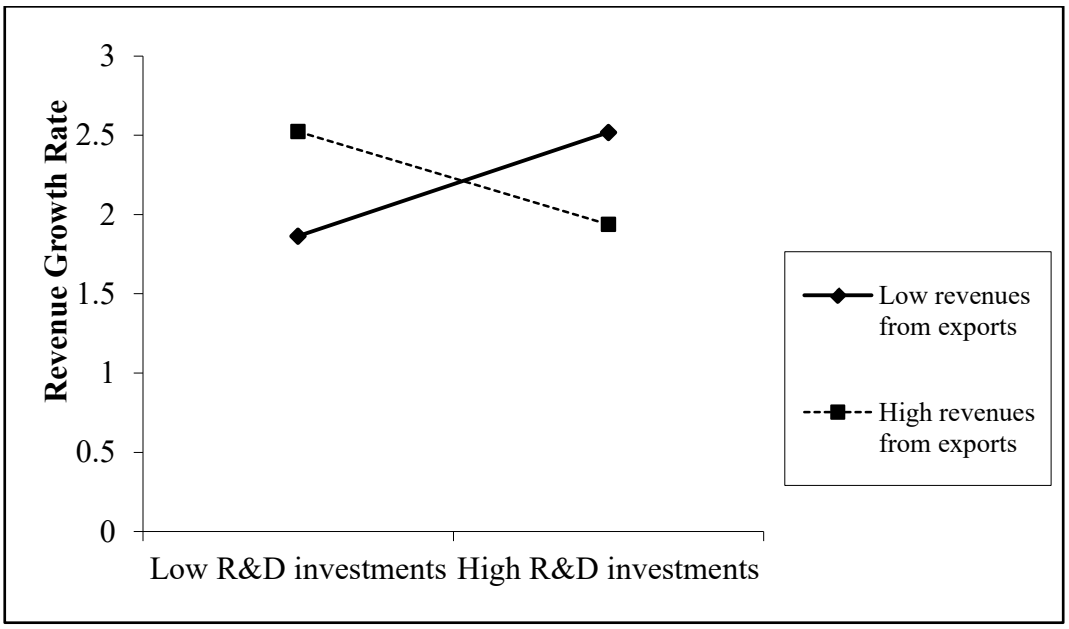


Figure 4.3: Two-way interaction between Exports and R&D investments

medium large part of its variance (Miles and Shevlin, 2001). To understand the form of the interaction, we performed again simple slope analysis (Aiken et al., 1991). The regression lines for high and low values of R&D spending, export intensity and age are plotted in Figure 4.4. This figure clearly describes the nature of the moderation effect played by age. The plot shows that higher revenue growth is attained by the younger SMEs that engage in high R&D spending and which are focused on their domestic market (low export intensity). Increasing export intensity has a detrimental effect on revenue growth for younger firms with high R&D spending. A marginal negative effect on revenue growth emerges for such firms, due to increasing exports. The revenue growth rates are higher for older SMEs with high spending in R&D initiatives, when these firms engage in more exports than in the case of limited export intensity. Thus, we find support for the fact that older firms with high spending in R&D experience superior growth when they can access international markets. However, the interaction plot also shows that such firms report similar revenue growth rates to the ones of a comparable age that are focused on more incremental R&D initiatives and on local sales.

In order to identify the age group that benefits the most from combining R&D and export initiatives, we compared the effect on the revenue growth rate of the contemporary engagement of firms in R&D endeavours and export activities for three age groups. To do so, we re-estimated the regression models using dummy variables for age categories rather than expressing age in logarithmic form. Consistently with past research on age as a factor of influence on the conduct of SMEs (e.g. Carr et al., 2010; Zhou and Wu, 2014), we defined two cut off points in the SMEs' age: 10 and 25 years.

We chose the two cut-off points, because of the general lack of consensus in literature about how to define age classes for firms, considering three rules. First, we adopted cut-offs that had been employed in past studies. For example, a 10-year cut-off has been used to identify the difference in behaviour of "early youth" SMEs and "adolescence" ones over their life cycle in relation to their investments and exports on revenue growth strategies on accessing new financial capital (e.g. La Rocca et al, 2009). In a similar vein, the 25-year cut-off was used in previous literature to identify firms with a more established presence on the markets

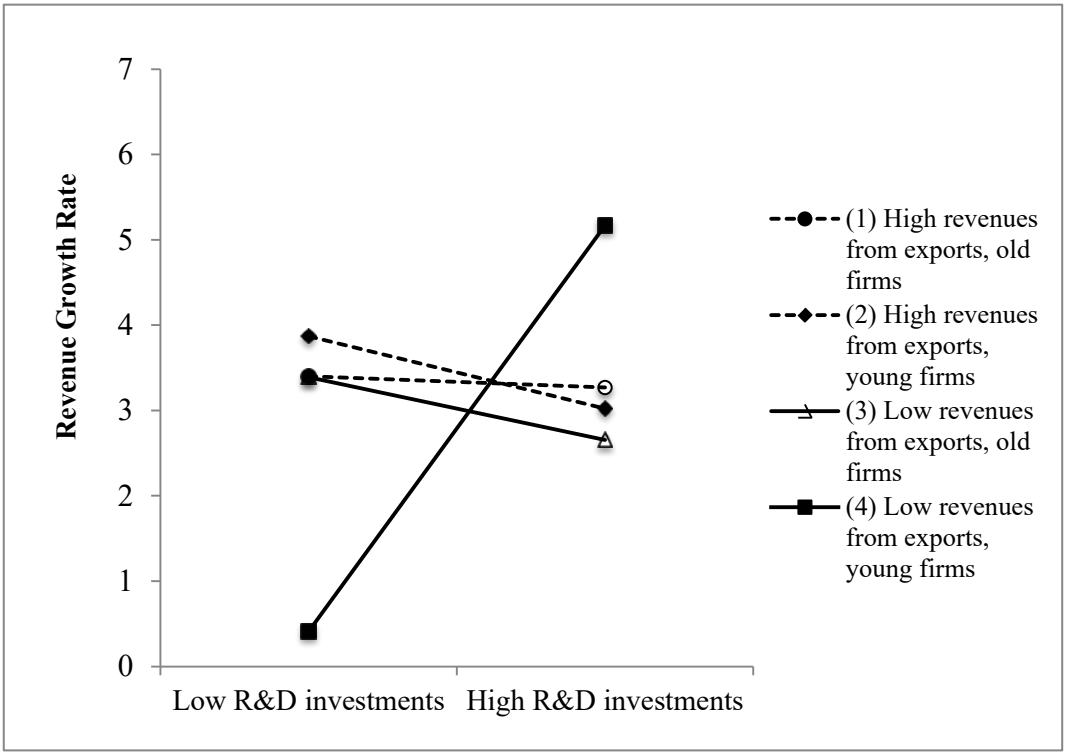


Figure 4.4: The moderation effect of age on the effect of R&D

(e.g., Berger and Udell, 1998). The three classes also reflect the tendency of firms to show different innovation behaviours and to develop different innovation capabilities throughout their life (Branzei and Vertinsky, 2006), as well as to adopt different internationalization pathways (Kuivalinen et al., 2012). Although SMEs may begin to lower product innovation endeavours after about ten years and begin focussing on efficiency and process innovation activities (Klepper, 1996), those firms that have survived competition after about 25 years attempt to maintain and establish their product-market position less through the innovativeness of their product and more through their efficiency in producing and selling it. At the same time, international activities also change according to the lifecycle of the firm. In the very first years, firms rely on intermediaries in their international activities (Neirotti and Paolucci, 2015). However, after 25 years, firms may begin to have a consistent market presence abroad or international experience, and they may rely on their own capabilities to address foreign markets (Johanson and Vahlne, 2009). Second, the creation of the three

groups has allowed us to test our second hypothesis on three well-balanced sub-samples, in terms of number of observations. This reduces the risk of capitalization of chance that may incur when results obtained from small sub-samples are considered. Third, in order to check the consistency of the two cut-offs, we employed the Chow test (Chow, 1961) as a robustness test to confirm the existence of structural breaks in the sample with reference to age. Model 3 in Table 4.3 reports the results of the analysis in which we used three dummy variables to express the two cut-off levels. In general, the model reports a significant discontinuity in the effect given by the combination of R&D endeavours and export activities on the growth of revenues for SMEs for the two age thresholds. In fact, the interaction terms between the three variables and the dummy variable that discriminates firms with less than 10 years and firms between 10 and 24 years are significant. Chow's test confirmed the differences indicated when considering the two thresholds.

At this point, in order to gather more evidence on the age moderation factor, we estimated the two-way interaction effect on the three different subsamples (models 4, 5 and 6; Table 4.3) identified when considering the two different firm age thresholds (i.e. 10 and 25 years). Considering the interaction results, it is possible to see that a significant negative interaction effect only exists for firms with less than 10 years (β_3=-14.404, $p<0.01$), and that revenue from exports are not significantly correlated to revenue growth for this group of firms, while R&D investments are positively correlated (β_3=4.004, $p<0.05$). Conversely, the revenue growth rates of adolescent firms are positively correlated to the contemporary presence of R&D investments and exports (β_3=13.773, $p<0.01$), but suffer from R&D expenditures, since it can be observed that they lowered the growth rate (β_3=-4.237, $p<0.05$). Contextually to the change of sign of the interaction between R&D investments and exports between models 4 and 5, we also notice that the baseline effect of R&D investments is opposite between model 4 and model 5. There are a number of reasons explaining this effect. First, young firms have been proved to possess extra innovation capabilities compared to older firms, which compensate for the size handicap they are subject to (Huergo and Jamandreu, 2004). In this vein, with reference to the product and the market domain, during the very first years of existence, SMEs are more concerned with the development of market capabilities rather than with the development of technological capabilities since they already have them (Huergo and Jamandreu, 2004). This

implies that firms are more able to capitalize investments from R&D activities rather than from international activities (a result which is also confirmed by Model 1 and figure 4.3). Moreover, at the very beginning of their inception, and especially in manufacturing sectors, SMEs tend to operate under "make-to-order" logics. Thus their R&D projects usually follow pull logics, which render easier to capitalize growth from them.

In contrast, adolescent firms are more characterized by decreasing marginal returns from R&D activities - since their R&D activities are more specialized than smaller firms - due to path dependency (Danneels, 2002). Moreover, they usually develop a narrower set of exploratory projects in order to be as consistent as possible with the technological trajectory undertaken in previous years and, finally, they are more oriented toward the development of market driven innovations (Love et al., 2016). This peculiarities may explain why for adolescent firms R&D investments have a negative effect on revenue growth (i.e. decreasing marginal returns from technological exploration), but also why the conjunct effect of R&D investments and export can beneficially contribute to their growth (i.e. more market driven innovations and a clearer idea of customers' tastes which renders more effectively R&D investments).

Finally, firms older than 25 years do not show any significant effect of R&D investments, exports or their interaction. Overall, these evidence support our Hypothesis H2, which posits that the detrimental effect on revenue growth, due to the attempt of SMEs to combine or balance R&D endeavours with internationalization, may tend to vanish when these firms become adolescent, that is, when they reach an intermediate age at which they are likely to be better organized.

The results we presented in Tables 4.2 and 4.3 might be driven by a dimensional factor implying that SMEs strive to achieve higher growth rates as they become larger (Lu and Beamish, 2006; Evans, 1987). To overcome this problem we included - as control in each model - the size of the firm (proxied by the number of employees). This control is not significant in each model, thus suggesting that the dimensional effect is not driving our results. Moreover an additional confirmation about the weak attrition in our sample between size and growth is represented by a peculiarity of Italian SMEs which is common also to our sample: many firms strive to progressively grow in terms of employees as long as they age, thus implying that older firms are not larger and then maintain high possibilities of growth. More specifically, Table 4.3 shows that despite the

average revenue growth (after controlling for the average industry growth) is positive only for young firms, the firm's size does not vary with a power law as long as SMEs age, thus confirming that age seems to play a more significant role than firm size in driving the growth of the firms included in the sample under investigation.

Table 4.3 - Frequencies tabulations and relevant statistics for subgroups.

Age (years)	Frequency	Sample Percentage	Average revenue Growth	Average number of employees
Under 10	54	24.44	0.69	10.7
Intermediate	68	30.77	-0.11	16.6
Over 24	99	44.79	-0.20	33.2
Total	221	100.00		

4.5.3 Robustness tests

The relevance of results presented above might be questioned by some issues related to causality of R&D activities, export and revenue growth. Despite we are limited in implementing further analyses controlling for endogeneity, we performed some robustness tests to corroborate the analyses we presented above.

The first concern might be related with the fact that our measurement of the SME growth rate took into account a period of six years, while the measurements of R&D expenditures and export intensity were punctual and refer to a single year (2013). Thus, there might be a problem of reverse causality that could have conditioned our findings. More specifically, levels export and R&D might be endogenous to the previous growth of firms. For instance, firms might decide to invest more in R&D activities or in developing superior relationships with customers abroad based on the growth of past years. To control for this issue, therefore, we retested our models using as independent variables the export and the R&D decisions. More specifically, we created two dummy variables (one for

Table 4.4: Chow's test and split sample analysis

	Model 3 Chow's Test	**Model 4** Subgroup with age <10	**Model 5** Subgroup with 10 ≤ age > 25	**Model 6** Subgroup with age ≥ 25
.	β (s.e.)	β (s.e.)	β (s.e.)	β (s.e.)
R&D Spending		4.004*	-4.237*	-0.987
		(1.55)	(1.78)	(1.56)
% of revenues from exports		1.107	0.610	0.244
		(0.90)	(0.38)	(0.27)
R&D * Exports		-14.404**	13.773**	0.758
		(5.24)	(5.34)	(3.67)
Employees (ln)	0.043	-0.334	0.154	-0.038
	(0.07)	(0.31)	(0.10)	(0.07)
Hi-tech. – Medium tech. Industry	0.022	1.076†	-0.052	0.071
	(0.16)	(0.60)	(0.28)	(0.16)
Age		0.760	-1.098**	0.002
		(0.60)	(0.41)	(0.20)
Munificence	-0.125	-2.086	-0.199	-0.291
	(0.36)	(1.81)	(0.38)	(0.39)
Competition	-0.206	-2.086	-0.102	0.202
	(0.25)	(1.81)	(0.24)	(0.35)
Component sales	0.073	2.199	-0.223	0.093
	(0.24)	(1.61)	(0.48)	(0.19)
End User sales	-0.330†	-0.289	-0.063	0.063
	(0.20)	(0.99)	(0.32)	(0.18)
Family	-0.309	-0.551	-0.149	-0.058
	(0.18)	(0.57)	(0.23)	(0.11)
Under 10 * R&D	2.114 †			
	(1.23)			
Under 10 * Export	0.362*			
	(1.13)			
Under 10 * R&D * Exports	-8.529*			
	(4.15)			
Intermediate * R&D	-2.772 †			
	(1.56)			
Intermediate * Exports	-0.025			
	(0.45)			
Intermediate * R&D X Exports	15.610*			
	(7.46)			
Over 24 * R&D	-0.485			
	(1.79)			
Over 24 * Exports	0.381			
	(0.28)			
Over 24 * R&D * Exports	-0.135			
	(3.59)			

Under 10	1.621* (0.72)			
Intermediate	1.363 † (0.76)			
Over 24	-1.014 (0.79)			
Constant		4.780* (2.17)	1.934 (1.41)	0.194 (0.83)
Adj. R-squared		0.144	0.483	0.138
N	221	54	68	99

Notes: ***p-value < 0.1%; ** p < 1%; * p < 5%; † p < 10% (robust standard errors in parentheses).
Dependent Variable: Logarithmic growth rate of revenues
Industry effects controlled at the second digit of the SIC code for each model.

Chow's Test

β [Under 10 * R&D] = β [Intermediate * R&D] = β [Over 24 * R&D]

β [Under 10 * Export] = β [Intermediate * Exports] = β [Over 24 * Exports]

β [Under 10 * R&D * Exports] = β [Intermediate * R&D * Exports] = β [Over 24 * R&D * Exports]

β [Under 10] = β [Intermediate] = β [Age≥25]

(1) Under 10 * R&D – Intermediate * R&D = 0

(2) Under 10 * R&D - Over 24* R&D = 0

(3) Under 10 * Export – Intermediate * Exports = 0

(4) Under 10 * Exports - Over 24* Export = 0

(5) Under 10 * R&D * Exports – Intermediate * R&D * Exports = 0

(6) Under 10 * R&D * Exports - Over 24 * R&D * Exports = 0

(7) Under 10- Intermediate= 0

(8) Under 10- Over 24= 0

F (8, 169) = 3.60

Prob > F = 0.0007

R&D activity and one for exports) which take the value of one if the firm did the activity in 2013 and the value of zero otherwise. In this way, our analyses should not be biased by the path dependence to which are subject R&D and export when measured using intensity measures. More specifically, despite levels of investments are likely to be biased by past performance; the decisions to begin a certain activity (export or R&D) are more persistent over years and therefore less likely to be biased by past performance.

The results of this test are shown in Table 4.5 and show that, in line with the results presented above, R&D and export activities are responsible of lower revenue growth when combined together (Model 1). Moreover, as contended by our hypothesis 2 (and shown in Model 2, Table 4.2), age moderates positively the negative effect that R&D and export decisions have on revenue growth. Our results are therefore confirmed for both the decision to undertake R&D and export activity, as well as for the effect of the intensity of R&D and export activities that firms undertake on revenue growth.

A second concern might be related with the time lags and the discrepancy between the measurement of R&D and export intensity and revenue growth used in the previous analyses. To control for this issue, as far as new economics and financials have been published by the Aida database, we performed an additional robustness test. Despite problems related with the discrepancy between the time of measurement of R&D and export intensity was partially mitigated by the fact that R&D and export are not isolated activities, but they reflect long-term attitudes and exhibit certain stability over time, such robustness test provides more reliability to our results. Specifically, we calculated the revenue growth rate between 2013 and 2014 to check if the effect we identified above still persists.

Results are presented in Table 4.6 and show that qualitatively the results are similar to those obtained in the main analyses, thus confirming the existence of a conflict for growth between R&D and export activities, and highlighting that age positively moderates this conflict.

Further concerns might be related with sample selection issues (Heckman, 1976). Sample selection bias occurs when values of the dependent variable are available only for a certain number of observation as a result of another process which is typically not observable (Greene, 2003; Sartori, 2003). In the case of the work presented in this chapter there is mainly one condition according to which sample selection problems may arise. Exports (R&D investments) might represent

a censoring factor in our dataset if we would include only firms exporting (investing in R&D activities) in our sample. However, our sample includes also firms not exporting and not doing any type of R&D activities thus suggesting that sample selection is not a concern in this case. To get confirmation about this point, however, we implemented the suggestions advanced by Certo et al. (2016) for detecting the presence of selection bias. Certo and colleagues advanced the idea according to which it is not sufficient to implement a Heckman two-stage model to account for selection bias, but it is important first to understand if selection bias really may exist, because its application may lead to inconsistent results. Empirically, sample selection bias occurs if two conditions are satisfied: first, the independent variable must be significant predictor of the first stage in the Heckman model, and second the error terms of the first and the second stage must be correlated (Certo et al., 2016). Both conditions need to be satisfied to have sample selection bias, while the failure in meeting the first condition excludes the presence of selection bias. Moreover, Certo and colleagues suggested that the lambda incorporated in the second stage of the model cannot be univocally used to determine if sample selection does exist or not. Therefore, adopting the methodology advanced by them, we included the independent variables (exports and R&D investments) in the first stage of a Heckman two-stage model and we checked for the significance of such variables to determine the existence of selection bias. Results demonstrate that both the independent variables are not significant in the selection equation, thus demonstrating that results are not affected by selection issues.[xiv]

Table 4.5: Robustness test with R&D and export dummies

	Model 1 Two – way interaction	**Model 2** Three – way interaction
.	β (s.e.)	β (s.e.)
R&D dummy	0.470 (0.37)	3.131† (1.76)
Export dummy	0.688† (0.36)	4.028* (1.85)
R&D * Exports	-0.763† (0.41)	-4.498* (2.09)
Age * R&D	-	-1.17* (0.58)
Age * Exports	-	-0.981† (0.57)
Age * R&D * Exports	-	1.327* (0.66)
Employees (ln)	0.113 (0.08)	0.113 (0.08)
Hi-tech. – Medium tech. Industry	0.016 (0.08)	0.048 (0.17)
Age	-0.293** (0.11)	0.554 (0.48)
Munificence	0.083 (0.36)	0.104 (0.36)
Competition	-0.235 (0.26)	-0.203 (0.27)
Component sales	-0.083 (0.27)	0.035 (0.26)
End User sales	-0.377† (0.22)	-0.367 (0.23)
Family	-0.147 (0.12)	-0.084 (0.07)
Constant	1.709* (0.76)	0.731 (1.62)
Adj. R-squared	0.122	0.142
N	221	221

Notes: ***p-value < 0.1%; ** p < 1%; * p < 5%; † p < 10% (robust standard errors in parentheses).
Dependent Variable: Logarithmic growth rate of revenues
Industry effects controlled at the second digit of the SIC code.

Table 4.6: Robustness test with revenue growth between 2013 and 2014[xv]

	Model 1 Two – way interaction	**Model 2** Three – way interaction
.	β (s.e.)	β (s.e.)
R&D dummy	0.345 (0.261)	1.591 (1.31)
Export dummy	0.290* (0.13)	0.804 (0.58)
R&D * Exports	-2.71* (1.12)	-17.749† (9.10)
Age * R&D	-	-0.560 (0.58)
Age * Exports	-	-0.184 (0.16)
Age * R&D * Exports	-	5.144† (2.81)
Employees (ln)	0.076† (0.04)	0.064 (0.04)
Hi-tech. – Medium tech. Industry	0.008 (0.09)	0.001 (0.09)
Age	-0.140† (0.07)	-0.099 (0.087)
Munificence	-0.062 (0.18)	-0.067 (0.18)
Competition	-0.319 (0.14)	-0.279* (0.14)
Component sales	-0.215 (0.17)	-0.226 (0.18)
End User sales	-0.018 (0.09)	-0.022 (0.18)
Family	-0.095 (0.11)	-0.263 (0.19)
Constant	0.661*** (0.18)	0.588* (1.23)
Adj. R-squared	0.297	0.306
N	218	218

Notes: ***p-value < 0.1%; ** p < 1%; * p < 5%; † p < 10% (robust standard errors in parentheses).
Dependent Variable: Logarithmic growth rate of revenues
Industry effects controlled at the second digit of the SIC code.

4.6 Discussion and Conclusions

In this chapter, we have analysed the impact of R&D investments and exports on the revenue growth of SMEs. By developing two hypotheses, rooted in the theoretical framework of domain ambidexterity (e.g. Voss and Voss, 2013; Zhang et al., 2016), we have shown that although R&D investments and export intensity have a positive impact on the revenue growth of SMEs, their contemporary combination may be detrimental to revenue growth. In detail our estimates show that when exports over revenue are below 10%, R&D investments have a positive effect on revenue growth. By contrast, when exports over revenue are above 50%, the effect of R&D investments on revenue growth is negative. We have found that the tension on revenue growth between R&D and export intensity particularly occurs in young firms, due to their lack of resources and the difficulties they encounter in building or obtaining returns from contextual management approaches to ambidexterity. Therefore, SMEs – and in particular the younger ones - should focus their investments on either high R&D investments or on the internationalization of their sales. In more detail, the best results – according to our prediction – can be achieved keeping a focus on a high level of R&D investments, a result which confirms that young firms are more able to innovate than older firms (Schneider and Veugelers, 2010).

These results have a theoretical background in the emerging view of domain ambidexterity. We started the research by assuming that high R&D investments and high exports may occur in two different situations: when firms undertake a pure exploration strategy (Voss and Voss, 2013), in which they develop radical new technologies to address a new foreign market; or when firms undertake two different strategies contemporarily, namely, developing a radical new technology to address the needs of a local market and contemporarily refining a technology on which the SMEs are specialized to enter a new foreign market. Both of these situations denote a domain ambidexterity situation, namely an explorative position undertaken in both the technological/product and market domains.

Our results are different from those obtained by Voss and Voss (2013), who found a pure explorative strategy (i.e. high levels of product and market exploration) as being beneficial to the growth of sales. The results of our study are akin to those of Zhang et al. (2016), who found that strategies that are exploitative in a domain and exploitative in another domain are beneficial to performance. In this vein, our focus on age as a moderator of a firm's domain ambidexterity capability extends previous results (Voss and Voss, 2013) by

showing that, in the case of SMEs, mature organizations are not able to take advantage (in terms of revenue growth) of domain ambidexterity strategies. Our results suggest that 10 to 25 year old firms are able to take advantage of being ambidextrous across domains. The reasons why young and mature SMEs may be unable to take advantage of domain ambidexterity strategies are likely to be different. We have concluded that young firms are unable to set contextual management approaches to domain ambidexterity, due to their limited resources and the complexity of such approaches, whereas more mature firms probably have more rigid organizational routines and strategic myopia to effectively undertake exploration paths, especially on the technological domain.

According to these results, our research contributes to domain ambidexterity literature in two other ways. First, to the best of our knowledge, this study represents the first attempt that has been made to apply the domain ambidexterity framework to international studies. Second, the framework has been adapted to the context of small and medium enterprises operating in sectors with medium or high technological intensity in manufacturing and services industries, unlike Voss and Voss (2013), who developed their study in the non-profit organisation context, or Zhang et al. (2016), who developed their work to analyse product and market innovation in the Chinese high-tech firm context. The adoption of this framework has allowed us to unravel product and market activities and to categorize them as explorative or exploitative (March, 1991). The use of this feature can be very relevant, especially in the SME context, where exploration and exploitation activities are often difficult to distinguish and where the management of product and market activities often overlap, due to the intrinsic nature of SMEs. In this vein, we believe this work is valuable as it represents a further step towards depicting the way in which international activities are integrated with innovation activities within SME functions: while this aspect has been studied extensively for multinational enterprises (e.g. Hitt et al., 1997), the interaction between these two activities has been treated as a sort of black-box in the SME context, due to the social complexity that is related to the resources that are associated with the two operations. In this vein, our study also responds to the call for research on ambidexterity across domains in business (Lavie and Rosenkopf, 2006; Lavie et al., 2011).

