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*Degree of Doctor of Philosophy (PhD.)*

**INTERNATIONALISATION AND  
TECHNOLOGICAL INNOVATION: EMPIRICAL  
EVIDENCE ON THEIR RELATION**

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## **ABSTRACT**

Internationalisation and innovation of the firms have been considered two of the most important factors determining business success over the last decade (Buckler and Zien, 1996; Wind and Mahajan, 1997; Zahra and George, 2002; Vila and Kuster, 2007).

The purpose of this dissertation is to understand better the relation which exists between these two factors. To do so, we undertake empirical investigation which consists of three studies (an initial qualitative and two consequent quantitative ones). We first part from a general idea of the relation extracted from a combination between earlier evidence and academic literature, trying to explore it more in-depth through the application of qualitative methodology. Next, parting from the results, a large sample of manufacturing firm is analysed (data provided by the Spanish Survey of Business Strategy), employing different variables related to both the international and innovative activities of the firm. Last, we address the direction of this relation also to a special type of firms, precisely we separate our sample in family and non-family firms, having the objective to observe how much different is their behaviour in terms of the two processes of the firm discussed in this dissertation.

Results outlined the existence of a reciprocal relation between internationalisation and technological advances, as it follows: 1) firms acquired different types of international knowledge and therefore behaved differently in terms of innovation advances once they choose a certain entry mode in the foreign market; 2) product and process innovations are the result of and lead to exports; 4) innovation “Granger causes” internationalisation and internationalisation “Granger causes” innovation; 3) family firms do not have a conservative attitude and are not risk adverse, taking more advantage of their presence abroad in order to reach a higher level of technological advances than non-family ones.

Moreover, the dissertation offers various contributions to the literature (theoretical, empirical and methodological) as well to the managers and public policies.



## **DECLARATION OF ORIGINALITY**

No portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

I declare that the thesis embodies the results of my own work. Following normal academic conventions, I have made due acknowledgement of the work of others.

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***To my family***



## Table of contents

<b>Abstract</b> .....	iii
<b>Declaration of Originality</b> .....	v
<b>Copyright Statement</b> .....	v
<b>Acknowledgments</b> .....	vii
<b>List of tables and figures</b> .....	xv
<b>CHAPTER I</b> .....	1
<b>INTRODUCTION</b> .....	1
1. IMPORTANCE OF INTERNATIONALISATION AND INNOVATION.....	1
2. RESEARCH GAP .....	1
3. OBJECTIVE OF THE DISSERTATION AND RESEARCH QUESTIONS .....	4
4. RESEARCH APPROACH AND DESCRIPTION OF THE ANALYSES .....	4
4.1. Qualitative study.....	5
4.2. First quantitative study .....	6
4.3. Second quantitative study.....	7
REFERENCES.....	10
<b>CHAPTER II</b> .....	13
<b>AN IN-DEPTH LOOK AT THE RELATION BETWEEN TECHNOLOGICAL INNOVATION AND INTERNATIONALISATION</b> .....	13
1. INTRODUCTION .....	13
2. LITERATURE REVIEW .....	15
2.1. A focus on the innovation of the firm and innovative firms .....	15
2.2. A focus on the internationalisation of the firm.....	17
2.3. A focus on the innovation and the internationalisation of the firm.....	18
3. THEORETICAL FRAMEWORKS .....	20
3.1. Gradual internationalisation theory of the firm .....	20
3.2. Resource-based view .....	21
3.3. Proposed model .....	22
4. METHODOLOGY .....	23
5. ANALYSIS OF THE CASES .....	25
5.1. Individual analysis.....	25
5.1.1. Case EUROPASTRY .....	25
5.1.2. Case INDO .....	26

5.1.3. Case PINTURAS LOBO/ Euroquímica .....	28
5.1.4. Case COMEXI.....	29
5.1.5. Case TECNITOYS/ SCALEXTRIC .....	31
5.2. Cross-case analysis .....	35
6. CONCLUSION .....	39
REFERENCES.....	43
<b>CHAPTER III.....</b>	<b>47</b>
<b>LOOKING FOR THE CAUSALITY BETWEEN TECHNOLOGICAL</b>	
<b>INNOVATIONS AND EXPORTS.....</b>	<b>47</b>
1. INTRODUCTION.....	47
2. RELATED LITERATURE .....	49
2.1. Innovation as a cause of internationalisation.....	50
2.2. Internationalisation as a cause of innovation.....	51
2.3. Innovation and internationalisation in a reciprocal relation .....	52
3. CONCEPTUAL FRAMEWORK AND HYPOTHESES .....	53
3.1. Technological innovations.....	55
3.2 Export-related activities.....	55
3.3. Experiential knowledge .....	56
4. METHODS.....	57
4.1. Data sources, sample and time frame .....	57
4.2. Variables.....	59
4.3. Empirical analysis .....	61
5. RESULTS.....	63
5.1. Descriptive statistics for the variables.....	63
5.2. Empirical results and discussion.....	64
5.2.1. Technological innovations as a determinant of export-related activities .....	64
5.2.2. Export-related activities as a determinant of technological innovations.....	67
5.2.3. Results of the third analysis.....	70
6. CONCLUSION .....	71
<b>CHAPTER IV .....</b>	<b>81</b>
<b>ARE FAMILY FIRMS AS OPEN-MINDED AS NON-FAMILY ONES? .....</b>	<b>81</b>
1. INTRODUCTION.....	81
2. LITERATURE REVIEW .....	84
3. THEORETICAL FRAMEWORK AND HYPOTHESES .....	86
4. METHODS.....	90
4.1. Data sources, sample and time frame .....	90
4.2. Variables.....	92