Finally, this study offers further clarification about the complementarity that exists between innovation and internationalization in SMEs. While previous studies found mixed results about the effective existence of a complementary effect, with some studies pointing to complementarity, others to substitution and still others to no effects (e.g. Golovko and Valentini, 2011; Kumar, 2009; Filatochev and Piesse, 2009), our study argues that the complementarity between internationalization through exports and innovation activities may change according to the age of the firm, since the capabilities of managing the two activities vary according to the experience, the availability of resources and the inertia of the enterprise. In this vein, we reconcile the three different views and sustain that a complementary effect exists, does not exist or is irrelevant to SME performance, according to the age of a firm.

This work offers managers several implications. First, our results directly indicate that during the first years of SME's life, firms should be focused on pursuing exploration on just one domain among innovation in the product and in the geographical market. Since our results indicate that SMEs may deal with an overload of R&D and information requirements, the practical implication for managers is - therefore – to first develop the routines and the approaches in the R&D process to balance different projects, also with differences in the attributes of market and product exploration. In practice, this means that small firms should first develop the asset orchestration capabilities (Teece, 2014) that are needed to manage a large and diversified portfolio of innovation. Especially in the research and product development areas, such firms need to implant contextual management practices that put human resources in the condition to balance their cognitive effort and attention on different innovation projects.

Second, our results raise questions about how SMEs may benefit from the combination of international operations and R&D endeavours. The fact that age positively moderates the negative interaction between R&D endeavours and export may imply that experience and learning are two mechanisms in place in shaping growth through internationalization and innovation. In this vein, our results advice managers that they may benefit from accumulated experience in international markets. Due to the limited time to develop such experience, however, young SMEs could rely on vicarious learning by hiring managers with a previous experience of developing foreign markets in contexts of innovative products (Child et al., 2017). Other viable mechanisms could be the use of temporary managers or training programs that involve young managerial roles and

aim to give them an experience in managing international operations and product development.

More relevant contributions to managerial practice and theory may emerge in the future, in which the missing links in the moderation effect played by firm age on SME growth of combining high intensity in exports and revenue may be captured. For example, a missing link that could help to explain the superior ambidextrous capability of adolescent SMEs in combining R&D investments and exports may depend on the managerial routines of more mature firms. With reference to traditional studies on SMEs, it is possible to advocate that these firms may count on more structured management teams (Lubatkin et al., 2006; O'Reilly and Tushman 2013). An open point worth to be studied by future research is also related with the ambidexterity implications of our theorizing. Figure 4.1 have depicted two different situations in which tensions may arise both at the firm and the project level. In fact, tensions may arise at the project level when firms try to innovate for new markets or at the firm level when firms contemporary innovate for existing markets and enter new markets with existing products. Although tensions at the project level are likely to be reflected at the firm level (Andriopoulous and Lewis, 2009), we are constrained in disentangling at which level tensions actually occur. Different origins of the tension may require different approaches to solve it (for instance structural separation if the tension takes origin only at the firm level or temporal separation if they take origin at the project level). Moreover, an additional point worth of future investigation is related with the impact that tensions at the project level may have at the firm level.

Future studies could also overcome some of this study's limitations. First, our study was not based on panel data. Moreover, our measurement of the SME growth rate took into account a period of six years, while the measurements of R&D expenditures and export intensity were punctual and refer to a single year (2013). Thus, despite we tried to control for this issue through the adoption of some robustness tests, there might be a problem of reverse causality that could have conditioned our findings, and for which we were limited in implementing more robust analyses. This problem was partially mitigated by the fact that R&D and export intensity are not isolated activities, but they reflect long-term attitudes and exhibit certain stability over time. Finally, our study has focused on SMEs operating in a region that has been categorized as a "Strong Innovator" by the

European Union. Therefore, while our results are generalizable to regions with a similar innovation ecosystem structure, we have not been able to test the consistency of our predictions for firms operating in more innovative regions (i.e., firms in "innovation leader" regions). Institutional factors may play a significant role in supporting SMEs in combining innovation and internationalization activities (Yi et al., 2013). For example, in ecosystems such as the Silicon Valley, the well-rooted local presence of actors, for example, venture capitalists, technical universities with technological transfer programs toward SMEs and management programs for entrepreneurs, may help mitigate the tensions SMEs face in their attempts to combine technological and market exploration. Therefore, future research could test the same problem in a more innovative context than the one we have focused on, and could also explore the institutional factors that enable successful combinations of innovation and internationalization activities by studying different ecosystems.

Chapter 5

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

Premise

In Chapter 4 we have demonstrated both theoretically and empirically that, despite R&D investments and internationalization are two relevant activities for SME performance, their combination undermines their revenue growth. In this chapter, our aim is to depict the conditions and the factors which, instead, may enable the successful combination of such activities.

Accordingly, this chapter starts from the premise that R&D and export activities generate a tension on the growth of SMEs, and looks for moderators that may alleviate the complexity of combining these conflicting activities. From a theoretical standpoint, we reconcile previous contrasting elements in literature by showing that R&D activities and exports can be combined successfully - thanks to the creation of dynamic capabilities - if a firm collaborates with technological

partners to develop innovation projects or if it develops experience in international operations. Empirically, we adopt a quantile regression and find support for our hypotheses by considering a sample of 221 Italian SMEs. In other words, we show that external knowledge introduced by universities and research centres, as well as knowledge developed through a long experience on international markets, and through the reaching of a broad array of foreign markets, alleviates the tension between R&D and international activities. We discuss the theoretical and practical implications of this relationship.

5.1 Introduction

Technological innovation and internationalization are intertwined necessities for Small and Medium Enterprises (SMEs) in hi-tech sectors. Sales on international markets are important for SMEs to cover the fixed costs of their Research and Developments (R&D) endeavours, especially when firms operate on small domestic markets with a limited growth potential and with a more limited local demand for innovative products. This may be a common situation outside large market areas like the United States. 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 (e.g. laws, norms, technical standards and customer' needs can vary significantly from one country to another), and given that a firm's innovation patterns usually respond to domestic rather than to foreign demand (Fabrizio and Thomas 2012). Such challenges stem from the fact that developing products for international markets can result in an explorative endeavour on both the technological and the market dimensions of innovation. As this type of exploration is characterized by high uncertainty, it requires a great deal of commitment of resources to both R&D and marketing functions, and it may require long learning processes that may be characterized by erroneous decisions or by poor results in market strategies or in product design.

Despite the importance of internationalization for the growth of SMEs, there is no comprehensive evidence in literature about the effects of international activities and innovation endeavours on the performance of SMEs when the SMEs are engaged in product innovation that targets foreign markets. Although many

studies have shown the marginal, positive effects of each of these two activities on SMEs (foreign sales, and product innovation or R&D spending), those studies that have focused on analysing their interaction have produced contrasting evidence about the fact that the combination of these actions is beneficial for SME growth (e.g. Filatotchev and Piesse 2009; Golovko and Valentini 2011; Kumar 2009). Some studies have even shown that, in 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 (Kumar 2009; Booltink and Saka-Helmhout, 2018). The reasons for a lack of complementarity are essentially based on the resource constraints (related to the financial capital and on the choice of which managers to dedicate to different uncertain endeavours) that characterize SMEs and that can hinder the effectiveness of their exploration endeavours on both the market and in technological domains.

A theoretical support to this view comes from studies on domain ambidexterity (Voss and Voss 2013; Zhang et al. 2017), which show that a combination of market and technological exploration is associated with a lower performance than a scenario in which firms apply the results of their well-established knowledge in a specific domain to start exploration in another one (e.g. exploring a new market with an established technology with which they are familiar or introducing a product that embodies a new technology for the firm on a familiar market). Consistently with these reasons, recent studies have found that the interaction effect of R&D and export intensity on revenue growth depends on the SME's age, which can result in differences in the amount of financial and the managerial resources and in the absorptive capacities that firms can dedicate to these exploration activities. However, age is a structural variable of an enterprise that does not capture the managerial choices with which SMEs design and implement their strategies for R&D and international sales.

Owing to the fact that R&D and internalization can be "too much of a good thing" when undertaken together, our core assumption is that the conflict between these activities is a consequence of limits in the quantity of managerial attention and absorptive capacity that SMEs can dedicate to these endeavours. Hence, experience in internationalization and the way SMEs collaborate in their R&D endeavours with external partners may be factors that moderate the conflict between R&D activities and internationalization, since they have a favourable impact on the quantity of managerial attention that is needed to manage such complex endeavours and they increase the absorptive capacity from the external

market and technological environment. Exploiting the endeavour made by Birkinshaw and colleagues (2016) in bridging the ambidexterity framework with the dynamic capability framework, we contend that experience and openness in the R&D process help to capture elements of the dynamic capability of a firm which enables a balance between innovation and internationalization activities in SMEs. In general, dynamic capabilities imply that firms do the "right things" rather than do "things right" (Teece 2014), and they lead to superior asset orchestration choices in situations of resource constraints. In reference to R&D projects that can target a variety of markets, such asset orchestration capabilities can reduce the amount of managerial attention required for each project (due to experience) and the need for more effective technological partnerships to absorb relevant knowledge. Experience and partnerships can thus lead SMEs to sense, seize and transform opportunities into valuable product lines for foreign markets, which is the outcome of the application of dynamic capabilities (Teece 2014).

The capability to sense and seize opportunities on the product-market domain and to transform them into viable products to be sold in foreign markets is complementary to the way SMEs deal with the ambidextrous strategy they adopted to manage the tension between innovation and internationalization. In this vein, sensing, seizing and transforming capabilities enhance the value of balancing innovation and internationalization in SMEs (Birkinshaw et al., 2016) since such capabilities may lower the attrition existing between innovation and exports. In particular, the adoption of both the dynamic capability and the ambidexterity framework to study the tensions arising when SMEs combine innovation and internationalization activities may help us to clarify the strengths and weaknesses of different organizational settings that SMEs managers chose to sense and size opportunities and to reconfigure their internal activities.

According with these arguments, we analyse the role that previous experience on international markets and in technological partnerships may have in explaining whether and how SMEs can effectively combine a high level of effort on R&D spending and international sales with a superior performance. Experience may have an impact on a firm's dynamic capability, by exposing the organization to a variety of market situations that may increase its absorptive capacity and its capability to "learn to learn" (Zollo and Winter 2002). Collaboration in product innovation may provide a form of vicarious learning (Huber 1991), and it can

support firms in sensing and seizing new opportunities (Mack and Landau 2015), thus helping them to compress time economically into product development. Moreover, they can be important reputation accrual levers that help SMEs to overcome their "liability of newness" on international markets (Dittrich and Duysters 2007). In other words both experience in international markets and collaboration with universities and research centres in product innovation endeavours may provide SMEs the capabilities needed to integrate and balance exploration and exploitation activities at both the product and the market level (Zimmerman and Birkinshaw, 2016).

In order to analyse the international presence of SMEs, we have focused on exports, since high revenues from exports may capture more profound market exploration attempts and since exports represent the most common internationalization approach in SMEs, due to the fact that they require a lower commitment of resources than direct investments, such as establishing branches or plants on foreign markets. Our interest in exports is also motivated by the fact that they also represent the entry mode that hinders the learning processes and strategic foresight the most on foreign markets (Neirotti and Paolucci 2015).

We adopt Quantile Regression (QR) analysis on a sample of 221 high and medium tech firms operating in the north-west of Italy. Our findings are consistent with our predictions and show that, in the product domain, the development of knowledge through collaborations with external actors who are closer to the technological frontier, such as universities and research centres, positively moderates the negative impact that R&D activities and internationalization has on SME growth. At the same time, we have found that international market experience positively helps firms successfully combine these two endeavours, with respect to both the length and to the diversity of experience on different markets.

5.2 Theoretical Background

We discuss the theoretical arguments for which experience and openness in an R&D process can support SMEs in their R&D and internationalization endeavours according to the following logic. Section 5.2.1 explains why high intensity in R&D and export intensity can be conflicting goals for an SME that is pursuing sustainable business growth strategies. Section 5.2.2 explains why a dynamic

capability can mitigate the managerial tensions that arise when firms combine high spending on R&D with a broad market presence abroad, and why, when following the dynamic capability logic, previous experience in international operations and openness towards the innovation process are elements that support the dynamic capability that SMEs can develop to contextually balance R&D spending and exports. Section 5.2.3 discusses the relevant performance metrics used to assess the effect of combining high intensity in R&D spending and exports.

5.2.1 Why high intensity of both R&D spending and exports is too much for the typical SME

Product innovation in situations of high spending on R&D and market penetration abroad represents an explorative endeavour for an SME, whose returns are risky and uncertain and which require the application of a great deal of absorptive capacity to unfamiliar knowledge domains. For these reasons, recent studies have shown that SMEs have a lower business growth when they combine high intensity in both exports and R&D spending than when they pursue just one of the two actions (Battaglia et al. 2018). This may happen since SMEs are not able to enact explorative actions on both technological and market dimensions or in cross-domain ambidexterity situations on a diversified portfolio of R&D initiatives that combine exploitative and explorative projects that target both the foreign and the domestic market. This inability is due to the typical resource constraints that characterize SMEs. For example, most SMEs are family-run businesses in which no external managers participate in leading the firm (Bugamelli et al. 2012). This managerial structure weakens the capabilities of SMEs to conduct effective market and technological exploration, as the diversity of managerial experience and the professional background available in a firm's management team enrich its absorptive capacities (Lubatkin et al. 2006).

The other reason for the complexity of innovation initiatives that have an explorative objective on both the product and the market dimensions is not necessarily related to a firm's size. In other words, situations in which firms experiment a product that embodies a new architecture and/or a new technology entail an intensive coordination - and thus geographical proximity - with a lead

user over the entire innovation process (from the front-end to the validation). As such, firms conduct exploration on the product domain more effectively in situations of exploitation of their established market relationships. For SMEs, such a situation usually consists of a prevalence of local sales on their domestic markets.

High intensity in both exports and R&D spending can also reflect a diversified R&D project portfolio that includes both incremental and radical innovation projects that require a diversity of managerial and cultural approaches for the necessary coordination with customers (Gibson and Birkinshaw 2004). In the best option of feasibility for SMEs, such a situation includes technological exploration of a new product that targets a customer on the domestic market with incremental innovation initiatives that target some foreign markets. According to Voss and Voss (2013), this situation entails cross-domain ambidexterity, namely the capability of combining exploration in a domain with exploitation in another one. Such ambidexterity is not feasible for an SME, due to the limited scale and the few resources available for coordination between different R&D teams (Lee et al. 2001). On the other hand, contextual approaches can be sustainable, in terms of costs, since they do not entail any organizational separation of the teams that are engaged in different innovation projects. However, in a diversified R&D project portfolio situation, SMEs may make poor decisions on which projects they have to orchestrate their managerial attention as well as on the time of their R&D and marketing teams. This occurs since the routines and systems used to prioritize and allocate efforts across different projects, such as stage-to-gate processes or agile project management in product development, are generally not common in SMEs. The lack of prioritization may result in an "attention-allocation problem" (Koput 1997) that leads firms to under-invest in each of their multiple innovation projects. In these situations, the time-to-market of SMEs is likely to be slow, as will be their response to customers' requests for change, especially when the customers are geographically and culturally distant. For example, a firm could be ineffective in seizing the opportunity of revenue growth that stems from a radical product innovation on its domestic market when it is distracted by the need to introduce and market distinct incremental product refinements in order to adapt their established product to their multiple foreign markets (Chen and Nadkarni 2017). Furthermore, the more markets are dynamic and competitive – such as in hi-tech sectors - the greater the risk of losing growth opportunities, due to an under-investment in R&D or marketing activities.

5.2.2 How to develop dynamic capabilities to balance internationalization and R&D investments

If the feasibility of temporal and structural separation approaches for balancing exploration and exploitation activities on product and market domains is low for SMEs (Lubatkin et al., 2006), contextual approaches (as the balance of exploration and exploitation on the product-market domain) are more likely to occur in practical terms. However, the shortage of resources SMEs are subject to may limit the capabilities of firms to integrate divergent activities related with exploration and exploitation. In this vein, contextual ambidexterity (i.e. the ambidextrous strategy entailing the contemporary balance of exploration and exploitation at the product-market level) may be enabled and encouraged by the development of dynamic capabilities which are required to identify which tensions and challenges a firm faces and then to design the solutions the firm has to implement in order to mitigate or reconcile such tension (Birkinshaw et al., forthcoming).

In this vein, Birkinshaw et al. (2016) suggest that contextual managerial approaches to ambidexterity should be developed by developing an explorative and exploitative capability at the front-line managerial level across the entire organization, emphasizing that top managers (or entrepreneurs in the case of SMEs) should develop higher level context-shaping capabilities to orchestrate exploration and exploitation activities at the lower functional level. In other words, the development of sensing, seizing and transformation capabilities at the product and market level by functional managers belonging to their respective units (i.e. product and market) enable firms to manage tension within domains, and then to properly manage and balance exploration and exploitation activities in the product and the market domain. Once such capabilities at the domain level are reached, it is possible for managers to properly orchestrate resources across domains, in order to achieve a balance between exploratory and exploitative activities along the product-market domains (Teece, 2014).

At a front line level, dynamic capabilities can contribute supporting firms in exploration across different functional domains (R&D and marketing/sales, in this chapter), given their role in sustaining firms in sensing and seizing opportunities that are available in the firm's technological and market environment (Teece et al.

1997) and given their role in supporting firms in combining and integrating knowledge of different kinds and sources (Verona and Ravasi 2003).

The first mechanism takes place through openness with technological partners. In this vein, the open innovation literature (e.g., Lazzarotti et al. 2016) indicates that collaboration with external partners in innovation activities sustains firms in opportunity recognition and in their more rapid and efficient transformation into new business initiatives, whether it is a new radical product or entry onto a new foreign market through an incremental adaptation of an existing product. The second mechanism occurs through an SME's experience on international markets. In this way, the firm can be exposed to a greater diversity of institutional and market settings that can contribute to its absorptive capacity and its capability to develop new ways of learning that are applicable in unfamiliar knowledge domains.

In short, experience and collaboration with external innovation partners reflect the exertion of dynamic capabilities (Teece 2014) through make-or-ally decisions.

External Innovation Partners. According to the open innovation literature (Chesbrough 2006), the openness of innovation processes can contribute significantly to the dynamic capability of a firm (Laursen and Salter 2006). This is inherent to the vision of Teece (2014) of dynamic capabilities being the capability to do "the right thing" in relation to the goal of evolutionary fitness that firms have in environments characterized by high technological and market dynamism. In this vein, collaboration with external innovation partners, such as universities and research centres (Brunswicker and Vanhaverbeke 2015), may favour the development of such capabilities. The view on how openness can allow SMEs to be good at investing in product development and in penetrating foreign markets at the same time (i.e. in balancing exploration and exploitation within or across domains) has only been explored marginally from a theoretical and an empirical standpoint. According to the open innovation perspective, related to a partner-type depth of collaboration (e.g., Laursen and Salter 2006; Lazzarotti et al. 2016), previous works mainly distinguished two kinds of collaborations that a firm can build (Brunswicker and Vanhaverbeke 2015): collaborations with supply-chain partners, such as suppliers, customers or distributors; and collaborations with technological partners (such as universities and research centres). The focus of this study is on collaborations with technological partners.

As a first impression, the depth of collaboration with technological partners may just seem beneficial in relation to the capability of an SME to develop radical innovations (i.e. product exploration), while being indecisive for market exploration (West and Bogers 2014). Firms that are used to collaborating with universities and research centres are expected to develop superior absorptive capacities and to compress time in learning and product development processes (Kafouros et al. 2015). Moreover, the more technical and scientific universities develop technology transfer capabilities, the more they can lower the search costs for SMEs, thus preventing them from falling into problems of local search or over-search (Friesike et al. 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 et al. 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 own knowledge (Fabrizio 2006). This can have positive effects on the capability of a firm to develop and market new products that successfully meet the technical and market requirements of a broad variety of geographical markets. This can be reflected in superior revenue growth or even in superior profitability.

Experience. A complementary position to collaborations with technological partners emerges from experience. Learning processes are gradual and path dependant, since organizations develop new knowledge on the boundary of previous knowledge (Kogut ad 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/or 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 in relation to 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 - in the case of SMEs facing new international markets and technological discontinuities - refer to how they have become able to manage new technological and market uncertainty and complexity sources at a limited cost. Moreover,

rephrasing the idea that absorptive capacity depends on the level and the continuity of R&D investments (Cohen and Levinthal 1990), longer and more diversified international experience may reflect a superior absorptive capacity to sense and seize market opportunities.

International sales require new approaches to learning, given the diversity that different market areas exhibit in relation to value chains (Johanson and Vahlne 2003), distribution strategies, pricing strategies and financial systems (Eriksson et al. 2017). Such activities are not unambiguously identical country-by-country or region-by-region, but differ according to the cultural and institutional context. In this vein, experience allows firms to anticipate and respond to specific international conditions (Cieslik et al. 2015), to identify and exploit opportunities that arise on foreign markets, and to simultaneously avoid environmental threats (Zou and Stan 1998). In this vein, superior experience in international operations allows managers to draw on a larger set of knowledge and strategies that can be leveraged to extend their international activities by operating by analogy (Gavetti et al. 2005) and, thus, replicating and refining entry strategies from one geographic market to another (Jonsson and Foss 2011). 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 additional markets abroad to be replicated or developed quickly. In this vein, international experience allows managers to better orchestrate resources that enable a superior performance which, in turn, enables an appropriate allocation of resources between the innovation and the internationalization tasks. In other words, longer international experience may favour the balance of exploratory and exploitative endeavours at both the market and product domains by enabling firms to better manage exploration-exploitation tensions at the functional level, but also at a managerial level (Birkinshaw et al., 2016).

5.2.3 Relevant performance metrics for R&D and international activities

Exports and innovation may have an impact on both the revenue growth and operating profit margin of SMEs (Zhang et al. 2017). The first reason why an SME may decide to combine a great deal of effort in R&D and on exports is to allow it to pursue opportunities of revenue growth, thanks to the access to markets

where innovative products can be more easily marketed. According to the typical modalities of internationalization undertaken by SMEs, such growth opportunities can be realized at the expense of operating a profit margin, due to the use of export intermediaries or local partners on the foreign market (which leads to an increase in the service fees paid by SMEs to third parties). The other reason why the presence, on international markets, of innovative products that are the outcome of high spending on R&D can be detrimental to operating a profit margin is due to the cost of R&D projects. The greater complexity of coordination with customers and the greater effort necessary to explore technology or design alternatives can increase the costs of R&D, and this extra cost cannot be fully covered through the price applied to the product. However, in these circumstances, the increase in profit for SMEs may also stem from the fact that the same or lower operating profit margins are applied to a larger revenue base. Thus, SMEs may pursue value creation by enlarging their business growth while sacrificing their operating profit margins.

The attempts to combine product innovation with internationalization may also reflect a more ambitious attempt of SMEs to reposition themselves in stages of the value chain related to design and market relationships, where more economic value can be captured in the form of a higher operating profit margin. In this context, Wan and Wu (2017) have demonstrated how value distribution in vertical relationships depends on the suppliers' capability of repositioning themselves from manufacturing to more profitable positions in the value chain, which requires a greater effort on R&D, product design, marketing and customer relationship management. Therefore, greater efforts in R&D and exports may highlight the effort of a firm to reach superior operating profit margins.

5.3 Hypotheses development

For those firms that have a dynamic capability, the use of external sources in the innovation process often consists of partnerships with actors who operate at the frontier of technology development, such as universities and research centres. Specifically, relying on universities and research centres may lower the direct commitment of the resources sustained by SMEs in their attempt to incorporate new technologies that represent a radical innovation for them (Kafouros et al.

2015). In this context, Laursen and Salter (2006) demonstrated – with reference to the UK - 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, thus introducing products with a higher novelty degree onto the market. In the case of SMEs, this may occur for several reasons. First, as a result of a scarcity of resources, SMEs may be more reluctant to invest money and human capital in radical new projects, given their high risk (Salavou and Lioukas 2003). Harvesting radical new knowledge from universities and research centres may be a relatively easy and a less risky way of radically changing the technological trajectory and improving their long-term performance. Second, institutions that develop knowledge at the technological frontier (such as universities and research centres) can provide intellectual human capital, in the form of specialized labour, which SMEs could not deploy in their internal workforce (Zucker et al., 1998). Thus, as far as SMEs are concerned, the benefits that derive from collaborations with external actors at the frontier of technological development can lower the tensions in the allocation of resources on technology and market exploration. This is because it is necessary to use fewer resources to embrace radical new technologies in the product domain, since complex and time consuming explorative tasks are developed with the support of external actors. This in line with how Teece (2014) sees the role of managers in the creation of dynamic capabilities, namely orchestrating technological resources and technical know-how of their firms in the learning process that they need to undertake to pursue entrepreneurial opportunities. In other words, the development of dynamic capabilities requires resource orchestration to perform a dynamic set of tasks and activities, such as innovation and internationalization (Teece 2014).

The dynamic capabilities required by SMEs to tackle the radical innovation of products that are ready to be marketed on international markets can be built through collaboration with universities, following the tentative of the OEMs served by SMEs to move to a new technological paradigm. This has been well documented by Goracinova, Warrian and Wolfe (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 performances of new technology-based products on the basis of the requirements set by OEMs. The validation of technologies by universities offers both technological and market advantages. Research laboratories can allow SMEs to enrich their understanding of the properties and characteristics of a new technological paradigm (e.g. new

lightweight materials, new manufacturing processes, new product architectures, as in the case of electric vehicles), and to support their efforts in seizing new opportunities and transforming new knowledge into marketable products. From a market standpoint, collaborations with universities on new radical technologies can allow SMEs to attain important quality certification outcome, which reinforces their reputation on international markets. Hence, this collaboration reduces the newness and foreignness liability of SMEs towards OEMs and foreign customers, helps to sustain them in their exploration of foreign markets, and allows existing assets and routines to be reconfigured in new activities (i.e., realizing transformational dynamic capabilities). Another important point is related with the kind of product that universities bring to SMEs through collaborations. In many cases the collaboration between university and firm gives origin to technology platforms (Vohora et al., 2004) which firms may customize and refine to pursue different objectives in foreign markets. In this vein, firms may employ significantly less resources in refining the radical new technology to transform it into a marketable product. Therefore, they may save sufficient resources to pursue both market exploration and exploitation, thus rendering the balancing of explorative and exploitative activities possible within domains, a task which is usually very challenging for SMEs (Voss and Voss, 2013). Moreover, collaborating with universities and research centres, SMEs are more likely to properly balance exploration and exploitation endeavours and resources also across domains. In the specific case of collaborations with universities in the development of radical technologies, the product exploration activity is strongly reduced (i.e. is almost externalized) allowing SMEs to concentrate resources on the market domain, both on exploration or exploitation.

In short, these arguments support the idea that a close collaboration with universities and research centres is beneficial in orchestrating - at a higher level - resources on R&D and export activities thanks to the creation of dynamic capabilities. For these reasons, we posit that:

H1: The depth of collaboration of SMEs with technological partners in R&D endeavours positively moderates the negative interplay that R&D and export intensity has on their performance.

The relevance of the second-order dynamic capabilities that have been outlined above implies that the past knowledge and experience of SMEs on international markets may also play a significant role in reducing the costs and complexity of combining foreign sales with intensive R&D processes. The longer a firm's experience in addressing foreign markets is, the faster it will move and therefore the better its results in international operations will be (Thorpe et al. 2005). In fact, experience in foreign markets allows SMEs to reduce the costs associated with integration and coordination with foreign distribution partners, and to increase their ability to access knowledge on foreign markets and institutional regimes (Hsu et al. 2013). According to Cadogan et al. (2002), strategizing on international markets is a function of learning on two different dimensions, namely international experience intensity (i.e., the number of years a firm exports abroad with continuity) and international experience diversity (i.e., the number of geographical regions in which the company exports or has a direct market or productive presence).

We expect that those SMEs that have higher levels of international experience intensity and international experience diversity will be more able to successfully balance R&D and export endeavours, as these experience dimensions can be associated with second-order dynamic capabilities. In other words, those firms are more likely to have already encountered situations in which an unlearning of previous learning routines was needed to enter and prosper on an international market. As such, their repertoire of routines and learning modes to approach new markets and coordination with foreign customers in product innovation cycles may be broader, and firms can count on more experience to enter a new market effectively with low costs for exploration endeavours, thanks to their capability to "learn to learn" at a fast rate and with limited costs.

Overall, this process contributes to creating routines that can eventually be replicated to target different customers on the same foreign market. In fact, exporting firms may leverage economies of scale and, eventually, brand recognition to enter foreign markets through replication models (Winter and Szulanski 2001). However, replication models often have to be traded off with local adaptation. In this vein, firms are sometimes called upon to mix rigid replication strategies with flexible replication to adapt locally, in order to operate on foreign markets (Jonsson and Foss 2011). In other words, high international experience intensity leads to the escalation of the learning curve on the addressed international market, and allows firms to extend their foreign market to a larger customer base but with diminishing marginal costs. This enables a superior asset

orchestration, which in turns favours the balancing of R&D and export activities. Moreover, the balance between innovation and internationalization activities may also be enhanced thanks to spillover mechanisms arising from international operations. More specifically, a SME already engaged in international operations several (i.e. with a high international experience intensity) is more likely to benefit from the so called "learning by exporting" phenomenon (Clerides et al., 1998), implying that it may benefit for the development of new products of insights coming from international markets. This, in turn, enables the balancing of activities on the product and the market domain since, again, fewer resources may be used in product exploration, and can be employed in product-market exploitation activities or in market exploration activities. On the basis of these arguments, we may expect that SMEs with longer international experience are more likely to obtain performance advantages from combining high spending in R&D with export intensity than those with more limited experience.

Hence, we posit:

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

The international knowledge of SMEs can also augment when the firm operates on multiple and diverse foreign markets. This is because the exposure to different cultures, customers' behaviour and needs, institutional environments and technical norms increases the variety of experiences that a firm has to face in international operations and increases their rate of problem solving capabilities in the R&D activities that are needed to adapt the product to each local market (Barkema and Vermeulen 1998). The diversity of experience in foreign markets enhances a firm's knowledge stock through a learning process which is based on interactions with local knowledge sources and through exposure to different markets (Zahra et al. 2000). Moreover, this exposure broadens a firm's involvement in established networks of manufacturers and other technology providers, which in turn may increase learning on new technologies (Zahra et al. 2000), on new markets (Johanson and Vahlne 2009) and on new suppliers, distributors and technology partners. Moreover, this diversity of experience allows a firm to gain economies of scale by exploiting its distinctive capabilities

and assets across different geographic markets (Yeoh 2004) and allows it to develop a wide range of routines with which the firm can relate (Luo and Peng 1999). In this vein, from a learning exploitation perspective, a firm that addresses several diverse foreign markets is open to a multitude of diverse knowledge that has accumulated under the form of a stock of experience and behavioural models that can be efficiently exploited to address new markets (Barkema and Vermeulen 1998).

Moreover, having experience in multiple and diverse markets may favour the design of products and the *ex-ante* reconfiguration required by the products before they are sold abroad. This can be achieved at a low marginal cost. For instance, firms that design their products as platforms, or introduce modular innovations may reduce the refinements needed to address the preferences of foreign customers, thus allowing them to better orchestrate resources between the innovation and the internationalization functions. In a similar vein, an higher international experience diversity helps firms in understanding and transferring more easily and precisely to the product function customer's preferences, since firms are more accustomed in knowing where to search for understanding the tastes of their potential customers. This feature enables firms to save resources on the market domain since less cognitive, managerial, human and financial resources are employed in the exploration of foreign markets. Moreover, it also contributes to the development of products since the design unit is more likely to receive clear and certain product specifics from the market unit, thus reducing the effort spent in redesigning the product according to the new features introduced by the market unit each time that a change in the tastes of customers is detected.

For all the reasons stated above, the diversity of international experience may assume important roles in modifying the way SMEs combine internal innovative activities (such as R&D endeavours) and export activities. The capability to easily address a foreign market, thanks to the replication of routines developed while addressing other foreign markets, may allow SMEs to commit more resources to their R&D activities, ceteris paribus the outcome level of performance. Hence, we propose:

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

5.4 Data and methods

As for the empirical setting presented in chapter 4, testing the issues presented in this chapter would require to have project level data to understand firm's commitment toward exploratory projects on the product-market domains. Having such data would allow us to study if collaborations with universities and research centres and international experience would allow SMEs to develop dynamic capabilities able to let SMEs growing and profiting through exploratory product innovation targeting foreign markets, or through the combination of exploratory innovation projects targeting domestic markets and exploitative innovation projects targeting foreign markets. In this vein, we could adopt a split sample technique dividing our sample according to the level (low-high) of collaboration with research centres and universities, of international experience intensity and diversity. We could then test this issue reducing our sample to the SMEs pursuing both activities, using a 2SLS (to control for endogeneity). This technique would allow us to check for the impact of such strategies on growth and profit margins, emphasizing if in the case of high levels of collaboration/international experience the impact of the strategies above identified would turn positive with respect to growth and if they remain negative in the case of low levels of collaborations with research centres and universities or with low levels of international experience. Again, as in the case evidenced in chapter 4, we are prevented from obtaining such fine grained data. Therefore, we proceed to illustrate in the following paragraphs how we dealt to test our hypotheses.

Our data were taken from a survey administered in June and July 2014 on a cluster of innovative Small and Medium hi-tech Enterprises operating in Italy, in the Piedmont region, and concentrated in the province of Turin. These enterprises were selected according to the hi-tech requirements indicated by OECD (2009) and operate in several fields: manufacturing, ICT and advanced services. They were selected on the basis of the existence of some innovative requisites in operations over the three years preceding the survey (i.e. 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 realization of research projects funded by the European Community, ii) the realization of research projects funded by national and regional measures, iii) at least one patent filed, iv) the 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, obtaining a response rate that was in line with surveys on SMEs (30.26%). 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 data cleaning, we obtained 221 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).

5.4.1 Measures and construct validation

Dependant variables (performance)

As mentioned in section 5.2.3, we measured performance using both revenue growth and operating profit margins. In order to measure revenue growth, we used the logarithmic revenue growth rate calculated between 2008 and 2013. As the sample is a cross-industry selection of firms, we controlled for effects on revenue growth by centring this value on the basis of general industry trends of revenue growth and decrease. In this way, we used data from the Italian Institute of Statistical Analysis (ISTAT), which provides the aggregate annual revenues of all the different industries in Italy.

Operating profit margins were measured considering the Return on Sales (ROS), which was computed as the ratio between pre-tax operating income and sales revenue in 2013[xvi].

Independent Variables

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

Export intensity. This measure comes 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 external actors. The focus of our research has been on collaboration with technological actors. However, we have enriched our study with a post-hoc analysis that measured the marginal effect of technological actors against supply chain actors. This allowed us to capture the effect of technological actors alone and to avoid possible confounding effects, due to cross collaboration of firms with both technology and supply chain actors. For this reason, we asked the CEOs in the survey to indicate, on a Likert five-point scale, to what extent their firm relies on collaboration to develop new products with four different types of actors: suppliers, distributors, customers and universities and research centres. These types of actors are included in traditional literature on open innovation (e.g. Laursen and Salter 2006). We performed a Confirmatory Factor Analysis (CFA) using Principal Component extraction with Varimax rotation (see Appendix A5.1). We obtained two distinct constructs that discriminate the depth of collaboration with technological actors (universities and research centres) from the depth of collaboration with actors in the established supply chain of the firm (thus suppliers, customers, and distributors). As such, we included these separate constructs in the analyses in order to assess whether the depth of collaboration with external actors, irrespective of the type of partners, could mitigate the negative interplay on the performance between R&D and export intensity.

Experience in international markets: In order to measure the experience that a firm has in international markets, we measured:

-*Intensity of international experience*. This measure has been computed as the logarithm of the number of years of stable foreign activities the firm has achieved. This type of measure, pertaining to experience, was used extensively in the previous literature as a proxy of international experience (e.g. Hultman et al. 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. Being a weighted index, this variable takes into account not only the number of geographical regions addressed by each firm, but also their distance from the firm's headquarters (i.e. 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, expressed as the logarithm of the number of employees. Industry effects on the firm's growth rate of revenues were controlled by taking into account the munificence and the level of 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 and growth, whereas the latter scale was operationalized using established scales that took into account the respondents' perceptions about the market dimensions, entry barriers and the market concentrations.

Finally, we also included the position of the firm along the industry's supply chain. In other words, we asked firms to express the percentage of their sales to manufacturers of components or subassemblies and the percentage related to final customers or distributors. In this way, we were able to check whether a firm was prevalently positioned in an upper or lower position (i.e., closer to the final customer) in the supply chain.

5.4.2 Model specification

In order to test our hypotheses, we used Quantile Regression (QR). QR is a statistical tool that was developed by Koenker and Bassett (1978) which provides

information about the dependent variable and the regressors at different points of the conditional distribution of the outcome (Cameron and Trivedi 2009). This choice was driven by a right skewed distribution and by the great variability of the dependent variables. In such situations, it is preferable to consider a robust regression, such as QR, which allows one to work on each single point of the distribution and to make inferences at different quantiles (Li 2015). Moreover, this technique is more robust than, for instance, ordinary least squares, since the estimated coefficient vector is not sensitive to the observation of outliers on the dependent variable, and it is very appropriate when the error term is non-normal and when there is heteroskedasticity (Buchinsky 1998). This technique also allows a deeper analysis of the data, and thus showed a complete picture of the nuanced relationships at different levels of the conditional distribution (Li 2015). With reference to our analyses, we tested the hypotheses at three different levels of the conditional distribution for each dependent variable we considered. The regressions were performed at the 25th percentile, at the median and at the 75th percentile of the distribution of the dependent variables. This allowed us to capture a good fit of the models at low, medium and high levels of revenue growth and profitability.

5.5 Results

5.5.1 Descriptive statistics

The descriptive statistics are shown in Table 5.1. Firms' size is prevalently small in the sample, since on average the firms had 22 employees, with 50% of them having less than 15 employees. The small size of the firms may be due to the large presence of young firms, as about 25% of firms in the sample were less than 10 years old. However, the number of firms in the very first years of their activity was limited. The large presence of SMEs with a low number of employees and in a stage subsequent to the first five years of "incubation" indicates a general problem of growth in the analysed sample. This corroborates the interest in revenue growth as the dependant variable of the study.

The correlation between the depth of collaboration with technological and supply chain partners is low and not significant (Table 5.1). Thus, collaborating

with universities and/or research centres does not increase the probability of collaborating with supply-chain partners[xvii]. It is also worth noticing that, not surprisingly, the correlation between the intensity of international experience and the diversity of international experience is positive and significant. Thus, the longer the international experience of an SME, the more likely it is that the SME currently covers more foreign regions with its international sales.

5.5.2 Regression Results

Table 5.2 shows the results of the quantile regression models that tested the baseline effect of combining R&D endeavours and export on SME revenue growth (models 1 to 3) and on the profit margin (models 4 to 6). The results show that for the SMEs in our sample, regardless of the level of performance, combining endeavours in the product domain (i.e., performing R&D activities) and in the market domain (i.e., selling products abroad through exports) has a detrimental effect on both revenue growth and ROS. In particular, while the first-order effect of R&D intensity and export intensity is not significant at any of the levels of revenue growth or operating profit margin, the second-order interaction between R&D intensity and export intensity is negative and significant at all the levels of the conditional distribution of both revenue growth and operating profit margin, except for firms in the first quartile of the ROS distribution. However, in the latter case, the effect is still negative, and the significance is barely above the p-value threshold of 10%.

Table 5.3 shows the results of the quantile regression models that tested the moderation effect of the depth of collaborations on innovation and internationalization endeavours with universities and research centres, on revenue growth (Models 1,2 and 3) and ROS, respectively (Models 4, 5 and 6).

In Hypothesis 1, we predicted that the knowledge introduced by these actors in R&D initiatives helps SMEs to mitigate the tension between exports and R&D intensity on their performance. The results validate our prediction, both with respect to revenue growth and operating profit margin. In fact Models 1 and 3 depict a situation in which firms with low revenue growth rates (i.e. in the 25th percentile) and with high revenue growth rates (i.e. in the 75th percentile)

Table 5.1: Correlation matrix and descriptive statistics

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	ROS 2013	1														
2	Revenues Growth Rate (ln)	0.168*	1													
3	R&D intensity	0.099	0.222***	1												
4	Export intensity	0.052	-0.016	-0.117	1											
5	Collab. technological actors	0.537***	-0.057	-0.104	-0.159	1										
6	Collab. supply-chain actors	-0.134	0.008	-0.114	0.207**	0.020	1									
7	Int. experience intensity	-0.152	-0.135	-0.267***	0.559***	-0.069	0.350***	1								
8	Int. experience diversity	-0.112	-0.075	-0.159	0.464***	-0.179*	0.157	0.318**	1							
9	Employees (ln)	-0.237***	-0.092	-0.294***	0.272***	-0.079	0.063	0.050***	0.223**	1						
10	Hi-tech – Medium tech industry	0.041	0.053	0.249***	-0.158*	-0.005	-0.007	-0.306***	-0.031	-0.139*	1					
11	Age (ln)	-0.241***	-0.315***	-0.376***	0.236***	0.098	-0.233**	0.671***	0296***	0.593***	-0.241***	1				
12	Munificence	0.230**	0.096	0.222***	0.160*	-0.056	0.023	-0.005	0.013	-0.042	0.236***	-0.133*	1			
13	Competition	-0.024	-0.080	0.062	0.166*	0.091	0.174*	0.161*	-0.018	0.101	0.003	0.067	0.042***	1		
14	Components Sales	0.049	0.047	-0.135*	0.098	-0.066	0.050	0.171	0.076	0.076	-0.167*	0.132	-0.011	0.044	1	
15	End Users Sales	-0.014	-0.115	0.081	-0.093	0.059	-0.107	-0.285***	0.029	-0.146*	0.104	-0.167*	0.040	0.011	-0.651***	1
	Median	3.93	-0.11	0.045	0.15	0	0	1.980	0.571	2.710	1	3.135	1	1.11	0	1
	Mean	4.53	0.045	0.098	0.251	-0.148	-0.016	1.925	0.835	2.745	0.760	2.976	1.002	1.009	0.148	0.650
	Standard Deviation	6.825	0.966	0.152	0.286	1	1	1.609	0.886	0.949	0.428	0.876	0.216	0.265	0.290	0.422

****p-value < 0.1%; ** p < 1%; * p < 5%*

All reported statistics are referred to unstandardized values (except for 5 and 6)

Table 5.2: Quantile regressions on revenue growth and ROS. Baseline models

	Model 1 (ln) Rev.Growth *25th Percentile*	**Model 2** (ln) Rev.Growth *50th Percentile*	**Model 3** (ln) Rev.Growth *75th Percentile*	**Model 4** *ROS* *25th Percentile*	**Model 5** *ROS* *50th Percentile*	**Model 6** *ROS* *75th Percentile*
R&D intensity	0.064	0.011	0.098	0.064	-0.082	-0.173
	(0.06)	(0.06)	(0.09)	(0.15)	(0.13)	(0.14)
Export intensity	0.010	0.088	0.067	-0.121	0.078	0.163
	(0.06)	(0.06)	(0.09)	(0.13)	(0.11)	(0.11)
R&D int. X Export int.	-0.170*	-0.198**	-0.264*	-0.229	-0.290*	-0.310*
	(0.07)	(0.067)	(0.11)	(0.17)	(0.14)	(0.15)
Employees (ln)	0.086	0.064	0.041	-0.157	-0.127	-0.271
	(0.11)	(0.01)	(0.16)	(0.20)	(0.17)	(0.185)
Hi tech – Medium tech Sector	-0.009	0.015	-0.041	-0.035	-0.040	-0.175
	(0.10)	(0.09)	(0.16)	(0.20)	(0.17)	(0.18)
Age (ln)	-0.191*	-0.225**	-0.538***	0.011	-0.026	-0.051
	(0.08)	(0.073)	(0.11)	(0.12)	(0.13)	(0.14)
Munificence	0.090	0.069	0.072	0.132	0.259*	0.331**
	(0.06)	(0.06)	(0.09)	(0.12)	(0.10)	(0.11)
Competition	-0.062	-0.109†	-0.122	0.031	-0.185†	-0.330**
	(0.06)	(0.06)	(0.09)	(0.12)	(0.10)	(0.11)
Components Sales	-0.064	0.068	0.059	0.014	-0.036	0.013
	(0.07)	(0.06)	(0.10)	(0.12)	(0.11)	(0.12)
End Users Sales	-0.101	-0.398	-0.113	-0.096	-0.095	-0.179
	(0.07)	(0.07)	(0.11)	(0.13)	(0.11)	(0.12)
Constant	0.183	0.072	0.538	0.125	-0.021	0.104
	(0.422)	(0.39)	(0.62)	(0.73)	(0.62)	(0.66)
Pseudo- R2	0.18	0.16	0.28	0.24	0.22	0.30
Obs.	221	221	221	168	168	168

****p-value < 0.1%; ** p < 1%; * p < 5%; † p < 10% (Robust standard errors in parentheses).*
Industry effects controlled at the second digit of the SIC code.

Table 5.3: Quantile regressions on revenue growth and ROS for depth of collaboration with technological actors.

	Model 1 (ln) Rev.Growth *25th Percentile*	**Model 2** (ln) Rev.Growth *50th Percentile*	**Model 3** (ln) Rev.Growth *75th Percentile*	**Model 4** *ROS* *25th Percentile*	**Model 5** *ROS* *50th Percentile*	**Model 6** *ROS* *75th Percentile*
R&D intensity	0.093	0.059	0.315***	-0.284**	-0.220*	0.057
	(0.08)	(0.07)	(0.07)	(0.11)	(0.09)	(0.12)
Export intensity	-0.027	0.270	0.103	0.055	0.135†	0.277**
	(0.08)	(0.08)	(0.07)	(0.09)	(0.10)	(0.10)
R&D int. X Export int.	-0.178*	-0.264**	-0.340***	-0.315**	-0.032	0.031
	(0.08)	(0.08)	(0.08)	(0.12)	(0.10)	(0.13)
Collab. technological actors	-0.029	-0.049	-0.127*	0.558***	0.548***	0.641***
	(0.06)	(0.06)	(0.06)	(0.07)	(0.06)	(0.08)
R&D int. X Collab. technological actors	-0.054	-0.084	-0.277**	0.140	0.170*	0.168†
	(0.08)	(0.08)	(0.08)	(0.09)	(0.08)	(0.10)
Export int. X Collab. Technological actors	-0.038	-0.029	-0.133*	0.047	0.074	0.082
	(0.07)	(0.07)	(0.06)	(0.07)	(0.06)	(0.08)
R&D int. X Export int. X Collab. technological actors (H1)	0.175†	0.087	0.189*	0.197†	0.159†	0.393**
	(0.10)	(0.10)	(0.09)	(0.11)	(0.09)	(0.12)
Employees (ln)	0.037	0.054	0.019	0.000	0.018	-0.125
	(0.13)	(0.13)	(0.12)	(0.15)	(0.12)	(0.16)
Hi tech – Medium tech Sector	0.036	0.013	-0.076	-0.269†	0.105	-0.133
	(0.12)	(0.11)	(0.11)	(0.14)	(0.12)	(0.16)
Age (ln)	-0.160†	-0.264**	-0.396***	-0.091	-0.150	-0.364**
	(0.09)	(0.09)	(0.09)	(0.11)	(0.09)	(0.12)
Munificence	0.110	0.079	0.122†	0.181*	0.201**	0.215*
	(0.08)	(0.07)	(0.07)	(0.09)	(0.07)	(0.10)
Competition	-0.009	-0.129†	-0.131†	-0.143	-0.214**	-0.213*
	(0.08)	(0.07)	(0.07)	(0.09)	(0.07)	(0.10)
Components Sales	-0.057	0.006	0.052	-0.164†	-0.085	-0.038
	(0.08)	(0.08)	(0.08)	(0.09)	(0.08)	(0.10)
End Users Sales	-0.113	-0.077	-0.165	-0.146	-0.117	-0.063
	(0.09)	(0.08)	(0.08)	(0.10)	(0.08)	(0.11)
Constant	0.283	0.113	0.121	-0.163	0.103	0.722
	(0.47)	(0.46)	(0.44)	(0.52)	(0.44)	(0.58)
Pseudo- R2	0.21	0.18	0.34	0.43	0.41	0.46
Obs.	186	186	186	168	168	168

****p-value < 0.1%; ** p < 1%; * p < 5%; † p < 10% (Robust standard errors in parentheses).*
Industry effects controlled at the second digit of the SIC code.

Table 5.4 – Quantile regressions on revenue growth and ROS for international experience intensity

	Model 1 (ln) Rev. Growth *25th Percentile*	**Model 2** (ln) Rev. Growth *50th Percentile*	**Model 3** (ln) Rev. Growth *75th Percentile*	**Model 4** *ROS* *25th Percentile*	**Model 5** *ROS* *50th Percentile*	**Model 6** *ROS* *75th Percentile*
R&D intensity	-0.053	0.039	0.094	-0.192	-0.362	0.258
	(0.12)	(0.11)	(0.15)	(0.18)	(0.22)	(0.17)
Export intensity	-0.229*	-0.120	0.046	-0.178	-0.214	0.321*
	(0.10)	(0.09)	(0.13)	(0.14)	(0.16)	(0.12)
R&D int. X Export int.	-0.545***	-0.576***	-0.663***	0.135	-0.115	0.731***
	(0.12)	(0.10)	(0.15)	(0.22)	(0.26)	(0.21)
Int. experience intensity	0.188	0.338	0.081	0.397†	0.376	0.342
	(0.26)	(0.23)	(0.33)	(0.23)	(0.27)	(0.22)
R&D X Int. experience intensity	-0.305†	-0.395**	-0.475*	0.202	0.266	-0.142
	(0.16)	(0.15)	(0.20)	(0.24)	(0.28)	(0.22)
Export X Int. experience intensity	0.310*	-0.304*	0.261	-0.000	-0.084	0.225
	(0.13)	(0.12)	(0.16)	(0.16)	(0.20)	(0.15)
R&D int. X Export X Int. experience intensity (H2)	0.529**	0.538**	0.829**	-0.427	-0.489	-1.086*
	(0.19)	(0.17)	(0.24)	(0.27)	(0.32)	(0.25)
Employees (ln)	-0.167	-0.013	-0.043	-0.791***	-0.586**	-0.423*
	(0.16)	(0.15)	(0.21)	(0.18)	(0.21)	(0.16)
Hi tech – Medium tech Sector	0.068	0.047	0.002	-0.024	-0.043	-0.101
	(0.13)	(0.11)	(0.16)	(0.16)	(0.19)	(0.15)
Age (ln)	-0.33	-0.585**	-0.568*	-0.259	-0.140	-0.331†
	(0.21)	(0.19)	(0.26)	(0.21)	(0.25)	(0.20)
Munificence	-0.049	-0.008	-0.079	0.114	-0.135	0.247*
	(0.09)	(0.08)	(0.12)	(0.11)	(0.13)	(0.10)
Competition	-0.048	-0.155†	-0.138	0.004	-0.079	-0.311**
	(0.09)	(0.08)	(0.12)	(0.10)	(0.13)	(0.09)
Components Sales	0.036	0.004	0.043	0.072	0.057	0.141
	(0.08)	(0.07)	(0.11)	(0.10)	(0.12)	(0.09)
End Users Sales	0.057	-0.023	-0.015	-0.055	-0.113	0.107
	(0.10)	(0.09)	(0.13)	(0.11)	(0.14)	(0.11)
Constant	0.028	-0.086	0.089	-0.150	-0.116	0.025
	(0.48)	(0.43)	(0.61)	(0.57)	(0.68)	(0.53)
Pseudo- R2	0.31	0.30	0.47	0.40	0.34	0.43
N	127	127	127	127	127	127

****p-value =< 0.1%; ** p =< 1%; * p =< 5%; † p =< 10% (Robust standard errors in parentheses).*

Industry effects controlled at the second digit of the SIC code.

collaborating with universities and research centres benefit from reconciling R&D activities and exports to obtain a superior growth (b_{25}=0.175; p_{25}<0.1; b_{75}=0.189; p_{75}<0.05, respectively). The benefit of relying on collaboration with universities and research centres for firms that combine R&D activities and exports is also validated in terms of profitability. Surprisingly, Models 4, 5 and 6 indicate that the first-order effect of R&D intensity on operating profit margin is negative (in the two lowest quartiles) or at the most non-significant (in the higher quartiles of the distribution of operating profit margin). On the other hand, the effect of export intensity is positive and significant (in the higher quartiles of operating profit margin). Moreover, the second-order interaction effect indicates that firms have less operating profit margin when they combine a high intensity of both R&D spending and export levels. This happens for the firms in the lowest quartile. The third-order interaction effects at different levels of the conditional distribution report a significant and positive effect (which is more evident when such an effect is estimated at the 75th percentile), thus implying that the trade-off effects, due to combining export and R&D intensity, are less significant on ROS when SMEs collaborate with universities. This result also validates hypothesis H1 as far as profitability is concerned.