4.3. Empirical analysis .....	93
5. RESULTS .....	94
5.1. Mean, standard deviations and correlations between variables.....	94
5.2. Empirical results and discussion.....	95
6. CONCLUSION .....	100
REFERENCES .....	103
<b>CHAPTER V</b> .....	109
<b>CONCLUSION</b> .....	109
1. SUMMARY OF THE DISSERTATION .....	109
2. CONTRIBUTION OF THE DISSERTATION.....	111
2.1. Contribution for the literature.....	111
2.1.1. Theoretical contribution .....	111
2.1.2. Empirical contribution.....	112
2.1.3. Methodological contributions.....	113
2.2. Contribution to management .....	115
2.3. Contributions to public policy .....	115
3. LIMITATIONS AND FUTURE RESEARCH LINES .....	117
REFERENCES.....	119
ANNEX 1 .....	121
ANNEX 2 .....	122



## List of tables and figures

Table 1. Dissertation approach .....	9
Figure 1. A first approximation of the relation between innovation and internationalisation .....	23
Table 2. Case-studies results .....	33
Table 3. Types of innovation within the companies.....	36
Figure 2. A relation between innovation and internationalisation. The Born-Global case .....	39
Figure 3. Entry modes as a source of technological innovation.....	42
Figure 4. Conceptual framework.....	54
Table 4. Sample description .....	58
Table 5. Description of variables.....	61
Table 6.1. Means, standard deviations and correlations between variables.....	63
Table 6.2. Means, standard deviations and correlations between variables.....	63
Table 7.1. Results. Technological innovations as a determinant of export-related activities.....	65
Table 7.2. Results. Export-related activities as a determinant of technological innovations .....	68
Table 7.3. Results. F statistics from Granger test.....	70
Table 8. Linking familiness with internationalisation and/or innovation.....	85
Table 9. Descriptive statistics.....	91
Table 10.1. Descriptive statistics and correlations for family firms' sample.....	94
Table 10.2. Descriptive statistics and correlations for non-family firms' sample.....	94
Table 11.1. Results. Firms' investments in technology as a determinant of their international involvement.....	96
Table 11.2. Results. Firms' international involvement as a determinant of their investments in technology .....	98
Table 12.1. Contributions to literature.....	114
Table 12.2. Contribution to management and public policy .....	117





# **CHAPTER I**

## **INTRODUCTION**

### **1. IMPORTANCE OF INTERNATIONALISATION AND INNOVATION**

The evolution of the international economy has revealed important changes regarding the structure of the relationships among economic agents and the variables determining the conditions of competitiveness (Fletcher, 2001). There are two main factors that stand out over many others: the first is the growing number of elements of economic organisation affected by internationalisation; the second refers to the increasing complexity of the innovative process (Molero, 1998; Rogers, 2004). Internationalisation and innovation of the firms have been considered two of the most important factors determining business success over the last decade (Buckler and Zien, 1996; Wind and Mahajan, 1997; Zahra and George, 2002; Vila and Kuster, 2007).

Internationalisation is an important issue for firms that often results in vital growth, useful learning outcomes and superior financial performance (Prashantham, 2005). The first important steps in firms' internationalisation process are generally assumed to be trade related, and although import activity is considered to play a role, it is export activity that is most often recognised as being the initial real step in the internationalisation process (Jones, 2001). However, firms which expand their activities abroad also face increased competition and must, therefore, adopt innovation as a main tool in order to reduce pressures. As highlighted by Porter (1998), successful technological innovation in new products and processes is increasingly more regarded as the central issue in economic development and has become critical to achieve sustainable competitive advantage. Technological innovation is defined as an iterative process initiated by the generation of new products and processes or of significant technological improvements in current products and processes (OECD, 1997).

### **2. RESEARCH GAP**

In the last decades the internationalisation phenomenon of the firm has been largely studied, occupying many pages in the most important academic journals. Academicians'

view varies since there are two main directions the internationalisation process can go to: either firms follow a gradual internationalisation process (basing their arguments in Uppsala theory developed by Johanson and Vahlne, 1977) or they follow a radical process of development also known as the Born-Global phenomenon (Knight and Cavusgil, 2004). It has been proposed in the literature that the international activity of firms depends on the extent to which their industry is internationalised, or on the level of international activity that exists in a geographically distinct cluster of firms (Brown and Bell, 2001). On the other hand, it has also been indicated that industries are involved in an internationalisation process if member firms pass through similar stages of international development at the same time (Kirpalani, 1999).

As for the innovation literature, historically it was focused on the role of internal research and development on firm innovation (Griliches, 1979). However, internal R&D expenditures played only a partial role in firm innovation rates. Increasingly, scholars recognise that the ability to exploit external knowledge is critical to firm innovation (Cohen and Levinthal, 1990; Teece *et al.*, 1997). The relationship between a firm's performance and R&D spending is often imperfectly understood, despite the fact that R&D is often a cornerstone of an effective innovation strategy.

In the last years, academicians have observed that there was a need to link innovative with international activities and vice-versa, introducing the concept of "technoglobalism" (Archibugi and Michie, 1995). Even more, as highlighted by Jones (2001), the globalisation of technology markets has implied that different-sized companies get involved in various types of cross-border business activities, such as one-off arrangements with foreign partners or an ongoing process of their international development.