In short, Models 4, 5 and 6 depict a situation in which collaborating with technological partners positively moderates the negative effect, due to the combination of R&D activities and exports, on ROS (b_{25}=0.197; p_{25}<0.1; b_{50}=0.159; p_{50}<0.10 b_{75}=0.393; p_{75}<0.01).

Table 5.4 reports the models that tested the moderating effect of the intensity of international experience on R&D and export activities for revenue growth (Models 1 to 3) and operating profit margins (Models 4 to 6). In Hypothesis 2, we posited that the longer the international experience of an SME, the lower the negative effect on performance, due to the interplay between R&D and export intensity. The third-order interaction effect between intensity in R&D, export and international experience is positive and significant at all the levels of the conditional distribution (b_{25}=0.529; b_{50}=0.538; b_{75}=0.829; p_{25}<0.01; p_{50}<0.01; p_{75}<0.01) for revenue growth. Conversely, we did not find any significant moderation effect, due to international experience intensity, at the 25th and 50th percentile of the distribution of operating profit margins (Models 4 and 5). Model 6 (75th percentile) is an exception. In fact, we found that high international

experience intensity is detrimental to profitability. These results support H2, with reference to revenue growth, but do not support H2 with regard to SME profitability as a dependent variable.

Table 5.5 reports the models that were used to test the moderation effect of international experience diversity on reconciling R&D and export activities for revenue growth (Models 1, 2 and 3) and ROS (Models 4, 5 and 6). In Hypothesis 3, we posited that the broader the market coverage of an SME on international markets, the lower the negative effect on performance, due to the combination of R&D and export intensity. The third-order interaction effect that considers the moderating effect of international experience diversity, for revenue growth as the performance variable, is positive and significant for firms positioned in the 25^{th} (b_{25}=0.458; p_{25}<0.001) and the 75^{th} (b_{75}=0.376; p75<0.1) percentiles of the revenue growth distribution. These results validate H3, with reference to SME revenue growth. However, Models 4 to 6 – which were used to test the effect of international experience diversity on moderating the negative impact of R&D and export activities on operating profit margins – did not highlight any positive moderation effect but, as for the Hypothesis 2 test, they depicted a situation in which firms experiencing superior profitability (at the 75^{th} percentile) are undermined in their operating profit margins when they address multiple and diverse international markets. These results do not support H3, with reference to SMEs profitability.

Finally, in Table 5.6 further shows that the international experience diversity and intensity, as well collaboration with universities and research centres, are separately identifiable effects that explain, both when we take into account operating profit margins and revenue growth, the age moderation. This latter result thus suggest that behind the effect proxied by age there are these elements and that as firms age they should develop international experience to sustain growth, but also collaborations with universities and research centres to better balance innovation and internationalization endeavours. Only in one case international experience and collaborations with universities do not explain the age moderation or R&D investments and exports, namely when we try to measure the impact of such variables on the operating profit margins of the more profitable firms. In this case, the sign of the third level interaction entailing age still remains positive and significant, thus suggesting that other elements are in place in rendering viable internationalization and innovation activities in the context of SMEs achieving high operating profit margins.

In short, the situation depicted by the models in Tables 5.2, 5.3, 5.4 and 5.5 fully supports Hypothesis 1, but also partially validates Hypotheses H2 and H3. In other words, we found support for the idea that SMEs may benefit from collaborations with universities and research centres, with regard to revenue growth and operating profit margins, and from their international experience intensity and diversity, with regard to revenue growth. Conversely, we found that international experience intensity and diversity do not positively moderate the negative impact of R&D and export intensity on operating profit margins, but surprisingly contribute to undermining this intensity in situations where SMEs experience a high unit operating profit margin. Table 5.7 offers a synthetic version of the results to ease the reading.

5.6 Discussion and conclusions

This study has investigated the factors that enable those firms that attempt to combine product exploration activities with market exploration activities on foreign markets to achieve a superior performance. Previous studies provided mixed evidence about how pursuing explorative strategies in multiple domains affects SME performance (Voss and Voss 2013, Zhang et al. 2017). Our results are in line with previous research, that is, they point to a detrimental effect on growth and profitability of SMEs as result of the contemporary combination of innovation and internationalization endeavours (Kumar 2009; Battaglia et al. 2018). However, we have moved beyond this result by showing that opening up the innovation activities to collaborations with universities and research centres enhances the benefits of combining product exploration with market exploration – in terms of both growth and profitability. We found that previous experience on foreign markets is the second type of factor that mitigates such tensions. In short, firms with longer international experience and a broader coverage of foreign markets suffer less from the negative effect on revenue growth due to combining a high level of R&D and export intensity. However, this result only holds true when revenue growth is considered as the dependant variable, and not when the profitability margin is taken into account as the dependant variable.

These results contribute to both the ambidexterity and the dynamic capability literature, since the depth of collaboration with technological partners in innovation processes and previous experience on international markets are two

conditions that allow SMEs to exert a dynamic capability as far as SMEs try to balance product-market exploratory and exploitative activities.

In the words of Birkinshaw et al. (2016), opening to universities the innovation activities of SMEs and developing international experience help firms to build "a context-shaping capability enabling front line managers to sense and seize more easily opportunities at the same time" (p.37, emphasis added). Such conditions are more likely to offer SMEs the capability to manage the tension between R&D and market exploration for two reasons. First, the depth of collaboration with technological partners can reduce the costs for exploration, as they can compress the time necessary to access new technological knowledge and to validate its use for the development of a new product. In the same vein, the length and variety of experience on foreign markets put firms in a condition whereby they can avoid past errors in market exploration or can use analogy with previous similar market strategy decisions. Experience and technological partnerships thus reduce the cost of exploration, by putting firms in the condition whereby they can orchestrate their assets (management attention, human and financial resources devoted to marketing or technology exploration) more efficiently, coherently with what Teece (2014) considered as a fundamental trait of a dynamic capability. Second, international experience and deep collaboration with universities and research centres allow SMEs to sense and seize technology and market opportunities, and to transform them into viable products and strategies for international markets.

With reference to the ambidexterity literature, this chapter represents a further step in bridging the ambidexterity literature with the dynamic capability framework. Complementing the theoretical propositions advanced by Zimmerman and Birkinshaw (2016), we showed that not only the tentative of firms to contextually manage divergent activities may entail the development of dynamic capabilities, but also that to achieve balancing between activities generating tensions, as innovation and internationalization, requires SMEs to undertake a series of complementary actions entailing the development of dynamic capabilities. In sum, opening the innovation process to universities and research centres and accumulating experience in international markets enable and encourage firms to develop dynamic capabilities which facilitate the balancing of innovation and internationalization to sustain growth. In this vein, this research extends the relationship between dynamic capabilities and ambidexterity strategies advanced by previous literature (e.g. Zimmerman and Birkinshaw, 2016; O'Reilly and Tushman, 2008) by advancing the key role of dynamic capabilities as antecedent of contextual ambidexterity (i.e. without the dynamic

Table 5.5: Quantile regressions on revenue growth and ROS for international experience diversity

	Model 1 (ln) Rev.Growth *25th Percentile*	**Model 2** (ln) Rev.Growth *50th Percentile*	**Model 3** (ln) Rev.Growth *75th Percentile*	**Model 4** *ROS* *25th Percentile*	**Model 5** *ROS* *50th Percentile*	**Model 6** *ROS* *75th Percentile*
R&D intensity	-0.100	-0.084	0.232	-0.200	0.177	-0.250
	(0.11)	(0.12)	(0.18)	(0.14)	(0 19)	(0.24)
Export intensity	-0.047	0.010	-0.035	0.001	0.144	0.363*
	(0.08)	(0.09)	(0.13)	(0.10)	(0 13)	(0.16)
R&D int. X Export int.	-0.255*	-0.397**	-0.706***	-0.063	0.062	0.103
	(0.11)	(0.12)	(0.17)	(0.15)	(0 21)	(0.26)
Int. experience diversity	0.134	0.055	0.048	0.053	-0.131	-0.211
	(0.93)	(0.10)	(0.15)	(0.11)	(0 14)	(0.18)
R&D intensity X Int. experience diversity	-0.128	-0.070	-0.176	0.074	-0.367†	-0.432†
	(0.10)	(0.11)	(0.16)	(0.15)	(0 20)	(0.25)
Export X Int. experience diversity	0.197*	-0.030	-0.073	-0.329**	-0.368**	-0.473**
	(0.08)	(0.08)	(0.12)	(0.09)	(0 12)	(0.15)
R&D int. X Exp. X Int. experience diversity (H3)	0.458***	0.044	0.376†	-0.220	-0.301	-0.560*
	(0.12)	(0.14)	(0.19)	(0.16)	(0 22)	(0.27)
Employees (ln)	0.068	0.076	0.061	-0.460**	-0.580**	-0.548*
	(0.14)	(0.15)	(0.22)	(0.15)	(0 20)	(0.26)
Hi tech – Medium tech Sector	0.033	0.058	-0.039	-0.071	-0.107	-0.317
	(0.11)	(0.12)	(0.17)	(0.14)	(0 18)	(0.23)
Age (ln)	-0.082	-0.287*	-0.445**	0.166	0.294†	0.188
	(0.10)	(0.11)	(0.16)	(0.12)	(0 16)	(0.20)
Munificence	-0.028	-0.014	-0.108	0.144	0.222†	0.303†
	(0.08)	(0.09)	(0.13)	(0.10)	(0 13)	(0.16)
Competition	-0.011	-0.121	-0.106	-0.131	-0.112	-0.223
	(0.08)	(0.09)	(0.12)	(0.089)	(0 11)	(0.15)
Components Sales	0.010	0.042	0.042	0.018	0.007	-0.001
	(0.07)	(0.08)	(0.11)	(0.085)	(0 11)	(0.14)
End Users Sales	-0.062	-0.003	-0.037	-0.049	-0.053	-0.035
	(0.08)	(0.09)	(0.13)	(0.10)	(0 13)	(0.16)
Constant	0.012	0.143	0.261	0.114	0.280	-0.278
	(0.40)	(0.443)	(0.63)	(0.47)	(0 63)	(0.79)
Pseudo- R2	0.28	0.24	0.39	0.39	0 31	0.33
N	127	127	127	127	127	127

Notes: ****p-value < 0.1%; **p < 1%; *p < 5%; † p < 10% (Robust standard errors in parentheses).*

Industry effects controlled at the second digit of the SIC code

Table 5.6: Evidence of the separate effect and relationship with age

	Model 1 (ln) Rev.Growth *25th Percentile*	**Model 2** (ln) Rev.Growth *50th Percentile*	**Model 3** (ln) Rev.Growth *75th Percentile*	**Model 4** *ROS* *25th Percentile*	**Model 5** *ROS* *50th Percentile*	**Model 6** *ROS* *75th Percentile*
R&D intensity	0.211	0.252	0.009	-0.471	0.416	1.201**
	(0.36)	(0.46)	(0.43)	(0.37)	(0.62)	(0.45)
Export intensity	0.011	0.325*	0.625***	0.462**	0.137	0.703***
	(0.12)	(0.15)	(0.14)	(0.15)	(0.25)	(0.18)
R&D int. X Export int.	-0.294	-0.293	-0.464	-1.098**	-0.782	-1.139**
	(0.27)	(0.35)	(0.33)	(0.32)	(0.52)	(0.38)
Collab. technological actors	-0.099	-0.021	0.019	0.413***	0.285*	0.406***
	(0.08)	(0.103)	(0.09)	(0.07)	(0.12)	(0.09)
R&D int. X Collab. technological actors	-0.299*	0.029	0.108	-0.055	0.024	0.350*
	(0.12)	(0.158)	(0.15)	(0.12)	(0.19)	(0.14)
Export int. X Collab. Technological actors	0.046	-0.031	-0.081*	-0.224	0.077	0.262*
	(0.07)	(0.09)	(0.04)	(0.92)	(0.15)	(0.11)
R&D int. X Export int. X Collab. technological actors (H1)	0.038†	0.159**	0.116*	0.442**	0.118	0.383*
	(0.02)	(0.05)	(0.05)	(0.15)	(0.25)	(0.18)
Int. experience intensity	-0.659*	0.0389	0.601†	0.324	0.749	1.932***
	(0.28)	(0.36)	(0.34)	(0.35)	(0.57)	(0.41)
R&D X Int. experience intensity	-0.978	-0.596	-0.271	-0.618	1.757	-0.224**
	(0.63)	(0.811)	(0.76)	(0.69)	(1.13)	(0.08)
Export X Int. experience intensity	0.151	-0.799**	-0.827**	0.778	-0.480	-0.167***
	(0.22)	(0.28)	(0.27)	(0.69)	(0.49)	(0.03)
R&D int. X Export X Int. experience intensity (H2)	0.048†	0.352*	1.736*	-1.107**	-1.156	-0.267***
	(0.02)	(0.14)	(0.67)	(0.30)	(1.11)	(0.08)
Int. experience diversity	-0.-316**	-0.137	-0.347***	-0.140	-0.086	0.292*
	(0.08)	(0.11)	(0.103)	(0.10)	(0.17)	(0.12)
R&D intensity X Int. experience diversity	-0.488***	-0.402*	-0.478**	-0.128	0.189	0.339†
	(0.12)	(0.15)	(0.15)	(0.16)	(0.27)	(0.19)
Export X Int. experience diversity	0.239**	-0.072	0.044	0.371**	-0.127	-0.024
	(0.07)	(0.10)	(0.09)	(0.116)	(0.19)	(0.13)
R&D int. X Exp. X Int. experience diversity (H3)	0.175†	0.074	0.216†	-0.506*	-0.313*	0.207
	(0.10)	(0.17)	(0.11)	(0.22)	(0.12)	(0.26)
Age	-0.024	-0.760**	-0.883***	-0.235	-0.621	-1.816***
	(0.16)	(0.27)	(0.26)	(0.26)	(0.43)	(0.31)
R&D int. X Age	-0.047	-0.155	-0.440	0.671	1.078	1.547**
	(0.42)	(0.54)	(0.511)	(0.45)	(0.75)	(0.54)
Export int. X Age	-0.024	-0.753***	-0.849***	1.016***	0.522	1.318***
	(0.15)	(0.20)	(0.19)	(0.22)	(0.36)	(0.26)
R&D int. X Export int. X Age	0.185	0.136	-0.353	-0.574	-0.904	-2.254***
	(0.38)	(0.48)	(0.46)	(0.57)	(0.94)	(0.68)
Constant	0.082	-0.078	-0.149	-0.029	-0.488	-0.337
	(0.33)	(0.42)	(0.40)	(0.37)	(0.61)	(0.44)
Pseudo- R2	0.48	0.46	0.62	0.59	0.53	0.56

****p-value < 0.1%; ** p < 1%; * p < 5%; † p < 10% (Robust standard errors in parentheses).*

Industry effects controlled at the second digit of the SIC code.

Note: Each model has been computed including the controls previously used in the other analyses. They have been not included for the sake of space and readability.

Table 5.7: Summary of the main results

	Type of performance	
	Revenue Growth	**Operating Profit Margin**
R&D intensity	n.s.	n.s.
Export intensity	n.s.	n.s.
R&D X Export Intensity	-	-
H1: Moderation of depth of collaboration with universities and research centres	+	+
H2: Moderation by international experience intensity	+	-
H3: Moderation by international experience diversity	+	-

capability of orchestrating scarce resources between innovation and internationalization tasks SMEs strive to achieve contextual ambidexterity and superior performance).

The fact that the length and the variety of international experience do not have a positive moderating effect on the negative effect that the combination of R&D and export intensity has on profitability can offer another important finding to literature. A plausible explanation is that such a variety of market coverage increases the complexity of the innovation project portfolio, and this makes it necessary for SMEs to adapt their product configuration to an excessive variety of market requirements, which dramatically increases the product development costs. This can reflect the weaknesses that SMEs can suffer from the use of modular approaches to product development that are aimed at pursuing an easier adaptation of product features to a variety of configurations in market requirements (Schilling 2000). The implication of this finding for managers is that they can invest in modular systems before broadening their market coverage abroad. The other reason that can explain the lack of a third-order moderation effect of experience over the profitability margin can be the over-search problems that SMEs can encounter when they are confronted with a broad variety of market situations. Such an over-search can have an impact on the duration and the costs of R&D projects, which can be detrimental to their profitability margins.

In raising this evidence, we offer a finer-grained contextualization of the effect of age and the liability of newness proposed by past researchers (e.g. Battaglia et al. 2018) to explain the tension that combining R&D and export activities has on SME performance. In other words, our evidence and theoretical considerations show that younger SMEs are usually associated with a more limited capability to orchestrate R&D and market endeavours effectively when relying on past experience (which can favourably impact the learning of new market entry or foreign penetration strategies) and on collaboration with technological partners, which can offer younger SMEs faster access to new technology and its validation in their product architecture, and a more solid reputation of innovative product development on international markets. As such, those firms that are not at the initial stage of their life cycle may be more capable of using experience and external partnerships as two conditions to exert dynamic capabilities and to effectively orchestrate their resources on conflicting goals, such as R&D and export endeavours.

As this chapter is a first attempt to investigate the moderators of innovation and internationalization activities, it is not free of limitations. One of these concerns the generalizability of our results: we tested this relationship on a sample of firms from the north-west of Italy, but this work should be extended to verify the robustness of our results in other contexts. Second, we measured performance using the growth rate over six years, while the measurements of R&D expenditures and exports are punctual. However, the experience that led the SMEs to such levels of R&D intensity and exports is unlikely to have been matured over one or over just a few years, so punctual measures can be evaluated as a good proxy of the attitude of SMEs over the years. However, a study on panel data could overcome this limitation. Moreover, the other performance measures we used (operating profit margins) might not be perfect to capture the strategies of SMEs. Most of them, in fact, are focused, in the short-medium term, on obtaining viability (i.e. on growth) rather than sustaining viability (i.e. on increasing profitability). This could explain the results we obtained about the moderation effect of international experience. We suggest more research is needed to clarify this point. Third, in our study, we identified exports as a market exploration strategy. We acknowledge the possibility of exports taking place in SMEs as the exploitation of a market in a particular country instead of as an explorative strategy. This effect could in particular take place in older and well-established SMEs. We considered this effect negligible in our sample, due to the large presence of young SMEs. However, we suggest that this issue should be taken into account in future studies by using more fine-grained measurements of international market exploration and exploitation.

5.7 Appendix

Table A5.1: Factor analysis for collaboration with external actors

Construct name	Source	Items	SFL	Mean	SD	α
Collaborations with supply-chain actors	Laursen and Salter (2006)	What role do customers have in bringing new knowledge and information for innovation activities? *(1: very low/none; 5: very high)*	0.6863	4.18	1.03	**0.58**
		What role do suppliers have in bringing new knowledge and information for innovation activities? *(1: very low/none; 5: very high)*	0.7292	2.90	1.24	
		What role do distributors have in bringing new knowledge and information for innovation activities? *(1: very low/none; 5: very high)*	0.7772	2.42	1.43	
Collaborations with technological actors	Laursen and Salter (2006)	What role do universities and research centres have in bringing new knowledge and information for innovation activities? *(1: very low/none; 5: very high)*	0.9671	2.57	1.39	**n/a**

Table A5.2: Marginal effects of collaborations with technological actors vs. collaboration with supply-chain actors

	Model 1 (ln) Rev. Growth *25th Percentile*	**Model 2** (ln) Rev. Growth *50th Percentile*	**Model 3** (ln) Rev. Growth *75th Percentile*	**Model 4** ROS *25th Percentile*	**Model 5** ROS *50th Percentile*	**Model 6** ROS *75th Percentile*
R&D intensity	0.192*	0.171*	0.258**	-0.230*	-0.367***	-0.044
	(0.08)	(0.07)	(0.09)	(0.10)	(0.10)	(0.12)
Export intensity	-0.007	0.048	0.119	0.081	-0.016	0.143
	(0.08)	(0.07)	(0.09)	(0.09)	(0.09)	(0.10)
R&D int. X Export int.	-0.173†	-0.070	-0.335***	-0.280**	-0.252*	-0.108
	(0.09)	(0.08)	(0.10)	(0.09)	(0.10)	(0.11)
Collab. technological actors	-0.032	-0.045	-0.134†	0.494***	0.477***	0.474***
	(0.06)	(0.06)	(0.07)	(0.07)	(0.07)	(0.08)
R&D int. X Collab. technological actors	0.031	-0.046	-0.312***	0.252**	0.163†	0.086
	(0.08)	(0.08)	(0.09)	(0.09)	(0.10)	(0.11)
Collab. technological actors X Export int.	0.078	-0.025	0.109	0.144*	0.060	0.015
	(0.07)	(0.06)	(0.07)	(0.07)	(0.07)	(0.08)
Collab. technological actors X R&D int. X Export int.	0.193*	0.039	0.169	0.256*	0.120	0.244*
	(0.10)	(0.09)	(0.11)	(0.10)	(0.11)	(0.12)
Collab. supply-chain actors	0.072	0.086	0.049	0.032	-0.018	0.068
	(0.06)	(0.06)	(0.07)	(0.08)	(0.09)	(0.10)
R&D int. X Collab. supply-chain actors	-0.054	-0.042	-0.135†	0.068	-0.072	0.065
	(0.07)	(0.06)	(0.08)	(0.15)	(0.15)	(0.17)
Collab. supply-chain actors X Export int.	-0.092	-0.022	-0.050	0.050	0.061	0.030
	(0.07)	(0.06)	(0.07)	(0.09)	(0.10)	(0.11)
Collab. supply-chain actors X R&D int. X Export int.	-0.041	-0.107	-0.038	0.266	0.104	0.271
	(0.08)	(0.08)	(0.09)	(0.18)	(0.19)	(0.21)
Employees (ln)	0.183	0.053	0.017	0.000	-0.068	-0.141
	(0.12)	(0.11)	(0.14)	(0.14)	(0.15)	(0.17)
Hi tech – Medium tech Sector	0.078	-0.056	-0.130	-0.081	-0.077	0.007
	(0.10)	(0.10)	(0.12)	(0.14)	(0.14)	(0.16)
Age (ln)	-0.236**	-0.228**	-0.447***	-0.049	-0.104	-0.223†
	(0.08)	(0.08)	(0.10)	(0.11)	(0.11)	(0.13)
Munificence	0.027	-0.081	0.077	0.012	0.165†	0.181†
	(0.07)	(0.07)	(0.08)	(0.08)	(0.09)	(0.09)
Competition	-0.022	-0.141*	-0.105	-0.101	-0.168†	-0.244*
	(0.07)	(0.07)	(0.08)	(0.08)	(0.09)	(0.09)
Components Sales	-0.043	0.028	-0.072	-0.123	-0.075	0.002
	(0.07)	(0.07)	(0.09)	(0.09)	(0.09)	(0.10)
End Users Sales	-0.132	-0.034	-0.212*	-0.188	-0.219*	-0.070
	(0.08)	(0.08)	(0.09)	(0.09)	(0.10)	(0.11)
Constant	0.293	0.127	0.094	0.111	0.021	0.706
	(0.44)	(0.41)	(0.49)	(0.53)	(0.56)	(0.)
Pseudo- R2	0.28	0.21	0.35	0.42	0.38	0.41
Obs.	186	186	186	186	186	186

Notes: ****p-value < 0.1%; ** p < 1%; * p < 5%; † p < 10% (Robust standard errors in parentheses). Industry effects controlled at the second digit of the SIC code.*

Chapter 6

SMEs internationalization and innovation trajectories: combining import, export and innovation activities.

Premise

In the previous chapters we have addressed the conjunct effect of internationalization and innovation endeavours on SME performance. In particular, we have concentrated our attention on export activities and R&D endeavours looking at their effect on revenue growth. We arrived at two main results: first, we showed that R&D and export are two activities which, despite their potential of enabling superior revenue growth for SMEs if considered in isolation, taken together limit SME performance; second, we showed that under some specific conditions (i.e. collaborating in innovation activities with universities and research centres and developing international experience) such activities can be successfully balanced by SMEs to pursue higher revenue growth.

Altough previous results find confirmation in different theoretical views as the domain ambidexterity and the dynamic capability framework, they take under consideration a simplified model of how internationalization and innovation occur in SMEs. More specifically, in previous chapters we have proxied innovation with R&D expenditures. However, R&D expenditures may only represent an attempt of the firm to develop product innovations, which may finally result in no new products introduced into the market. At the same time, we have focused on international endeavours by relying to exports. Even in this case, exports are only partially representing the endeavour of SMEs to reach foreign markets. Firms, in fact, may rely to different activities to promote their activities abroad. In particular they may rely to foreign direct investments (FDIs), technology/product licensing or imports (Yasar and Paul, 2007). However, in the case of SMEs few of them rely to FDIs due to the high cost of such activities, which usually implies a huge investment of money to build foreign subsidiaries (EC, 2015). At the same time, their scarce financial resources force them to pay attention to patenting and licencing out products or technologies since it would be difficult for them to enforce infringements against competitors or firms adopting the technology (Holgersson, 2013). For this reason, in fact, SMEs are used to prefer other instruments, as industrial secrets, as way to protect their innovations. If SMEs rarely rely to FDIs and licensing out, they are very often engaged into import activities (EC, 2015). Import activities can be considered as a form of internationalization since it may open the doors to further exports thanks to the market knowledge gained through the presence in markets abroad and thanks to the advantage that firms may gain by insourcing technologies which are complementary with those commercialized by the firm. For this reasons, and since imports have been overlooked by past literature, in this chapter, we will concentrate our attention on import as additional form of internationalization and on product innovation as form of innovation introduced by SMEs.

Another objective of this chapter is to determine a causal mechanism between innovation, internationalization and performance in the context of SMEs. An evident shortcoming of previous analyses, as we claimed in the previous sections dealing with limitations, was related with the need of panel data to clearly rule out possible endogenous mechanisms linking the three factors under scrutiny. Thanks to the empirical setting of this study (a repeated survey of Spanish manufacturing firms), we are able to implement econometric techniques taking into account the endogenous nature of the relation above.