Additionally, articles focusing on a certain relation between firms' international and innovative activities have been published, both longitudinal (Barrios *et al.*, 2003; Salomon and Shaver, 2005; Díaz *et al.*, 2008; etc.) as cross-sectional (Cho and Pucik, 2005; Lachenmaier and Wößmann, 2006; Pla and Alegre, 2007; Vila and Kuster; 2007). When referring to the longitudinal studies, the cited authors prefer to use data from the Spanish Survey on Business Strategy (SBS) – a statistical investigation carried out by SEPI Foundation with the financial support of the Ministry of Industry, Tourism and Trade, and designed by the Program of Economic Investigations of SEPI Foundation – focusing either on the decision of a firm to export (Barrios *et al.*, 2003), or on how

exporters can access diverse knowledge inputs not available in the domestic market (Salomon and Shaver, 2005), or on the relation between technological knowledge assets and performance (Díaz *et al.*, 2008). On the other hand, the objectives and samples of the cross-sectional studies are diverse and thus enriching. Cho and Pucik (2005) examine the relationship between innovativeness, quality, growth, profitability, and market value at the firm level by focusing on “The Fortune Reputation Survey” (1983). Lachenmaier and Wößmann (2006) analyse 981 firms from 2002 Ifo Innovation Survey (Germany) in order to see whether innovation causes exports. Also focusing on the relation between internationalisation and innovation, Pla and Alegre (2007) and Vila and Kuster (2007) find a positive and significant link between innovation and export intensity, however not reciprocal.

Unfortunately, the direction of this relation has not been deeply addressed, or at least not so profoundly empirically demonstrated. Hitt *et al.* (1997) examine it, among other issues, and find that there is a linear relationship between international expansion and technological innovation, depending on the level of product differentiation. Kumar and Saqib (1996) provide evidence of a positive relation between firms’ export activities and their R&D expenditures. Consequently, Buesa and Molero (1998) find that firms’ international activity is one of the main determinants of regularity in innovation. Zahra *et al.* (2000) offer a more accurate image, focusing on the effects of internationalisation on a firm’s technological learning, and finding a strong relation between them, whereas Vila and Kuster (2007) demonstrate that internationalisation does not depend on product innovation though process innovation depends on internationalisation.

A construct of interest employed in some of these analyses (Zahra, 2000; López and García, 2005; Díaz *et al.*, 2008) is firm’s ownership (private, public and foreign), but the attention has gone more on the latter, its positive and significant influence over firm’s internationalisation and innovation being obvious in most of the studies (Roberts and Tybout, 1997; Ozçelik and Taymaz, 2004; Castellani and Zanfei, 2007). Private ownership embraces the family business field which importance is highlighted in many studies, especially due to the fact that these firms are active agents in the global economy (Casillas *et al.*, 2007). Interests in this topic are various, but mainly they regard agency relations and costs (Schulze *et al.*, 2001), role and effect of family in business (Gómez *et al.*, 2001; Aldrich and Cliff, 2003), and succession (Le Breton-Miller *et al.*, 2004; Royer *et al.*, 2008). Nevertheless, many family firms have recently

shown an active presence in the international, competitive arena (Davis and Harveston, 2000; Zahra, 2003; Graves and Thomas, 2006; de Farias *et al.*, 2009), but, despite their increased activity, not much is known about their internationalisation and innovation strategies and the connection between them.

### **3. OBJECTIVE OF THE DISSERTATION AND RESEARCH QUESTIONS**

The purpose of this dissertation, as underlined until now, is to understand better the relation which exists between internationalisation and technological innovation. To do so, we undertake empirical investigation which consists of three studies (an initial qualitative and two consequent quantitative ones). We first part from a general idea of the relation extracted from a combination between earlier evidence and academic literature, trying to explore it more in-depth through the application of qualitative methodology. Next, parting from the results, a large sample of manufacturing firm is analysed, employing different variables related to both the international – export – and innovative activities of the firm. Last, we address the direction of this relation also to a special type of firms, precisely we separate our sample in family and non-family firms, having the objective to observe how much different is their behaviour in terms of the two processes of the firm discussed in this dissertation. Resuming, we aim at answering the following research questions:

1. Is there a reciprocal relation between internationalisation and innovation?
2. Do technological innovations exert a positive influence over the development of export-related activities? Do export-related activities exert a positive influence over the development of technological innovations?
3. Do family firms behave differently than non-family ones in terms of international involvement and investments in innovation?

### **4. RESEARCH APPROACH AND DESCRIPTION OF THE ANALYSES**

As already mentioned and also resumed in the Table 1, the dissertation is formed by three studies, a first one qualitative and other two quantitative. Next, we proceed to the description of each of them.

#### **4.1. Qualitative study**

In order to answer our first set of research question, we first focused on a systematic application of the multiple-case study approach to an export context in which five Spanish exporters were first judgmentally chosen and then individually examined. Consistent with several qualitative methodologists (Eisenhardt, 1989; Yin, 1994; Maxwell, 2005), multiple-case-based investigations serve as a basis for either empirically testing previous theories or building new theoretical explanations of the researched phenomenon. The sample selection was made taking into account two important facts: firms should be widely recognized for their intense international activity and they should also be highly innovative.

After finding theoretical background in the resource-based view as well as in the gradual internationalization theory of the firm, we propose a model based on the assumption that internationalisation and technological innovation exist in a mutual, interdependent relation. This relation starts with the idea that the technology possessed by the firm leads to innovation, therefore to the creation of competitive advantages required in an international market. Once the firm develops activities in international markets, it gains knowledge about the existing environment and competition, and this knowledge will be very helpful in maintaining the firm's competitiveness by realising radical or incremental improvements to its products. The basis of doing so reside in the development of technological innovations, so the relation between innovation and internationalisation may be considered as a mutual.

The main idea highlighted in the results of this first part of the dissertation is that once the firms have entered the foreign markets through different entry modes – corresponding to different levels of commitment to the markets – they have gained experience and acquired knowledge, being able to develop more technological innovations. Furthermore, depending on the type of the entry mode, the companies acquire a certain type of knowledge (product/market) which leads to a certain type of technological innovation (incremental/radical). The results of this first study show us that indeed companies develop different types of innovation (product or process and incremental/radical) depending on how commitment they are to the foreign market. Put it differently, if a firm chooses to have less commitment to a foreign market, it will mainly gain product knowledge, which will imply more incremental product/process innovation. For example, by addressing to a new market through agents, are the agents

the ones who interact with the consumers and learn about them, not the company. This, at most, can receive the feedback from the agent and adapt its products, therefore product knowledge is acquired. On the contrary, if a company chooses more commitment to a market, it will gain not only product knowledge but also market knowledge, which will imply more radical product/process innovation. It is the case of companies which decide to enter a foreign market through a subsidiary or a joint-venture. Having an important presence abroad, the firm understands easier all the issues related to the new market, including not only the perception of the customers regarding its products but also the behaviour of the competition and the effects of the environment. Thus, the knowledge that the firm is able to acquire is much broader and helps it to realise remarkable improvements of the products, defined as radical innovations.

#### **4.2. First quantitative study**

Regarding the second set of research questions, we aimed at answering them by realising a quantitative study focused on a firm-level dataset of Spanish manufacturing firms. Explicitly, we use data from SEPI Foundation during the period 1994-2005, thus dealing with a longitudinal sample. The final sample is formed of 8,309 observations corresponding to 696 firms and it constitutes an unbalanced panel since some firms cease to provide information while others continue to do so every year. We once again base our hypotheses on the resource-based view, precisely on the intangible resources of the firm as technological innovations, exports and experiential knowledge. Since we believe that exports in year  $t$  can be influenced by technological innovation in year  $t-1$  and, consequently, exports in year  $t-1$  would also explain the technological innovations in year  $t$ , lagged values of the independent variables are introduced in the analysis.

Hence, the second part of the dissertation has a threefold focus. Firstly, the influence that technological innovation activities have upon exports is analysed. To do so, three variables which explain the innovative behaviour of the firms are employed in order to capture a clearer context: the innovative intensity (measured as the ratio between R&D expenses and total sales), the number of product innovations and whether the company develops process innovations or not. Secondly, we analyse the influence that export activities have upon the innovative ones and another three regressions are estimated. In order to capture the export behaviour of the firms, we employ variables referring to the number of main international markets, the propensity to export (measured as the ratio between exports and total sales), and the exports value. Considering Gemunden (1991),

we associate the first two variables with the firm's presence abroad or its export propensity and the third one with its export intensity.

As for the methodology used in this second study, for the first part we estimate three Tobit regressions since all dependent variables are truncated ones, and for the second part we estimate two Tobit regressions and one Logit, since one of the dependent variable is a binary one. However, running the models above-mentioned represents only a first insight of the causal relation between the two processes under analysis. In order to offer more accurate empirical support, we perform the Granger test of causality (Granger, 1969) since it remains the most popular methodology for evaluating the nature of the causal relation between two variables (Hood *et al.*, 2008). Therefore, we aim at determining whether one process is useful in forecasting the other one. Explicitly, we test whether technological innovations are “Granger caused” by exports and vice-versa. To incorporate dynamics, we also include lagged variables in this analysis.

The findings of our first analysis suggest that the technological activities of the firm are a key factor in its export performance, providing it with greater capacity to enter and sell products in foreign markets. Namely, we observe that if a firm is interested in selling more abroad or in increasing its propensity to export, it takes into consideration the process innovations developed a year before, while the product innovation have no significant impact. The results of our second analysis show that the international achievements of the firm are also a key factor in the advances achieved in technological innovations. Therefore, when a firm is consolidated abroad, having a relevant value of export-sales, it develops a complete picture of technological innovations, from high R&D investment to both product and process innovations. As for the third analysis, results allow us to affirm that innovation “Granger causes” internationalisation and that internationalisation “Granger causes” innovation.

#### **4.3. Second quantitative study**

Finally, the third part of this dissertation focuses not only on the reciprocal relationship between exports and technological innovations, but also on whether the type of the ownership affects this relation. Specifically, we aim at finding how family firms differ from non-family ones in terms of their export and innovation advances. Thus, addressing the third set of research questions, we use the same SBS data, but we distinguish firms in terms of ownership. The observations regarding family firms were

separated from non-family ones, the final samples being formed by 349 family firms on one hand and 444 non-family firms on the other hand. We also add a novelty in the dissertation, meaning that we apply a modern and outstanding methodology – the Generalised Method of Moments (known as Arellano and Bond (1991) estimators).

We pose two hypotheses based on the theoretical background given by the resource-based view and the agency theory. Explicitly, we initially assume that the impact of investments in technology over international activities is higher in non-family firms than in family ones, as well as the impact that international activities have upon investments in technology, since academic evidence emphasis the risk adversity of family firms and their lack of strong managerial knowledge. However, the results obtained allow us to reject both hypotheses. On one hand, this study shows that investments in technology have a similar influence over international involvement for both family and non-family firms. Family firms have understood the challenges of globalization and the need to take advantage of their know-how and therefore, of its technological advances. They adapt to the requirements of a global economy and face competition as well as a non-family firm. On the other hand, it seems that family firms not only follow the same cycle of development as non-family ones, but they even outperform them in terms of innovation; precisely they find easier the expansion abroad through technological competitive advantages and, once being international, they are able to invest more in technology so that they remain competitive and introduce new products and processes in the foreign markets.

This dissertation contributes in several ways to the literature (i.e. theoretical, empirical and methodological) as well to the managers and public policies, contributions deeply commented in the last chapter.