6.1 Introduction

Operating in foreign markets is a strategic objective and a requirement for SMEs willing to boost their growth (Knight, 2000). At the same time, innovation too is a crucial activity helping firms to sustain their performance. As internationalization, in fact, innovation positively contributes to boost performance through to the introduction into markets of innovative products which raise the willingness to buy of customers (Teece, 2010). In this vein, recent literature is more and more emphasizing how, taken together, internationalization and innovation are fundamental activities for firms.

Despite previous research has been more directed toward the analysis of the export-innovation link in shaping SMEs growth (e.g. Golovko and Valentini, 2011; Filatochev and Piesse, 2011), the recent development of Global Value Chains (GVC) – which emphasizes the crucial role of innovation and internationalization in pursuing superior economic results (Gereffi et al., 2005) - calls for a more fine grained analysis of the internationalization-innovation link. The integration in GVC systems, in fact, is not always easy for SMEs, especially since it requires high knowledge of both international systems and complementary technologies needed to operate with firms abroad. As put forward by Mudambi (2008), nowadays the crucial skills needed by firms to profit are related to the integration of the most profitable activities along the value chain, namely those at the ends (R&D and marketing activities), and to the outsourcing of the less profitable activities (as production). This implies that firms are needed to develop skills allowing them to internally integrate both the product concept and design phase, but also their selling and marketing activities, giving to third parties the duty of realizing products. The development of such skills is very critical, especially in the context of SMEs, since it requires gathering knowledge about innovation and internationalization activities both in relation to exports and imports. One way through which firms can mitigate the problems they face operating abroad is by looking for sources of such knowledge and accumulating it (Liesch and Knight, 1999). In fact, being exposed to international markets may enable SMEs to develop further capabilities that can sustain growth (Lu and Beamish, 2006; Sapienza et al., 2006) and their integration into GVCs.

Despite its relevance, however it is missing in literature and between practitioners a comprehensive view about innovation, import and export and their relationship with SME growth. Such activities have been largely analysed in isolation (e.g. Terziovski, 2010, Lu and Beamish, 2006), or, in some cases, at

couples (e.g. see the chapters 3 and 4 for the export-innovation link, Karlsen et al., 2003 for the import-export link, and Tybout (2001) for the import-innovation link). While literature agrees in general about the positive effect on growth of activities in isolation, as described in the previous chapters there is a much more uncertainty about the relationships between such activities when they are considered at couples. In previous chapters we contended that - in the context of SMEs - export and innovation are two conflicting activities since they drain scarce resources which, in turn, limit firm performance. In this chapter, instead, we analyse the conjunct effect of import with the previous two activities to see if it may bring further knowledge (Kuivalainen et al., 2003) to the SMEs, lowering the resources needed for innovation and internationalization activities, and thus letting arise complementarities and balancing between import, export and innovation.

To pursue our research objective, we theoretically motivate the adoption of import, export and innovation activities rooting our arguments in the resource dependence theory (Pfeffer and Salancick, 1978) and we analyse the knowledge flows existing between the three activities to search for the existence of knowledge complementarities (Yao et al., 2013) between import, export and innovation activities, with respect to SME performance.

In this vein, imports and exports provide SMEs the opportunity to access different types of experiential knowledge relying to different sources. Therefore, undertaking multiple operations at the same time, may allow firms to enhance the diversity of the knowledge experienced raising, in turn, the likelihood of complementarity between different activities. Such complementarity may finally take place as increased growth.

Empirically, we test this issue on a sample of Spanish SMEs operating in the manufacturing industry between 2002 and 2013, and we use the 2008 crisis as empirical setting allowing us to drive out endogenous factors which could bias our results.

To preview our results, although theoretically import, export and innovation activities may be complementary to growth, we find confirmation about the idea advanced in the previous chapters that innovation and exports are not complementary activities for SMEs growth, and we move on advancing that that neither import, export and innovation activities are complementary to SMEs growth. To search for a mechanism explaining such result we depict a more nuanced relationship between the three activities in the context of SMEs. Namely,

we advance the idea that such activities are not simultaneous complementary, but are complementary only if they are undertaken under a specific sequence (i.e. are sequential complementary).

Our results contribute to literature in several ways. First, we contribute to the strategy and SMEs literature exploring the complementarity between different activities (e.g. Golovko and Valentini, 2011). Our analyses offer a different methodology to explore this issue and new and fresh insights about the never-explored relationship between import, export and innovation. In this vein, we confirm previous results advocating a relationship of substitution between export and innovation, and we complement such evidence highlighting that import does not contribute to make export and innovation complementary to growth. Moreover, we also show that these activities are complements if undertaken under a specific adoption chain, which could help to explain the previous mixed findings in literature. Second, in line with the resource dependency theory RDT (Pfeffer and Salancick, 1978), we confirm arguments positing the necessity to create ties with foreign firms to source resources not available in the domestic market which may enable firms to boost their probabilities of growth and survival. The scarce availability of resources forces, therefore, SMEs to sequentially create ties with other firms in the form of import and export activities.

6.2 Theoretical background and related literature

The value of knowledge has been identified by several perspectives as a form of valuable resource enabling firm growth (e.g. RBV; Barney, 1991). More specifically the performance of firms are influenced by the capability to source, create and replicate new knowledge absorbed through operations in multiple foreign markets (Kogut and Zander, 1993). However, the knowledge based view of the firm (Grant, 1996) highlights that despite the crucial role of knowledge flows in shaping firm's growth, not all knowledge is equal, can be equally compared and equally contributes to performance since the potential for generating competitive advantage is different according to its type. For instance, experiential knowledge - in comparison to objective knowledge (Penrose, 1959) - is usually addressed as the most valuable type (Grant, 1996) due to its stickiness and tacitness which makes it more difficult to be transferred both between and within firms (Johansson and Vahlne, 1977; Eriksson et al., 1997). The way such knowledge flows are crucial in generating competitive advantage and in shaping

performance is critical in the context of SMEs performing internationalization and innovation activities. Internationally active firms can harvest and accumulate experiential knowledge through their engagement into international operations. The experiential knowledge gained through such operations can be considered of higher value than objective knowledge, and firms operating into international markets can – thus - leverage experiential knowledge to perceive and formulate new technological and market opportunities (Johansson and Vahlne, 2006), obtaining a direct benefit on their performance.

Focusing on international experiential knowledge literature has distinguished between two main typologies of knowledge: (i) internationalization knowledge and (ii) market knowledge. Internationalization knowledge is concerned with general routines and methods that firms develop to execute their strategies abroad. In particular, it relies to how firms identify and evaluate opportunities, screen country markets and select entry strategies (Eriksson et al., 1997). Market knowledge, instead, includes market specific knowledge, with particular reference to customer characteristics, competitors and supply-chain actors in the foreign market, but also to institutional factors, as laws and institutional operators (e.g. banks and credit market). The combination of internationalization and market knowledge (i.e. the experiential knowledge) enhances the capability of firms to pursue further international operations thanks to the development of routines and cognitive schemes which enable the replication through analogy of strategies (Gavetti et al., 2005).

International operations, however, do not rely only with market knowledge and internationalization knowledge. Operating in foreign markets, in fact, is a reliable source of the so called technological knowledge, which contributes firms to invent and realize goods and services (Nordman and Melen, 2008). Firms can accumulate this knowledge by intercepting new emerging technology trends in foreign markets or through collaborations with foreign partners (Zahara et al., 2000).

Traditionally, internationalization, market and technological knowledge have been connected by previous literature with international and innovation operations by looking at import, export and innovation activities, being these activities addressed as sources of such knowledge. The prevalent approach has been to investigate how each activity offers access to different sources of knowledge (Hernandez and Nieto, 2016).

On one side, export activities have been demonstrated to be positively linked with firm performance (productivity and growth, among others), signalling that export can bear significant experiential knowledge in the form of new internationalization and market knowledge (Bernard et al., 2004). Moreover, export activities have been demonstrated to have another indirect effect fostering technological knowledge (De Loecker, 2007). In particular, firms exporting can rely to a larger set of knowledge sources to grasp new information related with new technologies and innovations not yet available into the domestic market (Zahara et al., 2000). This latter effect, called learning by exporting, is of particular relevance in the case of SMEs since the knowledge gathered is specifically related with product innovations rather than process innovations (Golovko and Valentini, 2014). In this vein, works examining exports put particular focus on the exploitation of outward trade to obtain internationalization and market knowledge (Brouthers et al, 2009; Eramilli and Rao, 1993) and on the reverse mechanism allowing to source technological knowledge.

On the other side, recent research started investigating the role of internationalization on the input side, specifically looking at imports. In this vein, recent research have both theoretically and empirically investigated whether imports can trigger learning (and then knowledge transfer) leading to performance benefits for importing firms. Theoretically, imports can positively affect firm performance through a number of channels. For instance, import may enhance productivity and performance thanks to an increased number of product varieties imported which have a higher price-adjusted quality, or they can be imperfect substitutes for domestic inputs (Halpern et al., 2015). Moreover, the potential performance benefits can be realized since usually firms sourcing products from abroad rely to better technology embedded in the imported inputs (Veugelers and Cassiman, 2004), which suggests that imports - analogously to exports - may trigger learning in the form of technological knowledge. Therefore, works examining imports typically focused on how these operations may enhance quality, flexibility and technology of firms (Di Gregorio et al., 2009; Quintens et al., 2006). Moreover, the fact that both imports and exports are linked to firm performance through learning mechanisms based on technological knowledge suggests an important role of innovation in explaining their link with performance. As firms import higher quality inputs, in the form of new materials and components, they may be able to transform them in higher quality outputs through the development of new and better products.

Beside knowledge arguments, undertaking import and export activities responds to the need of SMEs to overcome the shortage of other resources they are subject to (e.g. financial, reputational) accessing them through their external environment. This idea is in line with what has been put forward by the Resource Dependency Theory (RDT, Pfeffer and Salancick, 1978). The fact that innovation and internationalization resources are scarce, valuable and difficult to be imitated (Barney, 1991), as well distributed all around the World and not always easily accessible, highlights the fact that organizations critically depend on other firms for their provision (Porter, 1990). According to Pfeffer and Salancick (1978) the environmental constriction to which are subject firms, imposes to them to manage resource dependencies by "setting up different forms of interorganizational arrangements" (p. 33). Among the various forms of interorganizational arrangements firms may create (e.g. joint-ventures, board interlocks) SMEs are well suited to contractually source such resources from other firms (i.e. importing) and to become a provider of such resources for other firms needing them (i.e. exporting). The desire of SMEs to overcome such dependency with respect to other firms pushes them to go beyond the mere sourcing of products (especially on the import side) and favours the development of new product innovations (Sherer and Lee, 2002).

6.3 The complementarity between import, export and innovation

According to RDT, firms are dependent upon other actors operating in their environment to obtain resources. To survive, firms need to grasp such resources from the external environment. Therefore, the organization will try its best to diminish or increase its level of reliance on external actors through actions such as alliances or joint ventures. For example, as GVC emergence requires more and more coordinated sourcing (Kotabe 1992), firms respond by creating alliances to reinforce their connections with key customers and suppliers (Pfeffer and Salancik 1978). This is why, as advanced by Hessels and Terjesen (2010) "many of Toyota's Japan-based parts suppliers set up operations in the proximity of Toyota's automobile manufacturing facility in Kentucky". In this vein, SMEs are dependent on their foreign suppliers for the provision of critical resources not available in the domestic market to realize their products.

If RDT can easily explain the importance of inflow trade, it can also be applied to consider a firm's need to obtain resources required for exporting (Tesfom et al. 2004). More specifically, RDT explains how a firm's location in a desirable home market can aid the accumulation of resources that are required to export. In this case SMEs depend upon the home market to obtain resources needed for exporting and may benefit when home environments are favourable and contain valuable resources. For instance, Italy has become a paramount example with reference to export activities (in 1960 the trade balance of Italy as percentage of GDP was about - 0.37%, in 1986 +1.25% and in 2016 +3.39%) since it embeds the crucial characteristics making valuable the domestic environment for exporting (Rullani, 2000). In fact, Italy is characterized by a challenging internal demand which is very selective and which can provide competitive advantage in foreign operations. Moreover, the Italian industrial structure is characterized by a large presence of family owned SMEs which prefer to serve small niches to avoid local competition (which is usually left to larger groups). These factors favour SMEs' development of commercial flows with foreign countries since firms are more able to satisfy customer needs and to select niche markets in which operating abroad. Moreover, such idea is also supported by the Porterian view (1990, 1998) according to which firms exploiting domestic markets enjoy certain competitive advantages which are - in terms of location - specific.

Based on these arguments, home market industry and factor conditions can enhance or constraint SMEs' abilities to perform exports (Hessels and Terjesen, 2010). For example, SMEs often depend on their domestic market to access finance and technological factors, as well as commodities needed for exporting. Thus, SMEs benefit when these resources are perceived to be widely available and easily accessible in the home market. Moreover, the fact that the production is held in the domestic environment and is not dispersed among several countries renders easier to begin export activities since - if production costs are perceived favourable - SMEs may be more able to supply internationally competitive products and services.

If the home market is not enough munificent in providing resources firms may exploit imports to grasp the factors missing in the domestic context. In this case, the integrated resources will complement those available in the domestic market, thus enhancing the probability of superior performance of firms.

SMEs may – thus - benefit from complementarities between resources coming from abroad and in the domestic context. However, they are continuously subject to contractual threats imposed by resource holders (booth in the domestic and foreign environment) and therefore aim to overcome such resource dependency by developing new innovations able to relax the ties they are subject to (Sherer and Lee, 2002). Therefore, as firms are more and more engaged into import and export flows they augment their perceived threat of resource dependency and try to lower such dependency by developing new innovations. In this vein, the conjunct adoption of import-export-innovation seems to create complementarities enabling SMEs to reposition themselves along the value chain and to grow.

A complementary argument is related with the way SMEs develop their innovations. When firms try to develop new products they need to develop new product competences for its research and design activities. Moreover, SMEs have limited capabilities to develop internally all the activities required to implement the innovative product and they are, thus, required to search for complementary innovative solutions outside the firm. This search phase is by nature more global than local (Laursen and Salter, 2014) and requires firms to explore markets and suppliers abroad to search for the proper complementary technology. This search phase is rather difficult for SMEs since they do not have any guidance or reference in doing this. It entails therefore a pretty high endeavour, but also enriches the value of the innovation which can more easily be sold on foreign markets. Finally, SMEs usually develop their innovations based on product specifications which are suggested by lead customers. This feature, in turn, enables them to sell more easily their product abroad, thus enhancing export.

In sum, two competing processes suggest the link between import, innovation and export activities. On one side, SMEs may decide autonomously to develop a new product innovation, thus adopting push logics to develop their new products. On the other side, SMEs may adopt pull logics in developing their new products, in which the firm is pushed by a lead customer to develop a new product. In the first case (push logics), firms decide to develop a new product and therefore activate search mechanisms abroad for complementary technologies, starting to import products to realize a proof of concept. Then it refines the product innovation and it finally presents the product to the market. The overall value obtained through the combination of the complementary technologies imported with the product innovation developed in-house, are likely to enhance the level of preference for customers for the product and then to influence its exporting. In the second case, SMEs are stimulated by a lead customer to develop the innovation.

Firms, therefore, start searching abroad for leading complementary technologies to develop the innovative product ordered (thus begins to import). Then, as in the previous case, the product is presented to the market (i.e. the innovative product is added to firm's product catalogues); and – finally - the firm, following the lead customer exports the product.

The insights offered by the RDT contribute to explain the joint adoption of import, export and innovation activities but are limited in suggesting their joint relationship with growth.

As underlined in Chapter 4, the combination of all the activities may not be beneficial per-se on firm performance. To analyse the complementarity between the three activities we need therefore to consider also the effect of each single activity and of their combination at couples. In particular, we need to consider the fact that despite each activity, taken in isolation, exerts a positive effect of SME growth, the combination at couples may not exert the same influence. We demonstrated, in fact, that export and innovation are two strategies which may damage SME growth if pursued together. The fact that the combination of such activities limits SME growth implies two things in order to assess complementarity between import, export and innovation: the marginal effect of import and innovation and of import and export should overcome the negative impact that export and innovation have; or import activities positively moderates such negative impact. There are reasonable arguments supporting the idea that imports can contribute positively to both export and innovation so that the marginal negative impact of the export-innovation link can be overcome. First, inward operations are connected with outward connections both through a technological and a market knowledge channel. On the one hand, inward operations allow SMEs to tap into technological knowledge derived from working with foreign suppliers and their network (Bertrand, 2011; Di Gregorio et al., 2009). This knowledge enables cost reduction, superior flexibility and the exploitation of location-specific benefits. On the other hand, inward operations may guarantee the access to internationalization knowledge through contacts, learning of new commercialization and negotiation techniques, and reduction of the first attrition in facing new institutional environments (Karlsen et al., 2003). Therefore, SMEs undertaking import and export together are likely to develop connections and complementarities. Moreover, thanks to such complementarities firms importing are likely to perform imports more efficiently, obtaining inputs of superior quality at a lower cost (Hernandes and Nieto, 2016). Similarly, SMEs will be better positioned to detect market opportunities which allow them to

perform further outward operations. The effect described above is reinforced if we take into consideration innovation as additionally strategy. Firms may source from abroad new technological advancements which are likely to be complementary to the in-house designed innovation and which, in turn, enhances the performance effect of such innovation (Teece, 2016, 1986). Complementary technologies, in fact, are responsible for the success of an innovation (Teece, 1986), and obtaining a complementary technology from abroad is likely to increase the success of the innovation not only with regard to export activities (therefore enhancing exports), but also with regard to domestic sales.

Finally, although the RDT theoretically suggests the joint adoption of import, export and innovation, there is a missing link between this joint adoption and the performance of SMEs. For this reason we can analyse how knowledge flows between the three activities contribute to SME growth (Kuivalainen et al., 2003; Yao et al., 2013). If diverse knowledge (coming from different sources, as imports and exports) helps SMEs to increase the variability of their experience, firms need also to acquire some related and specific knowledge (Casillas et al., 2009). Combining specific knowledge with varied knowledge coming from different sources generates knowledge complementarities, further opportunities for learning (Lofstrom, 2000) and effective knowledge absorption (Yao et al., 2013). Such complementarities between different kinds of knowledge allow SMEs to be more able in recognising opportunities, to be more aware of different trends and to find solutions to problems they may face. All together these elements constitute the basis for SMEs to achieve superior performance and results (George et al., 2001; Kostopoulos et al., 2011; Yao et al., 2013). In this vein, all previous elements seem to suggest that import, export and innovation are three activities which rely to different sources of specific knowledge that, put together, may enhance SME performance. Therefore, such activities seem to be complementary to growth.

We therefore advance the following hypothesis:

H1: The joint adoption of imports, exports and innovation positively contributes to SMEs growth.

6.4 Data and methods

6.4.1 The empirical sample

To test the proposed relationships empirically, we use the latest and most complete version of the ESEE dataset. This dataset is the outcome of a repeated survey of Spanish manufacturing firms which has begun in 1990. The project has been conducted by Fundación Empresa Pública with financial support of the Spanish Ministry of Science and Technology. The survey is administered to the population of Spanish manufacturing firms with 200 or more employees and to a stratified sample of small and medium firms, representative of the population of manufacturing firms with more than 10 but less than 200 employees. The final coverage of the survey is about 50-60% of large firms and 5-25% of Spanish SMEs. The methodology of the survey is designed to maintain constant the representativeness of the manufacturing sector in Spain over years in order to reduce attrition. For this reason, every year new entities are included in the sample to represent the population of new firms. Moreover, firms that exited the original sample during the sampling window (for instance because not wiling anymore to answer) are replaced with other firms having similar characteristics and belonging to the Spanish population of manufacturing firms.

For our analyses we focus on the time window between 2002 and 2013. This choice was taken for two reasons. First, due to the advent of information and communication technologies and to the fall of trade barriers, import, export and innovation have dramatically changed over the last decade. For this reason, we took the last twelve years available for the survey in order to keep external macroeconomic, technological and political conditions as stable as possible, to avoid the possibility that the effects would be driven by one of these elements.

Second, since our analyses are based on the exploitation of an exogenous shock as the 2008 credit and financial crisis (see paragraph 6.4.3),using the time window 2002-2013 allows us to obtain a perfectly balanced number of years before and after the crisis (i.e. six). The initial sample is an unbalanced panel with 1708 firms in 2002 and 1683 in 2013 coming from 20 different industries belonging to the manufacturing sector. In defining the final sample to be used in this analysis, we followed the definition of SME adopted by ESEE and therefore we limited our analyses to those firms having less than 200 employees. Therefore, the original sample of firms includes 1170 firms in 2002 and 1370 in 2013 which responded to the survey, leading to 16,256 firm-year observations. Finally,

because of missing values in some relevant variables for these analyses our final sample is reduced to 13,471 firm-year observation.

The ESEE dataset provides an appropriate setting to investigate the relationship between exports, imports and innovation for several reasons. First, the data allow tracing the firms and their import-export-innovation status over a long time period (twelve years in our case). Second, exporting and importing firms constitute a large proportion in the sample and show considerable variation in their behaviour over time. Third, there are few firms with foreign direct investments. In this way, we are able to focus on exports, without confounding effects of FDI. Furthermore, data reported in the sample regard also the innovation behaviour of firms, displaying significant variation across firms over time. Finally, previous research has used this dataset as significant and representative of the Spanish manufacturing industry (e.g. Cassiman and Martinez-Ros, 2007, Golovko and Valentini, 2011).

6.4.2 Key variables

In this study we are interested in assessing the relationship existing between innovation, import and export and the growth of SMEs. Therefore, our dependent variable $Growth_{it}$ represents sales growth of firm *i* at time *t*, with respect to time *t-1*. In doing this, we assume an exponential growth trend (e.g. Golovko and Valentini, 2011) which results in the specification which follows:

$$Growth_{it} = \ln\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) \qquad (1)$$

Since the time window of our analysis spans over twelve year, we assured the year by year comparability of sales by deflating the nominal value of sales in each year with a CPI index deflator (www.ine.es) to correct for inflation between 2002-2013. Sales used in the formula above represent, therefore, real sales rather than nominal sales.

Our potential independent variables are represented by the decision to adopt a certain strategy (import, export and innovation) over years. More specifically, the ESEE survey provides us information about the adoption of each strategy in each year between 2002 and 2013 and for each firm in the sample. As first step, we therefore create three non-exclusive dummy variables identifying if the firm *i* is

undertaking an activity in a specific year *t (Import $_{it}$, Export $_{it}$* and *Innovation $_{it}$).* In our models we also include a set of firm specific controls. First, it is well known in literature (e.g. Lu and Beamish, 2006) that growth rates vary according to the organizational size of firms. To prevent our analyses to be biased by this element, we included the term *Size $_{it}$* which has been calculated as the natural logarithm of the number of employees of firm *i* in year *t.* Second, we control for the percentage of foreign capital participation in the ownership of a firm *i* in year *t*. We include such control, since firms owned by foreign shareholders may be susceptible of further influence in export and import activities, but also to growth (Raff and Wagner, 2014). Third, to control for the investments in innovation undertaken by a certain firm, we also included the R&D intensity of each firm *i* in year *t* measured as percentage of total sales, in line with the most relevant literature in international business.

6.4.3 Statistical approach

In this study we are interested in assessing the relationship existing between innovation, import export and growth for SMEs. Previous literature has largely evidenced the endogenous nature of such activities. More specifically, Cassiman and Golovko (2011) have demonstrated the self-selection of firms into innovation and internationalization activities (exports) based on their productivity level. At the same time, being involved into such activities may reinforce the adoption decision of the others. For instance, Golovko and Valentini (2011) demonstrated that, for SMEs, the adoption of one strategy among exports or innovation is positively associated with the adoption of the other. Moreover, the engagement into one activity may result in superior performance in the other which - in turn – contributes positively to growth. For instance, the decision to undertake export activities enhances the probability of carrying out new innovation thanks to the learning by exporting mechanism (Golovko and Valentini, 2014). At the same time, the opposite mechanism is likely to be in place, with innovation enhancing the probability of being involved into exports since superior product characteristics (as superior innovativeness) are well perceived by foreign customers and are likely to allow further foreign market penetration (Hitt et al., 1997). Importing may allow firms to introduce new technological components which may enhance the quality of their products, then increasing the performance they reach, both in the domestic and foreign market (Amiti and Khandelwal, 2013), thus increasing the likelihood of exporting.

Potential endogeneity may arise also for other reasons. First, the selection of firms into import, export and innovation activities, as well as growth, may be all correlated with a common variable which we may omit to control. For instance, it is very likely that the selection into such activities, and the performance effect, are correlated with the managerial capability of the CEO or with the managerial practices adopted (Bloom and Van Reenen, 2007). In this case, a firm may self-select into import, export and innovation due to the superior skills of its manager. However, such superior skills are likely to influence by themselves firm performance. In such situation it is difficult to disentangle the real contribution of the independent variables from the omitted variable and, therefore, the OLS model may result in biased results. Second, there may be also a reverse causality problem. In fact, it is not possible *a-priori* to rule out if are exports, imports and innovation driving growth or vice versa. Potentially each of the three elements could be driven by firm growth since having superior performance may allow SMEs to explore further options for their business. Again, in this case, the OLS estimator is potentially biased and need to be corrected to control for such problems. All these elements point clearly to the existence of a potential problem of endogeneity of such activities in their relationship with performance.

The problem highlighted above has several econometric solutions. For instance, we could look for the existence of a sufficiently robust variable correlated only with the adoption decision of the import, export, innovation strategy but not with growth, and then instrument our regression for such variable. However, despite the large diffusion of such practice in social sciences, it is very hard to identify a proper instrument, especially in cases like this one, where we deal with strategic choices which are likely to be very linked among them and with the dependent variable. For this reason, to conduct our empirical analysis we need a source of exogenous variation which may address differently firms pursuing certain strategies with respect to others (Meyer, 1994). Luckily for us, during the time window we took into consideration, Western Countries (but the entire World practically) faced a profound credit and demand crisis in the wake of the financial crisis of 2008 (Garicano and Steinwender, 2013). So this happened in Spain, where the liquidity and the demand crisis were particularly severe. For instance, Jimenez et al. (2012) show that weaker banks were more reluctant to distribute loans to firms during the crisis years. Moreover, previous research show that reduced bank liquidity (as happened in the 2008's crisis) usually translates into a reduction of credit supply to firms (e.g. Paravisini et al., 2011). All this factors are likely to create a source of exogenous variation for Spanish SMEs according to the import-export-innovation strategy they adopted before the crisis.

More specifically, demand variation (drop actually) is likely to be less strong for firms internationally exposed since they can recover domestic demand drops through their international activities. Moreover, it is well known that the cost of pursuing innovation is usually very high for SMEs since they have to perform high R&D investments. Again, internationally exposed firm may resort to lower credit constraints, but also to higher cash liquidity thanks to their access to foreign markets not only in terms of customers, but also with respect to banks and institutions specialised in loans. In this case, the exogeneity implies that the threated firms were not self-selecting themselves based on the exogenous shock they faced (i.e. the crisis) and, more importantly, they were not knowing which could have been the effect of the crisis on their performance based on the self-selection into the one of the different strategy.

All the considerations above lead us to propose the following statistical approach to investigate our resource question:

$$Growth_{i,\,j,t} = \beta_0 + \beta_1 Treat_{i,j} * Aftercrisis_t + \beta_n X_{i,j,t} + f_i + \delta_t + \gamma_j + \varepsilon_{i,j,t} \quad (2)$$

where:

- $Growth_{i,\,j,t}$ is our dependent variable, as explained above (§ 6.4.2)
- $Treat_{i,j}$ is the treatment variable identifying the import-export-innovation strategy pursued by the firm before the crisis. This variable has been created by looking at imports, exports and innovation in the years between 2002 and 2007. More specifically, as first step, we created a dummy variable coding the existence of each activity in each firm in the years identified above. We therefore created a dummy variable *Import* $_{it}$ taking the value 1 if the firm was reporting importing expenditures, 0 otherwise, and a dummy variable *Export* $_{it}$ if firms were reporting revenues from exports, 0 otherwise. The variable I*nnovation* $_{it,}$ instead, comes directly from the ESEE survey, where respondents were asked if they have introduced product innovations in the last year. Therefore, our measure of innovation is specifically focused on products rather than other typology of innovations as process, organizational or business model.

  Then we created a set of dummy variables for each firm according to the specific strategy they adopted during the time window 2002- 2007. More specifically, each variable takes the value one if the firm

performed the activity at least once between 2002-2007, 0 otherwise.[xviii] A specification of all the strategies coded is reported in Table 6.1. The *Treat* variable has been created departing from such combinations of strategies. More specifically, we created for each model a specific $Treat_{ij}$ variable taking the value one if the firm is identified as treated, 0 if the firm belongs to the control group.

- $Aftercrisis_t$ is a dummy variable which takes the value one if the corresponding year is between 2008 and 2013, and the value of zero otherwise
- $X_{i,j,t}$ is a vector of control variables including $Size_{it}$, $Foreign\ Capital\ Owned_{it}$, $R\&D\ intensity_{it}$.
- f_i, δ_t, $\gamma_j$are firm, year and industry fixed effects that we included in our analyses to control for unobserved heterogeneity.
- $\varepsilon_{i,j,t}$ is the usual error term

For our analyses we are interested in the sign and magnitude of β_1, which is the difference-in-difference estimator of our model.

Table 6.1: Set of variables to create the treatment variable

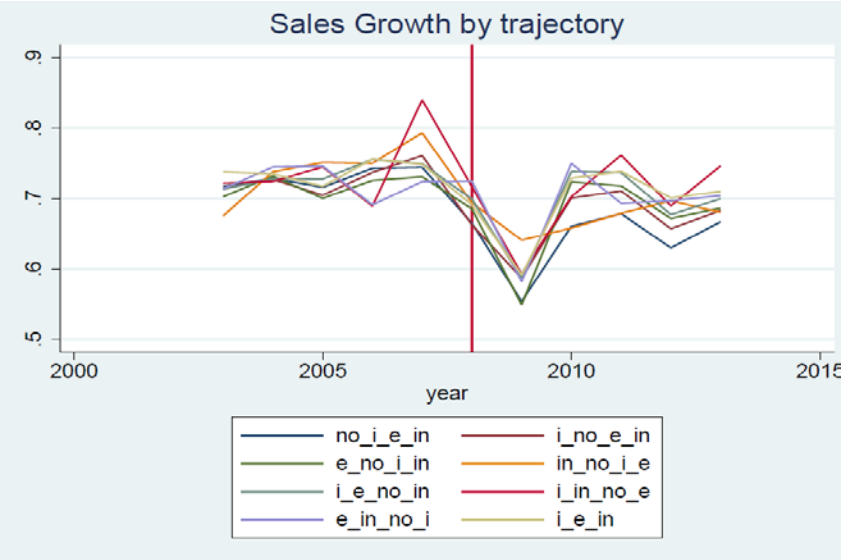
Strategy (takes value one if)	Import (I)	Export (E)	Innovation (In)
0 - No- I-E-In	0	0	0
1 - I-No-E-In	1	0	0
2 - E-No-I-In	0	1	0
3 - In-No-I-E	0	0	1
4 - I-E-No-In	1	1	0
5 - I-In-No-E	1	0	1
6 - E-In-No-I	0	0	1
7 - I-E-In	1	1	1

6.5 Results

6.5.1 Descriptive statistics

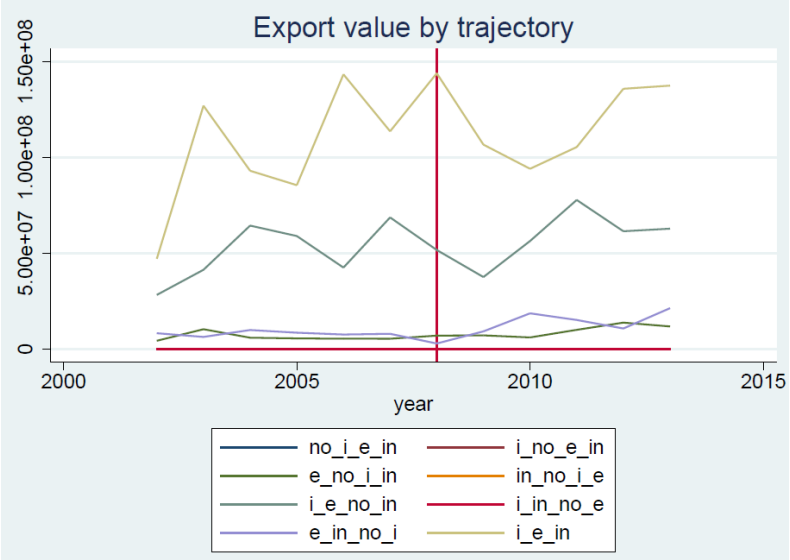
In Figure 6.1, 6.2, 6.3 and 6.4, we graphed out the respective trends for sales growth, exports, imports and the number of product innovations introduced by firms, distinguishing them for the import-export-innovation trajectory undertaken by the firm. We immediately notice that for sales growth the trends pre-crisis (on the left side of the vertical line) can be assumed as almost parallel, thus not violating the assumption of difference-in-difference. Moreover, we notice that after a steady drop after 2008 (the crisis year), firms recovered quickly the percentages of sales growth they had before, even if they eventually dropped again in next years. For what concerns imports, exports and the number of product innovations we detect that on average exports, as well imports, increased comparing the years before the crisis and those after the crisis. A different situation appears for the number of product innovations. In fact, after the crisis, innovation dropped and firms did not recover the pre-crisis levels. Such results are confirmed also by the analyses displayed in table 6. In this case we performed a Wald test to assess for the significance in the change of sales growth, import, export and the number of product innovation.

Figure 6.1: Average sales growth by strategy pursued by firms



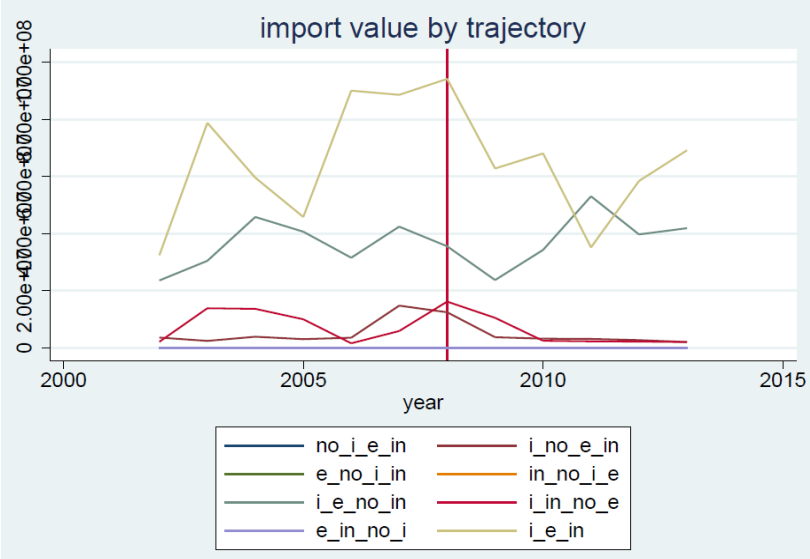
The trajectories in the legend are those reported in Table 6.1

Figure 6.2: Average exports in real Euros by strategy pursued by firms



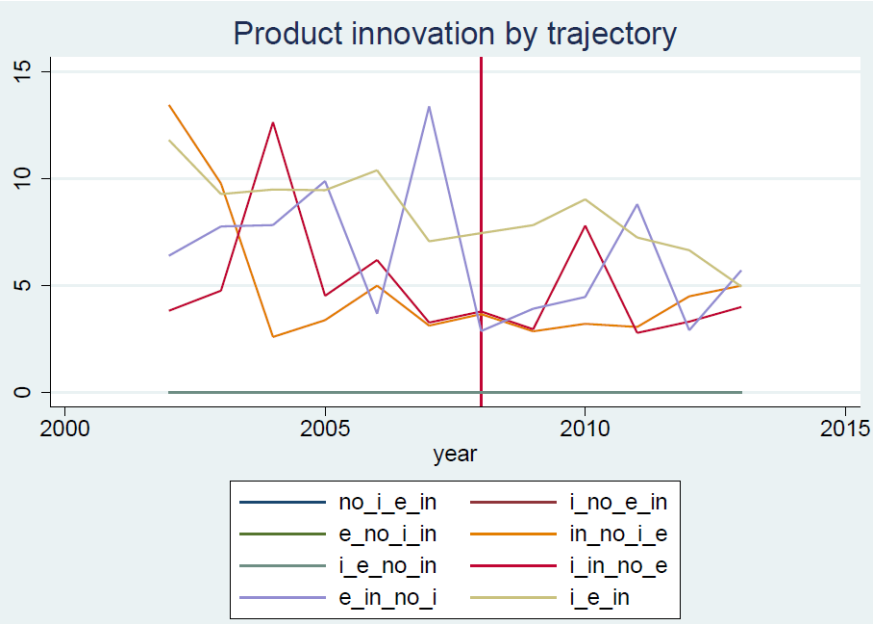
The trajectories in the legend are those reported in Table 6.1

Figure 6.3: Average imports in real Euros by strategy pursued by firms



The trajectories in the legend are those reported in Table 6.1

Figure 6.4: Average number of product innovation by strategy pursued by firms



The trajectories in the legend are those reported in Table 6.1

Table 6.2: Summary statistics of the main variables of interest and changes before and after the crisis of 2008

	Mean (s.e.)		Change	% of change
	Before crisis (2002-2007)	**After Crisis (2008-2013)**		
Sales Growth (ln)	0.726	0.670	-0.056*	-7.71% *
	(0.002)	(0.015)		
Import Value (M€)	1.412	2.262	1.214 *	85.98%*
	(0.064)	(0.106)		
Export Value (M€)	2.559	5.998	3.438*	134.38%*
	(0.106)	(0.207)		
Number of prod. innovations	1.8	1.204	-0.597*	-33.11%*
	(0.120)	(0.079)		

**significant at the 1% level, Two-sided*

The tests report significant drops in both the growth of revenues and the number of product innovations carried out, but an impressive increase in the volumes of both import and exports.

6.5.2 Regression Results

6.5.2.1 Differential effect across strategy adoption

Table 6.3 presents the main results from the estimation of equation (2). In the first three columns of the table, we try to replicate results advanced by previous research through the analysis of the effect of import-export-innovation strategies in isolation. In column (1), we show the effect on sales growth after the crisis of being involved at least once in the year before the crisis into exporting activities with respect to firms not involved into exporting activities in the same period. The positive and significant coefficient of the interaction between the treatment dummy (taking the value one if the firm exported at least once between 2002 and 2007, zero otherwise) and the after crisis dummy highlights that being involved in export activities is beneficial for firm growth (β=0.03; p-value<0.05). The same result comes out from column (2) where we test for the effect of being involved into import activities on SMEs revenue growth (β=0.018; p-value<0.05). Although international trade seems to contribute positively to SMEs revenue growth after the crisis, the model in column (3) testing the same effect but for the group of firms reporting innovation activities in the pre-crisis years does not highlight any significant effect related to innovation.

Despite the interesting results of the first three models, our main interest is to advance previous literature by exploring the conjunct role that innovation and internationalization activities have with respect to revenue growth. We take a further step in this direction with Models (4), (5) and (6). In this case, we explore the role of internationalization activities (import and export) on revenue growth. In each model, our treatment group is represented by firms which are contemporary involved in import and export activities (i.e. for such firms the $Treat_{it}$ variable takes the value one). The control group (i.e. the one for which the $Treat_{it}$ variable takes the value zero) varies model by model and allow us to assess differences in the growth of revenues with respect to the different internationalization strategies. Therefore, in Model (4) we compare firms performing both import and export in the years before the crisis with firms which

did not perform any of the two activities (neither once). Our expectation, according to previous literature is that internationally exposed firms would grow more than not internationally exposed firms. Confirming our expectations, the coefficient β is equal to 0.019 with significance below the 5%.

A more interesting question is which international activity drives more the performance of firms. This issue is explored in columns (5) and (6). Specifically, model (5) tests the marginal effect of performing import activities with respect to SMEs performing both activities. In this case, the *Treat* variable is coded as one when firms exported and imported at least once in the years before the crisis, while is coded as 0 if firms did preform only exports in the same time window. The difference-in-difference estimator resulting from this model is negative and significant (β=-0.024; p-value<0.05), which implies that firms performing both activities before the crisis grow less after the crisis than firms performing just export. Model (6) tests – analogously to model (5) – the marginal effect resulting on SME growth from performing both international activities with respect to firms just performing import activities. In other words, the difference-in-difference estimator could be interpreted as the marginal effect of adding exports to import activities. Results from the estimation highlight that, since the beta is positive and significant (β=0.017; p-value<0.10), firms performing both import and export activities result in superior revenue growth compared to firms performing just import activities. In other words, exporting exerts a positive marginal effect on revenue growth and it is the main internationalization activity influencing the growth of SMEs.

So far we have explored the effect of import-export-innovation as single activities and of internationalization activities on SME revenue growth. The main aim of this chapter, however, is to explore the relationship between the conjunct effects of import-export-innovation strategies on SME growth. Table 6.3 reports in columns (7), (8), (9) and (10) the results comparing the marginal effect of performing all the three activities with respect to performing only internationalization activities (i.e. import and export). More specifically, column (8) reports the marginal effect of performing innovation and internationalization activities versus not performing all the three. If complementarity between activities holds, we expect to find the diff-in-diff estimator positive and significant in this model. However, the beta associated with the *TreatmentXAftercrisis* interaction is positive but not significant (β=0.011; p-value>0.10). This result points to the fact that firms performing all the three activities do not perform significantly better than firms not involved in the three activities and, more

precisely, it suggests the absence of a complementary effect between the three activities. Column (8) tests the effect of performing both innovation and internationalization activities with respect to firms performing only internationalization activities. The results are quietly surprising and show that firms performing both internationalization and innovation activities perform significantly worse than firms focused just on both import and export activities (β=-0.016; p-value<0.10). This result seems to indicate that adding in the pre-crisis years innovation activities to internationalization activities could result in lower performance after the crisis. We thus find no support for our hypothesis. Finally, models (9) and (10) test the marginal effect of adding innovation activities only to one specific internationalization activity (i.e. import or export). The results show for both models that being involved in all the three activities seem to be detrimental to firm performance since coefficients, are negative even if they are not significant thus rendering their validity questionable.

Finally, with regard to control variables, we detect their consistency across all the models. First, we denote that firm size has a positive and significant effect on firm growth, according to previous literature. Second, R&D intensity negatively influences the growth of SME. This can be attributed to the fact that R&D investments usually have positive returns in the long-term rather than in the short. In our models, however, R&D intensity was included to control for the stock of expenditures in innovation and seems reasonable that they concur to lower revenue growth since they are not invested in activities giving potential positive returns for revenue growth in the short term. A potential confirmation to our idea that innovation is substitute to internationalization activities comes from model (8) where the coefficient of the R&D intensity variable is of high magnitude and significant. Finally, we also included a control for the percentage of foreign capital owned by the firm. We detect that, in each model, it has not a significant effect, nor is the magnitude of the coefficient appreciable. Therefore, the foreign ownership of the firm does not influence directly the growth of SMEs.

6.5.2.2 Robustness checks[xix]

One problem of the results presented above is that they may be dependent to some specifications we used to define the import-export-innovation strategy, to how we defined the crisis period, and to linear time trends existing between import-export-innovation and firm growth. To control for such problems we take

several steps. First, to control for the specification of the import-export-innovation strategy, we used a more restrictive categorization. Recalling that in the previous categorization the firm was belonging to a specific category (e.g. import-export-innovation) if the firm imported, exported and innovated at least once in the pre-crisis years, in this new specification we considered only firms that were always importing and exporting in the years between 2002 and 2007. At the same time we also considered only firms never doing the two activities. Therefore, we discarded the so called "intermittent exporters" (Bernini et al., 2016) which could influence our results.[xx] Even if the new sample included significantly less firms than in our baseline specification, results are qualitatively similar to those presented before, thus excluding potential bias due to misspecification of the treatment variable.

Second, in our baseline specification, we identified the crisis year based on previous literature (e.g. Garicano and Steinwender, 2013). We tested the robustness of this specification by using different specifications of the crisis based on industry factors. More specifically, we identified two factors from which extrapolating the occurrence of the crisis for each NACE code representing the industries of firms included in our sample. In particular, we identified significant drops in the industry value added and changes in the Consumer Price Index (CPI) to detect when the crisis happened. Such new specifications determined the occurrence of the crisis, according to the industry the firm belong to, between 2008 and 2009. We therefore coded the *Aftercrisis* variable accordingly and replicated the models. We obtained results which are qualitatively in line with those presented above.

Finally, we checked for the existence of industry time-trends which could bias our results. To deal with this problem, instead including specific year and industry fixed effects, we included a dummy variable in our models for each specific year-industry couple. Again, results are qualitatively comparable to those presented above, thus confirming that linear time trends are not biasing our results.

6.5.3 Explanation of the results: a zoom into sequential complementarity issues

The results above highlight clearly that both import and export are strategies leading to superior growth for SMEs. Moreover, we evidenced that among the

two, export drives more strongly the growth of SMEs. Furthermore, we highlighted that – potentially - it may matter for growth the sequence through which activities are undertaken by firms (i.e. the trajectories) rather than the mere "*being involved in"*. In fact, our results seem to point toward a complementary effect for SME growth when export is added to import activities, and to a substitution effect when import is added to export activities. Moreover, we also found that when innovation and internationalization strategies are taken both into account, performing innovation is not significantly different than performing other strategies, except in the case in which we compare firms doing only internationalization activities (i.e. import and export) and firms doing both internationalization and innovation activities (i.e. import, export and innovation). In this latter case, performing innovation depresses revenue growth, thus pointing to a potential substitution between innovation and internationalization activities.

The evidence we arrived to, seem to point toward the existence of an issue related with the timing of the adoption of innovation and internationalization activities. Previous research has studied the implications of joint adoption of activities (e.g. Golovko and Valentini, 2011), but did not express any indication about their possible sequential adoption (Vicente Chirivella and Battisti, 2017). More specifically, it is difficult to believe that firms (and in particular SMEs) are able to undertake contemporary internationalization and innovation activities to pursue growth objectives. The reasons at the base of this consideration can be found in the literature reviewed in Chapter 2 and Chapter 3: sunk costs related to both innovation and internationalization, learning effects and decreasing marginal returns (Aw et al., 2011), as well as resource constraints, are likely to make rational for managers to adopt innovation and internationalization strategies at different points in time rather than simultaneously (Battisti et al., 2015; Astebro et al., 2015). Therefore, in this section, we investigate the existence of a sequential or simultaneous adoption between the three activities to understand if our results might be driven by this effect, and to understand if innovation and internationalization activities are simultaneous or sequential complements. We begin by defining simultaneous and sequential complementarity using the definition provided by Astebro et al. 2015 (p.3; emphasis added):

"Simultaneous adoption [occurs] when the likelihood of the simultaneous adoption of two activities is greater than the likelihood of adopting each of them in isolation and […] sequential adoption [occurs] when a prior adoption decision leads to a posterior increase in the likelihood of the adoption of its complement".

As first step for our analysis, in Table 6.4 we present the transition probability matrix showing the probability that a firm will follow a given combination of import-export-internationalization activities in a specific year, given the combination it was following in the previous year. Two elements are immediately evident. First, despite strategies tend to be persistent (bold values), there is substantial variation over years which makes plausible the sequential relationship between import, export and innovation. Second, analysing the results presented, it emerges that: (i) there is a high attrition for SMEs in moving from the condition in which they do not perform any of the three activities; (ii) few SMEs move from the internationalization strategy (in which they pursue both import and export) to the strategy encompassing all the three activities (about 7% of probability), which denotes a possible non complementarity between the activities; (iii) for firms combining one internationalization activity (import or export) with innovation, there is higher probability to dismiss the innovation activity and to keep pursuing the respective internationalization activity rather than adding the other internationalization activity in order to perform all the three activities together or switch to perform the other internationalization activity; (iv) for firms pursuing all the three activities it is more likely to dismiss the innovation activity and perform only import and export in the subsequent year rather than to dismiss an internationalization activity to subsequently keep pursuing the other internationalization activity together with innovation. In sum, the transition probability matrix seems to emphasize that all the three activities taken together are not complementary and that it exists a sequential complementarity issue needing further exploration.

Table 6.3: Difference-in-difference results

	Treated vs. Not treated			**Exporting and importing once vs.**			**Exporting, importing and innovating once vs.**			
	Model (1) Exporting once	**Model (2)** Importing once	**Model (3)** Innovating Once	**Model (4)** Never exporting and importing	**Model (5)** Exporting once and never importing	**Model (6)** Importing once and never exporting	**Model (7)** Never exporting, importing and innovating	**Model (8)** Exporting and importing once	**Model (9)** Exporting and innovating once	**Model (10)** Importing and innovating once
Independent Variables:										
Aftercrisis	-0.03***	-0.024**	-0.036***	-0.045***	-0.015	-0.054***	-0.054**	-0.036**	-0.029	-0.021
(=1 after 2007)	(0.009)	(0.009)	(0.009)	(0.008)	(0.014)	(0.012)	(0.016)	(0.012)	(0.023)	(0.026)
Treatment*Aftercrisis	0.03***	0.018**	-0.006	0.028***	-0.024**	0.017*	0.011	-0.016*	-0.016	-0.029
	(0.006)	(0.006)	(0.007)	(0.007)	(0.011)	(0.009)	(0.011)	(0.009)	(0.015)	(0.022)
Controls:										
Size	0.096***	0.086***	0.089***	0.099***	0.063***	0.075***	0.103***	0.067***	0.066***	0.079***
	(0.007)	(0.009)	(0.009)	(0.008)	(0.013)	(0.012)	(0.013)	(0.014)	(0.022)	(0.022)
Foreign Capital Owned	0.000	-0.000	0.000	-0.000	-0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R&D intensity	-0.039**	-0.035***	-0.035***	-0.039**	-0.034***	-0.036**	-0.867***	-0.035**	-0.785***	-0.869***
	(0.016)	(0.013)	(0.013)	(0.017)	(0.013)	(0.014)	(0.143)	(0.013)	(0.174)	(0.142)
Constant	0.292***	0.283***	0.444***	0.383***	0.392***	0.468***	0.365***	0.475***	0.492***	0.410***
	(0.056)	(0.057)	(0.058)	(0.053)	(0.059)	(0.063)	(0.060)	(0.071)	(0.094)	(0.099)
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
R^2	0.162	0.161	0.123	0.164	0.105	0.123	0.137	0.109	0.124	130
Observations	13,471	13,471	13,471	11,859	4,742	4,960	3,422	4,107	1,999	2,004

, **, * significant at the 10%, 5% and 1%, level respectively*

6.5.4 A parametric approach to explore sequential complementarity

In order to detect the nature of the complementarity (or substitution) between import, export and innovation, we use an adaptation of the Mosconi and Seri's (2006) methodology for strong simultaneous independence and one step ahead non causality tests for discrete-time binary time series allowing us to discriminate between simultaneous and sequential adoption of strategies. Despite this methodology has been introduced in literature some years ago, only recently it is gaining momentum among scholars to test for the presence of sequential complementarity (e.g. Battisti et al., 2015; Astebro et al., 2015; Vicente Chirivella, 2017). The testing procedure is based on the estimate of the transition probabilities related to an eight states Markov chain (see Figure 6.5).