**Table 1. Dissertation approach**

Study	1.	2.	3.
<b>Research questions</b>	Is there a reciprocal relation between internationalisation and innovation?	Do technological innovations exert a positive influence over the development of export-related activities? Do export-related activities exert a positive influence over the development of technological innovations?	Do family firms behave differently than non-family ones in terms of international involvement and investments in innovation?
<b>Theoretical background</b>	Resource-based view Gradual internationalisation theory of the firm	Resource-based view	Resource-based view Agency theory
<b>Research approach</b>	<i>Qualitative research</i> Multiple-case study 5 in-depth interviews	<i>Quantitative research</i> SBS survey from SEPI Foundation Unbalanced panel, 696 firms from the period 1994-2005 Tobit/ Logit regressions Granger test of causality	<i>Quantitative research</i> SBS survey from SEPI Foundation Unbalanced samples: 349 family firms and 444 non-family firms from the period 1994-2005 GMM system estimator
<b>Key results and need for further research</b>	Reciprocal relation confirmed in all 5 firms. Depending on the type of the entry mode, the companies acquire a certain type of knowledge (product/market) which leads to a certain type of technological innovation (incremental/radical). Need to test empirically the reciprocity of the relation.	Technological activities of the firm are a key factor in its international performance. Development of process innovation in year t-1 positively affects firm's international sales volume and its export propensity. An international consolidated firm develops a complete picture of technological innovations. Innovation and internationalisation "Granger causes" each other. Need to look if a specific type of company behaves similarly.	Investments in technology have a similar influence over international involvement for both family and non-family firms. Family firms not only follow the same cycle of development as non-family ones, but they even outperform them in terms of innovation. Need to integrate and contrast the results with the existent literature.

Source: Self-elaborated

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## **CHAPTER II**

### **AN IN-DEPTH LOOK AT THE RELATION BETWEEN TECHNOLOGICAL INNOVATION AND INTERNATIONALISATION<sup>1</sup>**

#### **1. INTRODUCTION**

Innovation and internationalisation of the firms are two of the most important factors determining business success today (Buckler and Zien, 1996; Wind and Mahajan, 1997).

The evolution of the international economy has revealed important changes regarding the structure of the relationships among economic agents and in the variables determining the conditions of competitiveness. There are two main factors that stand out over many others: the first is the growing number of elements of economic organisation affected by internationalisation; the second refers to the increasing complexity of the innovatory process. These two features reinforce each other to the extent that today's economic analysis has to consider both of them simultaneously when trying to account for the new dynamic of the firms operating at the international level (Molero, 1998).

Internationalisation, commonly understood as the process of adapting firms' operations to international environments, is an issue of importance for firms that often results on vital growth, useful learning outcomes and enhanced financial performance, as Prashantham (2005) reveals in his paper. Furthermore, this author describes the internationalisation as an innovation of the firm that often entails decision-making under conditions of uncertainty, where knowledge is vital.

On the other hand, international markets are characterised by a greater competitive pressure than national markets, as López and García (2005) mention. This demanding competitive environment is reflected both on the demand side, where consumers demand high quality and low prices, and on the supply side, where firms face local competitors along with international rivals. In this way, firms that dedicate part of their efforts to markets abroad have intensified their search for competitive advantages, in order to confront the competition and survive in

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<sup>1</sup> A version of this study is published in *Advances in International Marketing*, volume 20, 2009, edited by professors Rudolf Sinkovics and Pervez Ghauri.

these markets. In addition, as it is mentioned by Hoffman *et al.* (1998), the firms' innovative capability is a key driver for sustainable competitive advantage in today's rapidly changing markets.

According to Eusebio and Rialp (2002), having competitive advantages allows a firm to compete in an active way in the markets, even more when the firm interacts in different foreign markets. In this context, the technology represents one of the most important factors in increasing the national and international competitiveness of the firms. Technology allows, on one hand, to obtain products, through product innovations, with superior characteristics as the ones offered by the competition and, on the other hand, to reduce the costs of production and, consequently the prices, through process innovation. In this way, the innovative firms obtain some competitive advantages that give them the possibility to compete in an active way in different markets.

As it can be observed, the connection among innovation and internationalisation seems to be considered in the literature. However, this connection has not been deeply addressed, and this relationship constitutes the ground for our main research question:

*Is there a mutual relationship among innovation and internationalisation of the firm?*

Precisely, the main research objective of this investigation is to evaluate, by means of case-study approach, the Spanish exporting firms in terms of patterns of technological innovation and internationalisation, in particular, to find out the relationship which exists between these two processes and the factors that influence this relationship.

Following the Oslo Manual (OECD, 1997), technological innovation is defined as the generation of new products and processes or of significant technological improvements in current products and processes. More precisely, incremental and radical innovation together with the product and process one, are going to be considered here, due to the fact that they are considered more tangible innovations and more easily observed within a sample.

Having as a purpose to accomplish the objective mentioned at the beginning, there are formulated the following outlined research questions:

**RQ 1:** Does the innovation of the firm lead to the internationalisation of the firm?

**RQ 2:** Does the internationalisation of the firm imply more innovation for the firm?

**RQ 3:** Does the market entry mode of the firm lead to a different type of innovation?

The main contribution of this research is the development of a model that will permit understand the relationship between internationalisation and innovation in one firm, and asses the existence of the model in the real world through explorative research. Therefore, and taking into account that different innovative profiles have been associated to different internationalisation patterns, this research could verify if there is a mutual relationship between the internationalisation and the innovation. As it was said before, this investigation will fill a gap in the scientific literature but it will also be very useful to managers, as it can be taken as a guide in order to improve their international activities by innovating or improving their innovation by exporting, depending on the results of this study.

For achieving the mentioned purpose, this research is organised as follows: in the next section, some key theoretical and empirical findings about the innovation and internationalisation phenomena are reviewed followed by the theoretical frameworks that are going to be used in this research, together with a proposed model of the relationship between innovation and internationalisation. Then, the research methodology is described, methodology which is based on a systematic application of the case-study approach in which five Spanish companies are judgmentally chosen. Each case is individually described and a cross-analysis is also presented. Finally, several conclusions and future lines of investigation are outlined.