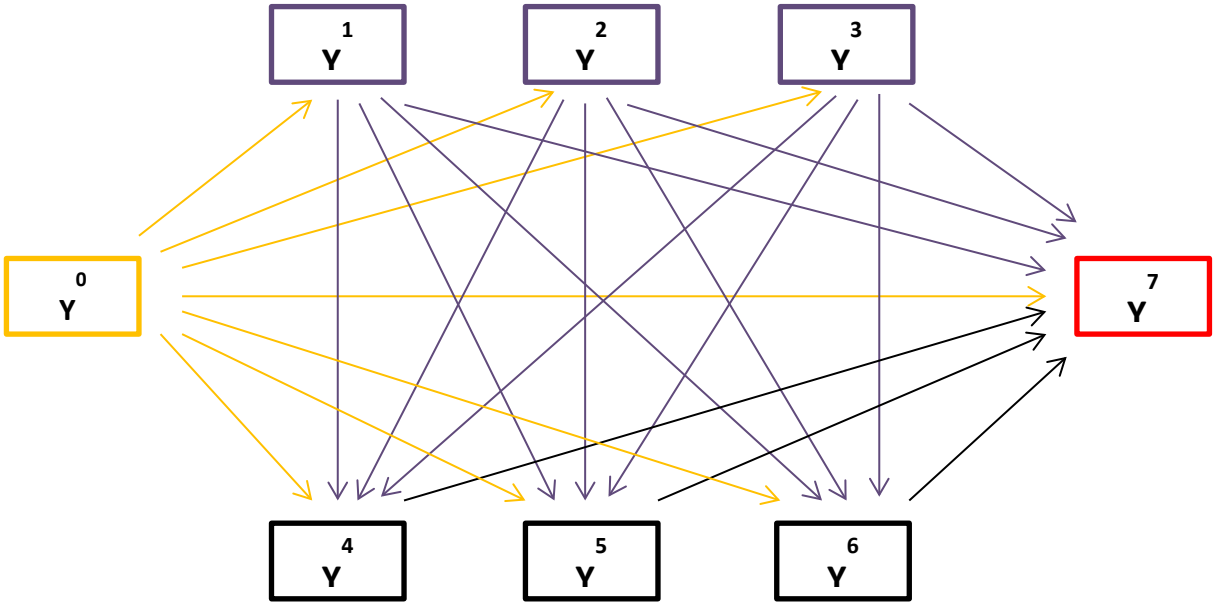


Figure 6.5: Markov Chain representing the different adoption sequence firms may undertake

We use the Mosconi and Seri's methodology to test for the necessary conditions for simultaneous and sequential complementarity by extending and adapting the methodology they propose for the case of complementarity among

two activities to three activities. First, we estimate the predicted probabilities of adoption of a specific strategy through a multivariate probit model including the lagged value of the three variables (i.e. *Import, Export and Innovation*) as determinants of the adoption of the strategies together with the control variables we presented in the previous models. The formal model is presented in the following equation (3):

$$
\begin{aligned}
&Product\ Innovation_{\,i,\,t} \\
&\qquad = \\
&\qquad \beta_0 + \\
&\qquad \beta_1 Product\ innovation_{i,t-1} + \\
&\qquad \beta_2 Import_{i,t-1} + \\
&\qquad \beta_3 Export_{i,t-1} + \beta_n X_{i,t} + \varepsilon_{i,t} \\
&Import_{i,\,t} \\
&\qquad = \beta_0 \\
&\qquad + \beta_1 Product\ innovation_{i,t-1} \\
&\qquad + \beta_2 Import_{i,t-1} + \beta_3 Export_{i,t-1} \\
&\qquad + \beta_n X_{i,t} + \varepsilon_{i,t} \\
&Export_{i,\,t} \\
&\qquad = \beta_0 \\
&\qquad + \beta_1 Product\ innovation_{i,t-1} \\
&\qquad + \beta_2 Import_{i,t-1} + \beta_3 Export_{i,t-1} \\
&\qquad + \beta_n X_{i,t} + \varepsilon_{i,t}
\end{aligned}
\tag{3}
$$

Table 6.4: Transition probabilities (in percent)

	No import-No Export- No Innovation	*Import-No Export-No Innovation*	*No Import-Export-No Innovation*	*No Import-No Export-Innovation*	*Import-Export-No Innovation*	*Import-No Export-Innovation*	*No Import-Export-Innovation*	*Import-Export-Innovation*
No import-No Export- No Innovation	**89.31**	4.26	2.90	1.90	1.14	0.12	0.29	0.07
Import-No Export-No Innovation	15.11	**70.74**	1.02	0.52	9.58	2.36	0.00	0.66
No Import- Export-No Innovation	8.29	0.83	**73.14**	0.35	12.71	0.07	3.31	1.31
No Import-No Export-Innovation	46.33	5.05	4.52	**35.59**	2.26	5.08	1.13	0.00
Import-Export-No Innovation	0.80	2.76	4.45	0.02	**83.9**	0.16	0.37	7.52
Import-No Export-Innovation	5.14	25.71	0.00	2.29	9.71	**48.00**	0.57	8.57
No Import-Export-Innovation	1.88	0.00	32.86	1.41	10.80	1.41	**38.50**	13.15
Import-Export-Innovation	0.42	0.91	1.05	0.07	31.69	0.63	1.55	**63.67**

Then, given the three strategies, and adapting Mosconi and Seri's test, we are able to test for the following hypotheses: (i) the probability of simultaneous adoption of the three strategies is the same as the probability to not adopt the strategies (rejection leads to sequential complementarity); (ii) the probability of simultaneous adoption of the three strategies is the same as the probability to adopt the strategies alone (rejection leads to sequential complementarity); (ii) the probability of adding the innovation strategy in time *t* is independent of whether the firm has already adopted import and export (rejection leads to sequential complementarity with innovation as last strategy); (iv) the probability of adopting export in time *t* is independent of whether the firm has already adopted import and innovation (rejection leads to sequential complementarity with export as third strategy); (v) the probability of adopting import in time *t* is independent of whether the firm has already adopted export and innovation (rejection leads to sequential complementarity with import as third strategy).

This method allows us to distinguish between sequential and simultaneous complementarity through the establishment of a causal direction in the adoption sequence (Battisti et al., 2015). However, this methodology has a drawback, namely that, although it controls for observable factors that may allow for the adoption of the three strategies, it does not allow for the control of unobserved heterogeneity which may drive the final results (Battisti et al., 2015).

The results of the multivariate probit estimating the probability of adoption of each of the three strategies is reported in Table 6.5. The correlation *rho* between the error terms of the three equations is positive and significant for what concerns innovation and export and import and export (0.068 and 0.256 respectively), but it is not significant for what concerns import and innovation. This is a partial indication of the existence of complementarity between export and innovation and import and export (Arora and Gambardella, 1990), but the fact that import and innovation are not correlated is a potential spoiler informing about the weak complementarity existing between the three variables when considered simultaneously. The results of the estimate report the persistent nature of innovation import and export over time (according to what already emerged from the transition probability matrix). In fact, lagged *product innovation, import and export* report significant coefficients in the estimations presented in Table 6.5. Moreover, we can note that all the three variables contribute positively and significantly to the involvement of the firm in the activity under scrutiny in the next year. Finally, the adoption of import, export and innovation activities is, as expected, positively related with firm size and the R&D intensity of firms. A

special mention is worth the contribution given by the *Foreign Capital Owned* variable. In fact, its impact is positive and significant for import and export, meaning that it can be a source of advantage for firms to reach more easily foreign markets (irrespectively if the final purpose is buying or selling products), but it may represent an obstacle for firms with respect to being involved into further product innovation. It should be noted that, as for probit models, in the multivariate probit model coefficients are not interpretable as marginal effects. We can only interpret the sign and significance of the coefficient, as the probability of adoption is a function of the linear combination of regressors. Due to this problem, and since the model does not say anything whether import, export and innovation are sequential or simultaneous complements (or both) and what is the sequence of adoption, we further perform the Wald tests suggested by Mosconi and Seri (2006) to assess whether import, export and innovation are sequential or simultaneous complements. To do so, we predicted for each observation in our sample the probability of adoption of the three activities and then we performed a Wald test of differences for baseline firms. This is equivalent to test how the predicted probability of performing all the three activities in *t* changes when a firm was only doing one or both or neither the activities in *t*-1, comparing this probability with the one of firms that were doing the activity *t-1* but switched to dismiss the activities in place in *t* (tests from 1 to 8 in Table 6.5). This technique allows us to check for the existence of the necessary conditions for the simultaneous and sequential complementarity. Results are presented in Table 6.5 and are point by point commented along the table. Tests from 9 to 11, instead, allow us to test for the most probable trajectories leading to the adoption of all the three activities. In this case we perform a different test with respect to the others, since we test how the predicted probability of performing all the three activities in *t* changes when a firm was doing two other activities in in *t*-1, comparing this probability with the one of adoption of all the three activities in *t* for firms that were doing another couple of activity in *t-1*. Testing this allow us to determine the couple of activities in *t-1* which has the superior likelihood to end in the adoption of all the three activities. In sum, such results present a situation which demonstrates again that imports, exports and innovation are not simultaneous complementary (Test 1). However, we find confirmation of the results emerging both in the multivariate probit and from the transition probability matrix which were suggesting the persistence of innovation, import and export strategies over years (Test 8). Moreover, from the first eight tests we can draw implications about the fact that the adoption strategy cannot be realized through the introduction of one activity followed by the introduction of the other couples of activities in the

following year. Therefore, firms cannot realize, for instance, a complementary strategy by introducing import in the year *t* and contemporary adding in the following year (*t+1)* export and innovation.

Models 5, 6 and 7 show us that once firms are involved in performing two activities (say import and export, for instance) it is more likely to begin to perform the third activity (innovation in our example) rather than to dismiss the two. This result highlights the fact that a sequential complementarity does exist between the three activities.

Thus, if a sequential complementarity phenomenon does exist, the straightforward question which arises is related with the sequence of activities firms should undertake. Tests 9, 10 and 11 provide us a partial answer to this question. In fact, they show that the combination of activities to be undertaken in *t-1* "import-export" is dominated both by the combinations "export-innovation" and "import-innovation", therefore demonstrating that the latter combinations lead to a higher probability to adopt in *t* all the three activities with respect to the first combination. Moreover, the test 11 shows that the "export-innovation" combination is dominated by the "import-innovation" combination. This finding provides us the evidence that firms willing to introduce all the three activities should implement import and innovation activities as first strategies. Unfortunately, the model specification we used to detect the sequential complementarity does not allow us to establish clearly which could be the first activity to be implemented. Speculating on the results of the Wald tests, we can see that among firms introducing only import and those introducing only innovation, the latter have a lower probability to arrive to perform all the three activities in *t+1* if they would add the other couple of activities. This could provide us a first evidence (even if admittedly very partial and weak) that the sequence of introduction of activities could be import, then innovation and finally export.

Table 6.5: Multivariate probit on the adoption of the three strategies

	Product Innovation	Import	Export
Independent Variables:			
Product Innovation (t-1)	1.804***	0.263***	0.235***
	(0.036)	(0.053)	(0.058)
Import (t-1)	0.194***	2.510***	0.366***
	(0.042)	(0.034)	(0.039)
Export (t-1)	0.279***	0.454***	2.944***
	(0.042)	(0.035)	(0.038)
Controls:			
Size	0.147***	0.251***	0.245***
	(0.021)	(0.035)	(0.023)
Foreign Capital Owned	-0.001**	0.004***	0.005***
	(0.000)	(0.001)	(0.001)
R&D intensity	0.246***	2.035**	-0.571
	(0.086)	(0.899)	(0.512)
Constant	-2.442***	-2.369***	-2.457***
	(0.073)	(0.070)	(0.079)
$\rho_{(Innovation,Import)}$	0.032 (0.026)		
$\rho_{(Innovation,Export)}$	0.068*** (0.029)		
$\rho_{(Import,\ Export)}$	0.256*** (0.025)		
Log-Likelihod	-9,504.49		
Observations	13,471		

, **, * significant at the 10%, 5% and 1%, level respectively*

Table 6.6: Difference in probabilities of the adoption of different strategies from year *t-1* to year *t*

	Case 1		Case 2				
	Adoption in *t*	**Strategies adopted in *t-1***	**Adoption in *t***	**Strategies adopted in *t-1***	**Question behind the difference of probabilities (if P(*Case 1) – P(Case 2)>0)***	**Difference in probabilities Case1-Case2 (percentage points)**	**Answer**
1	Import, Export, Innovation	None	None	None	Import, Export, Innovation are simultaneous complementary?	-80.81***	No
2	Import, Export, Innovation	Import	None	Import	If sequential complementarity holds, export and innovation are subsequent simultaneous complementary activities?	-21.59***	No
3	Import, Export, Innovation	Export	None	Export	If sequential complementarity holds, import and innovation are subsequent simultaneous complementary activity	-11.56***	No

4	Import, Export, Innovation	Innovation	None	Innovation	If sequential complementarity holds, import and export are subsequent simultaneous complementary activities?	-59.87***	No
5	Import, Export, Innovation	Import and Export	None	Import and Export	If sequential complementarity holds, is innovation sequential complementary to import and export?	10.55***	Yes
6	Import, Export, Innovation	Import and Innovation	None	Import and Innovation	If sequential complementarity holds, is export sequential complementary to import and innovation?	0.517	Unclear
7	Import, Export, Innovation	Innovation and Export	None	Innovation and Export	If sequential complementarity holds, is import sequential complementary to innovation and export?	4.591**	Yes

8	Import, Export, Innovation	Import, \Export, Innovation	None	Import, Export, Innovation	Once firms have activated the three activities, is this strategy persistent?	46.82***	Yes
9	Import, Export, Innovation	Import, Export	Import, Export, Innovation	Import, Innovation	Which combination of strategies among import-export and import-innovation is more probable to lead to the adoption of all the three activities?	-2.77***	The combination import—innovation has superior chance to lead firms to the adoption of the three activities in the subsequent year
10	Import, Export, Innovation	Import, Export	Import, Export, Innovation	Export, Innovation	Which combination of strategies among import-export and export-innovation is more probable to lead to the adoption of all the three activities?	-6.27***	The combination export—innovation has superior chance to lead firms to the adoption of the three activities in

							the subsequent year
11	Import, Export, Innovation	Export, Innovation	Import, Export, Innovation	Import, Innovation	Which combination of strategies among export-innovation and import-innovation is more probable to lead to the adoption of all the three activities?	-3.49***	The combination import—innovation has superior chance to lead firms to the adoption of the three activities in the subsequent year

, **, * significant at the 10%, 5% and 1%, level respectivel*

6.6 Discussion and conclusions

In this chapter we analysed the relationship occurring between import, export innovation and growth in the context of SMEs. Previous research analysed these activities in isolation (e.g. Becchetti and Trovato, 2002) or at most at couples (e.g. Golovko and Valentini, 2011), but no suggestion was given about the effect on growth that the three activities exert together.

Although our theoretical predictions pointed toward a complementarity between import, export and innovation activities, we found – using a sample of Spanish manufacturing firms – that a relationship of substitution is in place. More specifically, using the 2008 crisis to rule out possible biases due to endogenous choices of firms, we empirically found that innovation does not seem to be complementary to import and export activities which, in turns, seem to be complementary to SMEs growth. These results sustain the idea according to which internationalization and innovation are difficult activities to be balanced by SMEs to sustain growth. Moreover, we specifically found that combining innovation with import and export activities depresses the performance of SMEs. The reasons at the basis of this result can be resorted to absorptive capacity arguments (Hernandez and Nieto, 2016). The fact that the three activities, despite they bring together valuable and diverse knowledge, are not complementary might be due to the capability of firms to assimilate such knowledge. Clearly imports, exports and innovation provide new ideas and favour knowledge acquisition. Moreover, among import, export, innovation and growth there are several feedback loops which have been proved (e.g. Bernard et al., 2004) and which suggest that the knowledge acquired through internationalization and innovation can be easily transferred among such activities. The reasons behind our findings therefore, can reside in the fact that SMEs do not possess sufficient organizational capabilities which may enable the assimilation of such knowledge. One motivation can be found in the resource constraint SMEs have to face (Kiss et al., 2017). Since SMEs usually have few managers and are of a limited size, the cognitive potential of their organization is limited and absorbed mainly by ordinary operations (Miocevic and Morgan, 2018), which - in turn - limits the possibility of managers and other personnel to assimilate new information sourced through other activities (i.e. import, export and innovation). This scarce cognitive capability may imply that introducing several diverse and knowledge intensive activities for SMEs may represent an overload difficult to be managed. Moreover,

SMEs operating business-to-business are used to follow their lead customers in their operation abroad. The substitution existing between internationalization and innovation activities might inform us about the scarce capability of SMEs to internally manage new product specifics imposed by such customers, as well as, the lack of operational capabilities ensuring satisfactory service levels in the provision of the products. In ambidexterity terms, these results confirm that SMEs strive to balance innovation and internationalization endeavours (i.e. import, export and innovation) and highlight that they are better suited to balance exploratory activities on the market domain (i.e. import and export). Thus, these results contribute to enhance the relevance of resource shortage of SMEs in balancing multiple activities on different domains.

To better characterize the relationship among import, export and innovation, we explored whether the activities could be sequential complementary instead than simultaneous complementary (Astebro et al., 2015). The results support this last view, namely that complementarity between import, export and innovation can be reached through the sequential introduction of one activity at time. The fact that import, export and innovation are sequential complements supports our conjectures about the internal constraints that SMEs have in managing multiple and different activities. First, introducing activities sequentially implies that SMEs may keep their focus on one activity at time, therefore lowering the risk to invest cognitive resources on many activities which may ultimately result in a scarce attention, lower the capability to capture opportunities and evaluate threats promptly. Second, by introducing sequentially activities, the cumulativeness characteristic of absorptive capacity – which means that "accumulating absorptive capacity in one period will permit its more efficient accumulation in the next" (Cohen and Levinthal, 1990; p. 136) – can be fully exploited. By investing time and resources on one specific activity, in fact, may enable firms to increase their capability to assimilate new knowledge for the subsequent activity introduced, which may finally result in an increased capability to acquire, transfer and retain new knowledge. We believe that the fact that our results suggest export as the last activity to be introduced by SMEs with respect to import and innovation is coherent with this view, being exports an activity which can provide extremely important information and knowledge on both the product and the market domain but which need a high stock of cognitive resources and absorptive capacity to be fully assimilated.

Again, in ambidexterity terms, such results are informative with regard to the ambidextrous strategies that can be used by managers to manage divergent

objectives as exploration and exploitation. The classical literature on ambidexterity (e.g. Gibson and Birkinshaw, 2004; Birkinshaw and Gibson, 2004) have advanced three strategies to manage tensions between exploration and exploitation projects, even on different domains (Voss and Voss, 2013): structural separation of activities in multiple business units, temporal separation of activities in periods of exploration and exploitation, or the balance between such activities. Our results seem to point toward another possible form of strategy which can allow firms to manage ambidexterity, namely sequential ambidexterity. Such ambidextrous strategy seem to be well suited to SMEs since it allows the firm to avoid the dispersion of cognitive, financial and human resources on multiple divergent projects at the same time (e.g. in the tentative of balancing activities or in the tentative to divide activities in different organizational business units), but limits the threats of temporal separation (i.e. limits the risk to avoid to capture opportunities arising in the exploration (exploitation) domain while the firm is involved in pursuing the opposite strategy).

Sequential complementarity arguments are in line also with what posited by the RDT (Pfeffer and Salancick, 1978). The scarce availability of resources forces SMEs to sequentially create ties with other firms in the form of import and export activities. The suggestion that innovation may be optimally introduced as second activity in the sequence seems to confirm that innovation is one way through which SMEs try to lower the dependency they have with respect to other firms.

Our study contributes to literature in several ways. First, it contributes to the literature exploring the complementarity of activities, especially in the context of innovation and internationalization studies (e.g. Golovko and Valentini, 2011; Filatochev and Piesse, 2011), in two ways. On one side it adds further arguments pointing toward a general substitution relationship between innovation and internationalization activities (Booltink and Saka-Helmhout, 2018). On the other side, by characterizing the relationship between these activities as “sequential complementary” it contributes to reconcile previous mixed results. Moreover, the methodology adopted to detect sequential complementarity extends partially the one proposed by Mosconi and Seri (2006) and Astebro et al. (2015) for the analysis of sequential complementarity between two activities, to the analysis of three activities.

Second, our research is informative for literature on SMEs. In particular, the resource based view (RBV; Barney, 1991, Wernefelt, 1986) argues that SMEs

should exploit their valuable, rare and inimitable resources to gather competitive advantage and prosper. This perspective, underlines that - combining innovation and internationalization activities - SMEs should first begin from the activity enabling the sourcing of valuable, rare and inimitable knowledge which would allow creating competitive advantage. More specifically, among imports, exports and innovation RBV seems to suggest beginning from innovation or export activities as sources of more complex and valuable knowledge (Halawi et al., 2005). Our results, however, may be interpreted as pointing toward a different sequence, namely to begin from easier activities (i.e. imports). The reason behind this point - which is our third contribution – can be found in absorptive capacity and in resource-dependency arguments. As recalled by Golovko and Valentini (2011) there are two conditions which have to hold in order to let exist a complementary effect between innovation and internationalization activities. The first one is related to the recognition and absorption of knowledge available in foreign markets; the second is its effective embodiment into new products. The organizational limits of SMEs which may impede the fully exploitation of complementarities between innovation and internationalization activities can be overcome by introducing activities in sequence. This helps firms to refine more and more their ability to recognize and absorb valuable knowledge from import activities, to deploy it in developing new innovations and to harvest it through export, creating and feeding a virtuous cycle (Golovko and Valentini, 2011). Moreover, coherently with RDT arguments, our research informs SMEs about the necessity to rely to external stakeholders (and more specifically to import) for gathering resources not available within firm's boundaries.

This research aims to provide also contributions to managers and practitioners. Coherently with our results, many managers perceive innovation and internationalization as substitute activities competing for limited internal resources (e.g. Roper and Love, 2002), and they strive in reconciling them. The evidence of our analyses, which are in line with the arguments put forward in Chapter 4, suggests that their *gut feeling* is partially true and highlights the necessity to begin to introduce just one activity and then, after it has been properly internalised, to introduce another one. Moreover, the evidence about the existence of a proper sequence suggests performing innovation activities after the firm has harvested market and technological knowledge through imports and – finally, as last activity – to introduce exports. This evidence provides two direct insights to managers: first, that profiting from innovation requires complementary technologies which enhance the value of the marketed innovations and that such complementarities may be realized sourcing some technologies from abroad;

second, that to successfully exploit innovations to boost growth is required the development of new products which are sufficiently standardized to address multiple markets and that such requirement can be gathered only once firms have internalized some knowledge about the conditions in international markets.

This study represents a first attempt to analyse the relationship between import, export and innovation activities for the growth of SMEs. Despite many important precautions in econometric techniques have been taken, it is not free of limitations. First, our characterization of sequential complementarity is based on an extension of the Mosconi and Seri's methodology which was presented for the case of two activities. We can implement only a test explaining which could be the last activity to be introduced in the sequence, but we are limited in testing previous sequence of adoption of activities. In this vein, a further methodological development could help future research to overcome this shortcoming. Second, our multivariate probit does not control for endogenous choices of firms and for unobserved heterogeneity.

Finally, one important feature still remains worth to be explored with regard to the sequential adoption of import, export and innovation activities. We detected, in fact, that import activities precede innovation activities. However, there are reasonable arguments suggesting that firms may jointly adopt import and innovation activities and then combining exports in a second step. In fact, we are able, in our sample, to capture the occurrence of innovation only when the new product enters firm's product catalogue (it is usually a common pitfall of most samples dealing with innovation). This means that innovation activities begun, indeed, before the innovation are really observed. In this vein, a possible alternative explanation of our results could be that imports follow the inception of the innovation activities since firms search for complementary technologies which can support the creation of the new product. This implication would suggest that imports are a subsequent activity to innovation or that, alternatively, import and innovation activities are rather likely to be jointly adopted by SMEs. In this vein, we acknowledge that product innovation may take its manifestation only in a second step Future research, therefore, could implement more robust tests keeping under consideration this issue.

Chapter 7

Conclusions

7.1 Major findings

The aim of this thesis is to deepen the relationship existing between innovation and internationalization activities and growth in the context of SMEs, a topic of extreme relevance for scholars and managers and policy makers, but under-investigated by previous literature (Love and Roper, 2016). Salient findings and major contributions are presented below.

The background section and the literature review summarize the past literature on SME strategies for growth. In particular, they underline the rationale, motivation, and consequences of product and market diversification strategies (innovation and internationalization) in the context of SMEs. Special attention has been paid in describing how these processes take place and in what SMEs are different with respect to other firms in pursuing such strategies and why SMEs may strive to balance innovation and internationalization activities. Moreover, building on the relevant literatures of strategic management, innovation, international business and SMEs, we have highlighted the discrepancies existing among past studies in terms of results. In a nutshell, these sections put emphasis on the relevance of such topic for SMEs, highlight the research gap and, by emphasizing the existence of different views on this phenomenon among scholars, provide stimulation for the analysis of enablers and moderators which can

facilitate a successful combination of innovation and internationalization activities for SMEs.

In the first empirical chapter (§4), we have discussed - adopting a domain ambidexterity framework as theoretical lens - why SMEs strive in combining export and innovation activities to grow. Moreover, we have shown that this tension is reduced (and actually disappears) as SMEs age. This study provides an empirical evidence about the idea that resource constraints and scarce managerial capabilities may hamper the exploitation of such activities by SMEs, as advanced by some studies in the past (Kumar, 2009; Booltink and Saka-Helmhout, 2018). Moreover, our exploration of age as contingent factor moderating the negative relationship between innovation and internationalization endeavours is even more informative of the possible reasons which may cause different results in different studies. The fact that young firms suffer, in terms of growth, the combination of innovation and internationalization activities, while ”adolescent” firms benefit from their combination, in contrast with older firms which seem to be neutral to the benefits /constraints arising from such strategies, may indicate that previous research results can be biased by the composition of the sample used for the analyses. For example, Golovko and Valentini (2011) used a 10 years survey of Spanish firms to draw their conclusion about the complementarity between innovation and exports. Although they do not provide indication about the average age of the sample they used, in light of the results we provide with this study and of the time span they adopted to perform their analyses, it might be possible that their sample was unbalanced in terms of a large presence of adolescent firms which could have lead them to detect a complementarity between innovation and internationalization. Moreover, the fact that age acts as a moderator of the negative relationship between innovation and internationalization endeavours highlights the critical role played by experience.