## **2. LITERATURE REVIEW**

### **2.1. A focus on the innovation of the firm and innovative firms**

Innovation, as it is defined by Acs *et al.* (2001), is the effort to create purposeful, focused change in an enterprise's economic or social potential. According to Terziovski (2002), innovation is a complex process, easily identified as being of critical importance for organisational success yet not easily managed. Successful innovation in new products and processes is increasingly being regarded as the central issue in economic development (Porter, 1998).

The concept of innovation was studied a lot during the years, beginning with Schumpeter (1943) who gave the fundamentals of what can be called the "innovation theory" which was later developed in the neoclassical theory by Arrow (1979), arrived to its actual expression by the developments of Nelson and Winter (1982). Afterwards Dosi (1984) set the bases of the fundamental concepts of the actual technological innovation, more recently being Pavitt (1984)

the one who analysed the innovation process at international level, and Archibugi and Michie (1995) the globalisation of the processes of technological innovation.

Historically, the innovation literature was focused on the role of internal research and development on firm innovation (Griliches, 1979). Traditionally, those firms involved in R&D activities through laboratories or through specific units dedicated to the investigation and development of new processes and products, have been considered technological innovative firms.

Molero *et al.* (1998) characterise them as firms that execute activities on a regular basis, formal or informal, pursuing, either the creation of new product and process technologies or their improvement, in order to obtain results –quantitative or qualitative- that could increase their competitive capacity against other firms that work in the same market, or open for them new markets, that is, supporting the growth of the firm. As it can be observed, this definition considers, explicitly or implicitly, the mentioned technological innovation characteristics.

Veugelers and Cassiman (1999) structure the decision of a firm on how to innovate as a two-stepped process. First, the firm decides whether or not to innovate and second, the firm decides which innovation strategy to develop and how to acquire the necessary technology to accomplish its innovation goals.

De Propriis (2002), who analyses the impact of inter-firm cooperation over innovation, separates the innovation into four types: product, process, incremental and radical innovation. As a matter of fact, in our investigation this classification of the innovation will be taken into consideration. As the author mentions, product innovation corresponds to the introduction on the market of new or improved product, whereas process innovation relates to the sequences and nature of the production process. Process innovation is often more difficult to detect but it is very important especially for buyer-supplier transactions.

Radical innovations are, as Freeman and Perez (1988) define them, discontinuous events, which are the result of a deliberate research and development activity. Fernández (2005) mentions that a radical innovation occurs when the technological knowledge needed, in order to exploit it, is very different of the already existent knowledge. The radical innovations are also called “competence destroyers”. Incremental innovation refers to improvements due to use or experience; it can often take the form of smaller enhancements around major radical innovations. Freeman and Perez (1988) mention that the incremental innovation is crucial for firms’ productivity growth even though it is often underestimated in comparison to radical



innovation. In the case of incremental innovation, also named “competence increaser” by Fernández (2005), the knowledge needed in order to offer a product is based on the existent knowledge. Both radical and incremental innovations can be either in product or process.

## **2.2. A focus on the internationalisation of the firm**

The phenomenon of the internationalisation of the firms has been studied quite a lot since the last thirty years (Fletcher, 2001). In the external international business environment, the adoption of internationalisation is likely driven by two key trends that have substantially reduced the transactions costs of the foreign market expansion. Knight and Cavusgil (2004) talk about the first as being the globalisation of markets, which involves countless firms in international sourcing, production, and marketing as well as cross-border alliances for product development and distribution. The second trend is characterised as technological advances in information and communication technologies, production methods, transportation, and international logistics, which reduce business transactions costs and facilitate extraordinary growth in international trade.

The most common view on firms and their internationalisation processes is that firms begin to operate at home and then they address to closer markets from their domestic one, and, when time goes by and the managers acquire more knowledge, the firms expand abroad to more geographically and culturally distant countries. Actually, in the opinion of Prashantham (2005), knowledge is at the core of received wisdom on internationalisation. Even more, according to Johanson and Vahlne (1977) and Johanson and Wiedersheim-Paul (1975), the internationalisation of the firm is determined by its market knowledge. Regarding the internationalisation of the firm, there are three dimensions that stand out in the opinion of Jones and Coviello (2005) and these are the international market selection, the entry mode choice and the pace of internationalisation.

Regarding the market selection, Johanson and Vahlne (1977) postulated that psychic distance distorts the acquisition of market knowledge and therefore foreign markets that are initially selected will be psychologically closer to the firm’s domestic market. In terms of mode choice, a firm was considered as traversing a sequential set of stages, from indirect exporting at one end of the spectrum, and wholly owned production oriented subsidiaries at the other. As for the rhythm of the internationalisation, the manifestation of this model was anticipated to be as an incremental international expansion following a period of domestic growth. However many empirical studies of firms’ internationalisation behaviour, especially in technology-

based knowledge-intensive sectors, contradicted all the three predictions (Andersen, 1993). That is, these firms were international virtually from inception, entering psychically distant markets through high-commitment modes from an early stage in their life-cycle.

Furthermore, in recent years, researchers have focused on the time aspect and some results indicate that time may not be the only explanation to why firms start to internationalise (Rialp *et al.*, 2005a). Put differently, today many firms internationalise soon after their establishment, which has led to the emergence of the concept of Born Global firms. These are mainly small- and medium-sized firms (Saarenketo, 2002). During the past decade, the phenomenon has been highlighted among researchers who are active in the field of internationalisation processes of firms<sup>2</sup>.

Born-Global firms can be described in different ways. Since the research area is new there do not exist any common definitions of what constitutes a Born-Global firm. However, some definitions are more recognised than others are. Oviatt and McDougall (1994) describe the Born-Global firms as “business organisations that, since their inception, have sought to derive significant competitive advantage from the use of resources and the sale of outputs in multiple countries”. Thus, the rapidity and intensity of the internationalisation are the two key parameters. Born-Globals are firms that have reached a share of foreign sales of at least 25% after having started export activities within three years after their foundation (Knight and Cavusgil, 1996). These firms have, in particular, been described as especially innovative in their internationalisation (Knight and Cavusgil, 2004; Oviatt and McDougall, 1994).

The time between the moment of the first international sale and the moment of the firm’s founding is a common criterion to use when establishing if a firm is a Born-Global or not. However, it is also an area of controversy and the time span used differs from two to six years. It is important to establish a generally accepted definition of a Born-Global firm because, otherwise, it will continue to be difficult to compare researches about the phenomenon. In the present investigation, the definition of Born-Global firms that is considered is the one by Oviatt and McDougall (1994).

### **2.3. A focus on the innovation and the internationalisation of the firm**

Internationalisation supposes gaining entry to new country markets. It may, therefore, be described as a process of innovation in the opinion of Andersen (1993) and Casson (2000).

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<sup>2</sup> Rialp *et al.* (2005a) investigate the phenomenon of Born-Global firms, also called early internationalizing firms, realizing an inquiry into this field of investigation with a focus on the decade 1993-2003.

This is also coherent with the idea of Bilkey and Tesar (1977) who consider that the fact that knowledge is a necessary driver in the successful internationalisation of the firm is becoming evident when internationalisation is considered to be a form of innovation in which knowledge is a vital source.

Faced with increasing international competition, innovation has become a central focus in firms' long term strategies. Firms competing in global markets face the challenges and opportunities of change in markets and technologies. According to Veugelers and Cassiman (1999), one important aspect within innovation management is the optimal integration of external knowledge, since innovation increasingly derives from a network of companies interacting in a variety of ways.

Considering Eusebio and Rialp (2002), different research-works from the last years, focused on the area of innovation and internationalisation, tend to collect the activities of technological innovation realised by the firms taking into account the percentage of billing that these are investing in R&D activities. Although this is the measure more used in the main investigations in order to capture the innovative activities carried out by the companies, the certain thing is that the concept of technological innovation could be wider than the simple formal realisation of activities of R&D. Consequently, the use of the investments in R&D as the only explanatory measure of the innovative effort carried out by a company could generate partial and/or not very exhaustive results.

The role of innovation in trade behaviour is of particular interest in the case of UK, as Wakelin (1998) mentions, innovation having a positive influence on the trade performance. The author finds that the number of innovations used at the sector level is positively and significantly related to the probability of exporting, and is negative and significant for the propensity to export of the exporting firms. To put it in another way, the author finds that the number of innovation has a positive impact on the probability to export (and no relationship to the propensity to export. Moreover, it is observed that firms with a large number of innovations are more likely to export, indicating heterogeneity even within the group of innovating firms.

Following the same line of investigation, Basile (2001) analyses and compares the relationship between innovation capabilities and export behaviour of Italian firms in different exchange rate regimes. He also investigates the specificity of export behaviour of firms localised in the south of the country over the same period of time. The results of his study

show that innovation is a very important competitive factor and helps explain firm heterogeneity in export behaviour among Italian firms. The product innovation strategies have a positive effect on the export intensity only after the currency (Lira) devaluation. It was also found that the relationship between innovation strategies and export behaviour of southern Italian firms is weaker than that found for the national average.

Being aware of the need for disentangling the direction of causality between exports and measure of firm performance, Lachenmaier and Wössman (2006) have the possibility to directly test whether innovation causes exports, having a German sample. Actually, the authors mention more than once that a causal relationship between innovation and export is expected, focusing on the product-cycle features and the endogenous growth models. However, their results can only show one part of the relationship, the one that stands out the fact of being innovative causes firms to have substantially larger export shares than non-innovative firms in the same sector. So, considering this, it is obvious that more extent research is needed in order to accomplish the objective of analysing the causal relationship between these two factors.

Nowadays, the concept of “techno-globalism” is to a greater extent used in the scientific literature, referring to the relationship between technological innovations and internationalisation of the firms (Archibugi and Michie, 1995), and to the reach of generation, transmission and diffusion of the technologies which are increasingly more international.

### **3. THEORETICAL FRAMEWORKS**

#### **3.1. Gradual internationalisation theory of the firm**

The internationalisation theory of the international activities explores the transferring of the international operations inside the firms, with the purpose of exploiting efficiently the capacities obtained by them. Also known as the Uppsala model, the gradual internationalisation theory (Johanson and Vahlne, 1977; 1990) develops the advantages of the firms, emphasising the knowledge of international markets which can be considered as an advantage against the competitors, and the level of compromise with them from a perspective of greater personalisation of the managers of the firm.

This theory explains why firms generally initiate internationalisation processes later in their development and why such processes generally proceed slowly once initiated. According to Oviatt and McDougall (2005), knowledge is at the core of the traditional process of

internationalisation. They mention that Johanson and Vahlne (1977; 1990) viewed the lack of foreign market knowledge as an impediment to international expansion, postulating that firms tend to operate in the vicinity of existing knowledge and remain domestic unless provoked, pushed, or pulled by an event such as unsolicited export orders. With time, the firm gradually progresses through a series of learning and commitment stages, as it follows: no regular export, export through agents, founding of an overseas sales subsidiary, and overseas production. Their model suggests that, once initiated, internationalisation proceeds incrementally, regulated by the experience-based accumulation of “foreign organising knowledge”. Johanson and Vahlne (1977; 1990) proposed a more dynamic conception of the firm’s internationalisation process, stressing the continuous interaction between both the development of knowledge about markets and foreign participation and an increasing commitment of resources regarding international markets.