Another main contribution of this thesis resides in the idea proposed in Chapter 5, which explores in detail the contribution of some factors proxied by age. In fact, we demonstrated that for SMEs previous learning experience in foreign markets and opening up their innovation process to universities and research centres allow a successful combination of innovation and internationalization activities. With respect to these results, several insights are offered to theory. First, we uncovered the important role of university-industry collaborations in smoothing the tensions that innovation and internationalization activities exert on growth. In this vein, we contribute to open innovation literature (e.g. Chesbrough, 2006) by highlighting the critical role of open innovation

projects in allowing SMEs to develop radical new innovations with consequent limited resource drain (Garriga et al., 2013). In fact, the idea that developing open innovation projects with universities allow the contemporary pursuing of internationalization activities emphasises the crucial impact that innovation endeavours exert in absorbing key resources which can be employed in pursuing other growth strategies. Moreover, the salient evidence brought by this result is concerned with the innovation trajectory followed by SMEs. More specifically, many SMEs follow the innovation trajectory imposed by their lead customers risking to be locked-in into incremental paths which lower the palatability of the products they offer (even in international markets). Breaking up this vicious cycle through the engagement into innovation projects with universities, which are more radical by definition (Nelson, 1959), allow SMEs to escape from this trap and allow them to potentially achieve superior results in both domestic and international markets. Second, we highlighted the crucial role of experience in the management of resource-draining activities as R&D projects and exports. Again, superior experience allow the fully exploitation of SME capabilities in a specific domain, relaxing therefore the constraints firms have in the exploration of other domains. In the specific case of SMEs combining internationalization and innovation endeavours, firms may benefit from previous experience on internationalization markets to exploit procedures and routines in the internationalization process and therefore to keep a higher focus on the innovation side.

Finally, the last contribution of this thesis resides in the investigation – in the context of SMEs - of the effect of import activities in combination with export and innovation. Previous literature about their relationship is really scant and fragmented, despite the relevance of import activities is strongly emerging in international business studies (e.g., Damijan et al., 2014). The fact that import, export and innovation activities are not complementary (at least simultaneously), confirms our previous results pointing toward a general incompatibility between innovation and internationalization activities in SMEs. In this vein, this study reinforces our view presented in Chapter 4 by testing the prediction on a different sample, in a different context (Spain vs. Italy) and with more robust econometric techniques. Therefore, this study grounds and confirms our thesis according to which internationalization and innovation activities are two substitute strategies for SME growth.

The exploration of the mechanism at the basis of the relationship of substitution between the three activities, contributes also to reinforce our view

presented in Chapter 5. Namely, the fact that between import, export and innovation holds a mechanism of sequential complementarity, advocates that gaining experience from these activities allow the introduction of the others, thus lowering the resource constraint firms face. Moreover, it depicts also a situation in which SMEs may utilize such activities to gain new and fresh knowledge (mainly technical) to escape from the resource dependence they are subject to.

Beside the considerations presented above this thesis offers some specific contributions to theory. These are summarized in table 7.1 and discussed below. Domain ambidexterity literature (Voss and Voss, 2013; Lavie et al., 2011; Zhang et al., 2017) advanced that pure explorative strategies (i.e. those which combine activities to search and serve new customers abroad and activities of research and development aimed at creating new product innovations) and cross-domain strategies (e.g. those combining market exploration with product exploitation) were viable to sustain SME growth. Our results falsify this proposition and contribute to theory sustaining that pure explorative strategies are not viable for SMEs. Moreover, taking into account the age of the firm combining innovation and internationalization activities, we offer a contribution to this framework arguing that the capability to be ambidextrous across different domains is dependent on the stock of knowledge accumulated during the previous years, and depends on the organizational conditions linked with the maturity of the enterprise. Moreover, these results provide another insight to the ambidexterity literature. In fact, previous studies have addressed the problem of combining exploration and exploitation activities mainly proposing three strategies firms may undertake, namely: structural separation of activities, temporal separation of activities and contemporary balance of activities (Gibson and Birkinshaw, 2004). Since for SMEs both temporal and structural separation as well as balancing are problematic tasks due to resource constraint problems and due to the limited time windows they have to catch opportunities, our study advances a different strategy to combine such activities namely sequential adoption. In particular, we offer the idea that balancing strategies might be undertaken only after a certain period of time in which the firm resolves the tensions suffered. In detail, we offer to theory the idea that SMEs should first begin from one activity and then add the other only later. The results presented in chapter §6 seem to reinforce this idea suggesting that SMEs should begin from import activities, then add innovation activities and only at this point move toward new markets to sell their products. For this reason, the evidence stemming from this thesis point toward the identification of a new way to deal with exploration and exploitation activities which we call “incremental ambidexterity”.

Our second contribution to theory is related with the organizational lifecycle theory (e.g. Chandler, 1962), which postulates that SMEs are subject to phases of organizational growth and then of decline, and that new and nascent organizations are fragile due to the lack of formal structures, while older organizations are subject to decline due to problems of organizational inertia and resistance to organizational change. In this vein, internationalization strategies have been analysed by previous literature as decisions which emerge gradually as far as the organization ages and procedures are developed and put in place (Johansson and Vahlne, 1990). In this vein, our results pointing to the fact that innovation and internationalization cannot be combined successfully when firms are relatively young emphasize the idea of the liability of newness (Freeman et al., 1983), thus providing support to this theory for what concerns innovation and internationalization activities. Moreover, our results contribute highlighting that organizational growth through innovation and internationalization is an achievable result for firms as far as they get older and this, in particular, holds for firms in an "adolescent" phase of their life. In this vein, despite Henderson (1999) highlights some shortcomings to which "adolescent" SMEs are subject, we support the idea according to which such firms have the capabilities to profit from the contemporary pursuit of innovation and internationalization endeavours. Finally, in line with what postulated by the organizational lifecycle theory, we confirm that mature firms - being characterized by organizational inertia - are not able to profit from the combination of such activities and therefore to extract value in terms of growth.

The third theoretical contribution of this thesis is linked with the dynamic capabilities framework introduced by Teece et al. (1997). In this perspective, innovation and internationalization activities can contribute in supporting SMEs in exploration activities across different domains (R&D and marketing/sales) given their role in sensing, seizing and transforming opportunities which are available for SMEs. Despite the relevance that dynamic capabilities may have for SME development, such firms usually lack asset orchestration capabilities which may allow them do deal with tensions arising when they pursue different activities (in terms of exploration and exploitation, or belonging to different domains). In this vein, we have uncovered some mechanisms through which the development of dynamic capabilities can enhance SME performance thanks to the development of asset orchestration capabilities. In fact, we have provided evidence that both experience on international markets and technological collaborations with universities and research centres put SMEs in the condition to better orchestrate

their asset. This is because international experience and collaborations with universities and research centres decrease the need of human and financial resources for exploration, as well as allow managers to better manage their attention and their (scarce) time focusing on the most critical exploratory activities.

Finally, this thesis provides a contribution also to the RDT (Pfeffer and Salancick, 1978). This theory postulates that SMEs are dependent upon other actors operating in their environment to obtain resources. Our results highlighting that SMEs should sequentially adopt import, export and innovation to grow, implying that despite SMEs may suffer such dependence there are viable strategies to grow and to overcome such liability, as adopting sequentially the activities listed above. Moreover, our study opens further questions about the sequence of adoption of activities. In this vein, the analyses seem to indicate import as an antecedent of export activities and innovation as an antecedent of export. Despite previous literature underlined the link between such activities, pointing toward a virtuous cycle between innovation and internationalization (e.g. Golovko and Valentini, 2011) there has been a contention in establishing the starting activity for SMEs (Love and Roper, 2015). This study contributes in this vein suggesting import as first activity to be undertaken. Lastly, an open point suggested by the empirical evidence that we offer for further theoretical development is represented by the fact that since sequential activities should be preferred with respect to undertaking them contemporary, SMEs may be subject to inefficiencies related with time compression diseconomies which may hamper both growth and survival.

7.2 Managerial implications

For SMEs, at a certain stage of development, the domestic market will no longer be sufficient to support business growth and it is at this stage that these companies need to follow a strategy of product diversification or internationalisation to achieve sustainable growth. Although some studies in the past have promoted the joint adoption of these two strategies, this thesis advances a different view suggesting that managers should be careful in performing a diversification strategy entailing innovation and internationalization activities.

Table 7.1: Summary of the main results and contributions

Theory / Framework	Main contents	Predictions related to innovation and internationalization	Implications proposed by the theory / framework	Main problems for SMEs according to the theory/ framework	Hypotheses developed in the thesis related with the theory / framework	Results in the thesis related to the theory / framework	Results in the thesis related to the theory / framework
Domain Ambidexterity *(Voss and Voss, 2013; Lavie et al., 2011; Zhang et al., 2017)*	- Balancing exploration and exploitation activities is a critical challenge. -It is particularly difficult for smaller organizations which lack the resources, capabilities, and experience necessary to successfully implement ambidexterity.	To obtain superior performance: - Product exploration can be complemented with market exploration. -Market exploration can be complemented too with product exploitation.	To achieve superior performance SMEs have several strategies: -Structural separation of exploration and exploitation activities. - Temporal separation of exploration and exploitation activities. - Balancing of exploration and exploitation activities.	- SMEs have scarce resources to deal with structural separation - SMEs are too urged to catch opportunities to survive for temporal separation. - SMEs lack managerial resources to deal with exploration and exploitation contemporary (i.e. to implement ambidexterity).	- Innovation and internationalization are conflicting activities for SMEs. - Age moderates the tension between innovation and internationalization activities. - International experience moderates positively the tension between internationalization and innovation. -Collaborations with universities and research centres positively moderate the tension between internationalization and innovation.	-Innovation and internationalization are conflicting activities for SMEs growth. -Age, International experience and collaborations with universities and research centres positively moderate the tension between the two activities. -Internationalization and innovation activities are sequential complementary.	-Pure exploratory strategies are not viable for SMEs (i.e. exploring both new markets and new technologies). -The tension can be less incisive for SMEs with a certain degree of maturity -Previous internationalization experience may allow implementing ambidexterity. -Collaborations with universities may allow SMEs to adopt a kind of structural separation which can resolve the tension. -Sequential ambidexterity is suggested to combine innovation and internationalization activities.

Theory / Framework	Main contents	Predictions related to innovation and internationalization	Implications proposed by the theory / framework	Main problems for SMEs according to the theory/ framework	Hypotheses developed in the thesis related with the theory / framework	Results in the thesis related to the theory / framework	Results in the thesis related to the theory / framework
Organizational Lifecycle *(Chandler, 1962; Steinmetz, 1969; Hanks and Chandler, 1994)*	-SMEs are subject to phases of organizational growth and organizational decline. -New organizations are fragile because lack formal structure to give its value creation processes and actions stability and uncertainty. -Older organizations are characterized by organizational inertia, resistance or lack of inclination to change.	-Internationalization and innovation decisions emerge gradually as far as procedures are made. -At a first stage, young SMEs rely very much on the owner/entrepreneur competences and skills. -At a certain point organizational inertia, resistance or lack of inclination to change, occurs and lead SMEs to decline, impeding the combination of innovation and internationalization activities.	- Liability of newness impedes SMEs to combine several different activities since the owner/entrepreneur is overwhelmed. - Innovation and internationalization are required to be introduced gradually.	-SMEs need to grow especially in the first years of their life to obtain viability. -Growth becomes less important once the SME is at later stage.	- Age moderates the tension between innovation and internationalization activities.	- Age moderates the tension between internationalization and innovation activities. - Young SMEs are not able to deal with the two activities contemporary. -"Adolescent" SMEs benefit from their contemporary undertaking. - Mature SMEs do not benefit from the combination of internationalization and innovation activities.	-Liability of newness is confirmed: young SMEs with low managerial skills cannot keep a good focus to pursue both activities. -Innovation and internationalization should be introduced sequentially, at least once the SME has accumulated some experience or has a superior managerial structure. -SMEs could introduce internationalization activities in their "adolescent" phase rather than when they are more established to gather benefits for their growth

Theory / Framework	Main contents	Predictions related to innovation and internationalization	Implications proposed by the theory / framework	Main problems for SMEs according to the theory/ framework	Hypotheses developed in the thesis related with the theory / framework	Results in the thesis related to the theory / framework	Results in the thesis related to the theory / framework
Dynamic Capabilities *(Teece, Pisano and Shuen, 1997; Teece, 2014)*	-Dynamic capabilities involve higher-level activities that can enable an enterprise to direct its ordinary activities toward high-payoff endeavours. -This requires managing or "orchestrating" the SME's resources to address and shape rapidly changing business environments.	- Creating and capturing value from innovation and sustaining innovation long-term is the essence of dynamic capabilities. -Dynamic capabilities can contribute to supporting SMEs in exploration across different functional domains (R&D and marketing/sales), given their role in sustaining SMEs in sensing, seizing and transforming opportunities that are available in the SME's technological and market environment and given their role in supporting SMEs in combining and integrating knowledge of different kinds and sources.	-SMEs need to develop sensing, seizing and transforming capabilities to sustain their performance through innovation, but also through internationalization. -SMEs need to learn how to orchestrate their assets in the product and market domain to successfully combine activities in both domains.	-SMEs lack asset orchestration capabilities allowing them to deal with tensions between exploratory and exploitative activities	-International experience moderates positively the tension between internationalizatio n and innovation. -Collaborations with universities and research centres positively moderate the tension between internationalizatio n and innovation.	-International experience and collaborations with universities and research centres positively moderate the tension between innovation and internationalization, enabling superior growth.	-Experience and technological partnerships reduce the cost of exploration, putting SMEs in the condition whereby they can orchestrate their assets (management attention, human and financial resources devoted to marketing or technology exploration) more efficiently. -International experience enable asset orchestration since managers can operate on foreign markets by analogy. -Collaboration with universities and research centres allow SMEs to sense and seize technology and market opportunities, and to transform them into viable products and strategies for international markets.

Theory / Framework	Main contents	Predictions related to innovation and internationalization	Implications proposed by the theory / framework	Main problems for SMEs according to the theory/ framework	Hypotheses developed in the thesis related with the theory / framework	Results in the thesis related to the theory / framework	Results in the thesis related to the theory / framework
Resource Dependency Theory *(Pfeffer and Salancick, 1978)*	SMEs are dependent upon other actors operating in their environment to obtain resources.	-To obtain the resources needed to pursue their operations SMEs need to source from abroad products (import). -To overcome resource dependency SMEs continuously strive to innovate. -To provide the resources needed by other SMEs and to perform their operations, SMEs need to sell their products in domestic and international markets.	-International operations (i.e. import and export) and innovation are strictly linked activities.	-Not clear the kind of relationship between the activities.	-Import, export and innovation activities are complementary for SME growth.	-Import, export and innovation are not simultaneous complementary. -Import, export and innovation are sequential complementary.	-The sequence of adoption of innovation and internationalization activities matters for SME growth. -Despite the dependence to other SMEs, they can adopt a consistent strategy to grow through the combination of internationalization and innovation activities. -Sequential adoption is confirmed with reference to import, export and innovation activities, pointing toward the idea that import and innovation can be antecedent of export activities -Introducing the activities not in sequence may imply inefficiencies (time compression diseconomies)

SME managers, however, have the discretion to decide on the pace of their international expansion (Avlonities and Salavou, 2007) as well as their long term innovation strategy. We can summarize managerial implications stemming from this research in three main points. First, managers of SMEs have to pay attention in combining innovation and internationalization activities since they may drain resources. This is particularly relevant in the first years of their life. In fact, SMEs in the early stage of their development are usually in a weak position in terms of resources (especially financial) and instead than obtaining viability through growth they risk incurring business failure.

Second, despite the tensions that innovation and internationalization activities pose for SMEs growth, the high potential of such strategies may be achieved under some conditions. In particular, the fact that open innovation activities and international experience act as moderators of such relationship inform managers that lowering the resource consumption in pursuing one of the two strategies allow their successful combination. The fact that international experience positively moderates the tension between innovation and internationalization activities, and the fact that firms investing strongly on innovation activities are able to reach superior revenue growth if they combine moderate levels of international presence, suggest that firms should approach foreign markets gradually in order to gather foreign market information, create and adopt routines to operate in such markets and then increase the level of their commitment.

Third, our research informs managers about the sequentiality between import, export and innovation activities. Moreover, the results about their sequential complementarity provide them prescriptive indications on the adoption of such activities. Beginning from import would allow managers to understand the foreign environmental context, collecting information about competitors and opportunities and directing more efficiently further investments in both innovation and internationalization endeavours. We believe that market, internationalization and technological knowledge sourced through import plays a key role in enabling an efficient and successful combination of both export and innovation.

7.3 Policy implications

The results presented in this thesis offer several insights also to policy makers. The relevance of these results for them has to be considered in particular with respect to other policy recommendation which have been developed in the last years. In fact, our results are relatively in contrast with other recommendation drawn by other studies. In 2015, the European Commission (EC, 2015) were indicating as policy recommendation: *"[…] the link between innovation and internationalisation do suggest - even if the direction of the casual effect is not always clear - that it is a good thing to design and present policy support measures aimed at stimulating innovation and internationalisation in conjunction as both issues are policy objectives in their own right. Public bodies should consider a unified approach to both issues including merging the implementing agencies into a single body."* (p.72). Our results depict a more nuanced relationship between innovation, internationalization and performance. We believe that indeed innovation and internationalization are two crucial activities for SMEs which are responsible of superior performance. However, we point out that – in contrast with other views - the support to the development of such activities should not be directed toward the mere "adoption" of activities (i.e., undertaking exports / developing new innovations), but should be oriented toward relaxing the constraints which limit the concurrent undertaking of both the activities to pursue growth. In this vein, policy incentives should be dedicated to improve the access to capital of SMEs or toward the development of their managerial competences. This result can be pursuit in two ways: on one side, more credit support can be given to SMEs to lower their financial constraints and to simplify the resource acquisition process; on the other side, governments may enable processes aimed at the development of the managerial competences of SMEs, which can reinforce the managerial capabilities required to profit from the contemporary undertaking of innovation and internationalization activities. One step ahead toward this direction has been done in countries as Italy, where the government in the last three years has supported the employment of special managers aimed at the specific management of export activities (the so called *export-managers*).

Another potential policy suggestion stemming from this research is concerned with the domain of application of policy instruments. In the last years, several policies have been developed to sustain the innovation of SMEs (e.g. at the EU level). Despite this effort, the innovation paradox (Oughton et al., 2002) of EU SMEs is still evident, with many firms striving to convert research and

development activities into effective innovations. Some other studies have pointed toward the nature of such innovations which, sometimes, are far from market needs, and – therefore – strive to find a profitable market in which they can be sold and through which SMEs can profit. The suggestion stemming from the last study of this thesis (namely that firms would need to explore foreign markets through import as first step and then would need to realize innovation before exporting) seems to indicate the lack of capabilities of SMEs in sensing foreign markets and in recognising their needs. In this vein, we propose, based on our result that successful policies aimed at the development of innovation and internationalization activities in SMEs should push SMEs in being more market driven. As consequence, we believe that the development of new innovations and the growth of SMEs would be a consequence of the superior capabilities of firms to understand product-market requirements.

7.4 Limitations and future research directions

The theoretical framework and empirical methodology in this thesis have been developed through careful consideration. The empirical setting and the estimation employed have been designed to deal – as far as possible – with the usual problems related with quantitative studies. Considerable efforts have been put to ensure the accuracy of the robustness of the empirical tests. Nevertheless, there are a few limitations that are worthy to be mentioned.

One limit is related with the generalizability of our results: despite our results provide similar indications on firms operating in two different samples (i.e. Italy and Spain), we believe there is room for testing and extending our predictions to other countries. We believe this to be relevant since industry composition largely varies across countries, but Italy and Spain present some peculiar features which render the two contexts similar. For instance, both countries are characterised by a large presence of family businesses which may limit the managerial capabilities of firms, thus limiting the generalizability of results. Therefore, we advise future research to extend our study to countries characterized by greater managerial practices (as U.S. for instance) to extend the validity of our model.

Another limitation resides in how innovation measurements have been constructed. In two of the three studies we used R&D expenditures to proxy innovation activities. In the other one we used a measure based on the perception

of respondents to the survey, which may lead to common method bias problems (i.e. the measurement error that is compounded by the sociability of respondents who want to provide positive answers (Chang et al., 2010)). To overcome these pitfalls, future research may employ more objective measures to extend the validity of our model. A practical example could be represented by the use of patents as measure of innovation.

Another limitation is related with a hidden crucial assumption we made in conducing this research project. The fact that we deal innovation and internationalization activities as exploratory strategies, and the fact that we often recall resource shortage, experience and the development of open innovation projects as arguments to sustain the idea that SMEs cannot combine such strategies and should rely to specific activities to lower the tension arising between them, implies that resources are perfectly mobile across activities. Some famous perspectives like the resource-based view of the firm, theorize that to create sustainable competitive advantage resources should be imperfectly mobile between firms (Barney, 1991; Petraf, 1993). Our assumption does not violate this theory but may be questionable, since if we believe resources perfectly mobile within firms the likelihood they are also between them (at least in part) should be higher. Although we believe that in the context of SMEs resources are more mobile than larger firms, especially thanks to the fuzzy internal environment they have, we acknowledge the fact that this might be a strong assumption. We therefore urge future research to investigate the problem taking into consideration this problem to provide fine grained results.

Apart from overcoming the general limitations presented in this section, and those specific which we have discussed at the end of Chapters 4, 5 and 6, this thesis paves the way for further future research. In fact, further contributions are required to better explore the mechanisms behind some stylised facts we presents with reference to the factors enabling a positive contribution on growth from the innovation-internationalization nexus. In some cases we are able to explore them (as for the open innovation and international experience moderations), but we are confident that more moderators are in place in influencing the interplay between export, import and innovation. In this vein, our suggestion is to look at the role that SME capabilities (Teece et al., 1997), managerial capabilities (Adner and Helfat, 2003), strategy-operation fit and financial and human slack (Kiss et al., 2017) may have. Based on previous literature on resource based view (Barney, 1991), dynamic capabilities (Teece et al., 1997) and upper echelon (Hambrick and Mason, 1984), we believe these features as informative of how the dynamics of

internationalization and innovation have influence in shaping SMEs performance. For instance, a crucial role in SMEs is played both by the management team and by the characteristics of the owner (if the firm is family managed; George et al., 2005). In our analyses we do not reach such a level of detail of analysis, but the crucial role advanced by previous literature, with reference to how both internationalization and innovation activities are performed according to managers' characteristics seems to suggest that this topic could represent a fruitful avenue to be undertaken to uncover the factors enabling a successful combination of innovation and internationalization activities.

Another element worth of exploration is related with the kind of innovation activity undertaken by the firm. In a recent review of the literature about SMEs and the innovation-export link, Love and Roper (2015) highlight that "*[…] information on different types of innovation and their effects is limited; specifically we know relatively little about the effects of organizational innovation […]*" (p.21). The complexity arising from the combination of innovation and internationalization activities emphasizes a possible crucial role of organizational innovations. In fact, operating in multiple markets requires developing multiple product configurations which coexist both in the innovation and in the production pipeline. In many cases, the only viable solution SMEs have, is related with the possibility to first introduce an organizational innovation and then to manage this large product portfolio. We strongly believe this topic as extremely relevant for SME managers and - therefore – we believe of extreme importance its study in the future.

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[i] According to the EU (2018), Piedmont is above the Italian and Europe average in terms of highly cited publications (+1% and +22% respectively), R&D business expenditures (+61% and +20% respectively) and employment in medium-high/high tech manufacturing and knowledge intensive sectors (+29% and 34% respectively).

[ii] Battaglia, Neirotti and Paolucci (2015; 2016a)

[iii] Battaglia, Neirotti and Paolucci (2018)

[iv] Battaglia, Neirotti and Paolucci (2016b)

[v] Golovko, Cassiman and Battaglia (2017)

[vi] For multinationals and larger firms there has also been a stream of literature analysing the relationship between corporate diversification and shareholder's value (see for instance Villalonga, 2004). However, despite the high relevance of the topic, it is out of scope for what concerns this thesis.

[vii] The literature on product diversification and international diversification is very extensive since it took origins in the middle of the '70s. A complete review of these literatures is out of scope of this work and can be founded looking at the works of Ahuja and Novelli (2016) and Cardinal et al. (2011). Here are reported some substantial findings which can help to contextualize the relationship between product/international diversification and firm performance, in order to be propaedeutic to the discussion of the relationship between product-market diversification and firm performance.

[viii] In such context, they have been labelled as "Pocket Multinationals" (Pirani, 1991)

[ix] Further specific theoretical and empirical analyses with regard to age are offered in Chapters 4, 5, 6 and 7.

[x] A more detailed literature review addressing the specific issues explored in this thesis will be provided in chapters 4, 5 and 6, jointly to the empirical analyses.

[xi] The only action firms can take is to exit the market. We do not consider this as a viable option in the short-medium term due to attritions related with sunk costs which make difficult and impracticable this option.

[xii] Porter and Siggelkow (2008) suggest in detail that strategy-specific activities allow firms to create and implement different strategic positioning in the market. While such positioning is easily imitable if activities are generic (i.e. independent from the configuration of other activities) and creates a universal optimum which is easily reachable by each firm, it is more complicated if the activities are tightly coupled and interdependent with each other since they create multiple optimal configuration which represent local optimal solutions (Rivkin, 2001). In other words, interdependence renders more hard to identify and achieve an univocal optimal configuration for each firm.

[xiii] Building on Vernon's model, Johansson and Vahlne (1977) theorized the internationalization model better known as Uppsala Model. According to them, the internationalization process of firms is gradual and firms move from the domestic market to export in close markets (in terms of cultural diversity and

geographical distance), to further markets. Finally, they begin to create subsidiaries abroad and they undertake the so called Foreign Direct Investments (FDIs).

[xiv] The results are available from the author upon request.

[xv] The number of observation differs of three firms with respect to the previous analyses since the Aida database do not report the level of revenues for such firms in 2014.

[xvi] Although ROS also takes into account inventory costs, we have highlighted the difficulties of isolating sales/marketing and R&D costs in empirical research, especially when actual cost and performance data are taken into account. In the case of Italy – our empirical setting - the financial accounting standards have not established an accounting separation of inventory costs from the period costs for sales/marketing and R&D activities, thus making ROS the most preferable measure for our analyses on profitability.

[xvii] This aspect is crucial in our analyses. Although our interest was in technological partners (i.e. universities and research centres), we could not ignore the crucial role that other actors may have in shaping performance. For this reason, we also performed some additional analyses to control for the role that the extent of collaboration with supply chain actors has (see the "Results and discussion" section and the Appendix).

[xviii] We also created a stronger specification of such variable, namely we coded such variable as one (or zero) if the firm was doing (or not doing) import and export in each year between 2002-2007 and was doing at least once or twice innovation (since innovation is less persistent than import and export we are prevented by adopting a stronger restriction on this measure since no firms in our sample reported to perform innovation for all the seven years). Further details about this specification are provided in the robustness section (§6.5.2.2).

[xix] The detail of the results is available upon request.

[xx] We recall that we do not have in our sample firms always innovating, so in this case we keep considering firms as innovators if they were innovating at least once in the years before the crisis.