### **3.2. Resource-based view**

Many investigations concerning the theme of innovation and internationalisation of the firm consider also the resource-based theory, which has its origins in Penrose’s (1959) seminal work. The resources approach suggests that the best way of regarding a firm is as a collection of productive resources, imperfectly imitable and specific to each firm, which allows it to compete successfully against other firms.

Thus, according to this perspective, every firm is heterogeneous, since it possesses resources that other firms cannot easily imitate, and moreover these resources allow it to generate and sustain competitive advantages, which means it can earn above-normal profits and maintain them in the long run. The capacity of firms to generate sustainable competitive advantages depends on their particular set of resources. Barney (1991) mentions that resources that generate competitive advantages must fulfil four conditions: they must be valuable, scarce, inimitable and non-substitutable.

According to Fahy (2002), resources have been generally categorised on the basis of barriers to duplication and a broad distinction is made between assets and capabilities. Assets can be thought of as being either tangible (Wernerfelt, 1989) or intangible (Hall, 1992), as for the capabilities, they have been described by a variety of terms, such as skills (Klein *et al.*, 1991), and intermediate goods (Amit and Schoemaker, 1993). Intangible resources are of a great significance from their strategic perspective, being considered the key resources for business success.

Consequently, the resource-based view helps to explain how, in the context of an innovative culture, knowledge and resultant organisational capabilities are developed and leveraged by enterprising firms (Knight and Cavusgil, 2004). Knowledge, understood by these authors as the capacity of the company to learn and use the relationships among informational factors in order to achieve its purposes, is the most important resource, and the integration of individuals' specialised knowledge is the essence of organisational capabilities (Nelson and Winter, 1982). So, the most important knowledge resources are unique, inimitable, and immobile, reflecting the distinctive pathways of each company (Grant, 1991)<sup>3</sup>. As for the organisational capabilities, these reflect the ability of the company to perform repeatedly, and represent the main source of the company's performance advantage (Grant, 1991).

As regards intangibles, the resource-based view lends great importance to the firm's technological capability. It points out that innovative capability does not come from skill in exploiting external technologies, which are easily accessible for competitors and therefore insufficient for sustaining a competitive advantage (Barney, 1991). It rather comes from the generation of internal innovation, which implies the possession of heterogeneous and specific technological resources, and the capability to generate other new resources and to build basic technological competences.

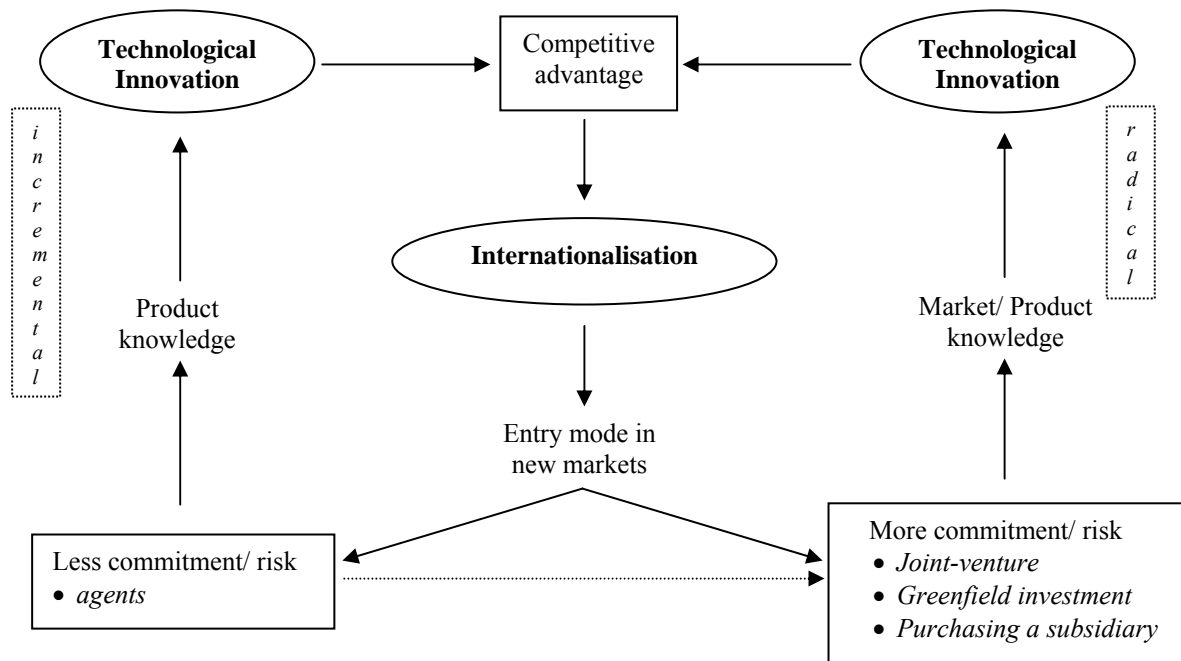
### **3.3. Proposed model**

Considering all the above mentioned, it is proposed a model (Figure 1) which is based on the assumption that innovation and internationalisation exist in an interdependent relation. Due to its technological resources (innovation), a firm gains competitive advantages in order to extend itself to new markets, this process of internationalisation being realised by different modes of entry into the foreign countries, which can be made by agents (less commitment to the markets) and/or by joint-venture, Greenfield investment, purchasing a subsidiary (more commitment to the market). Depending on the entry mode chosen, the firms gain product knowledge or product and market knowledge, these types of knowledge leading to a continuous technological innovation process.

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<sup>3</sup> Nevertheless, the international business literature attributes importance to country-specific resources or comparative advantages as well as to firm-specific resources (Dunning, 1977; Ghoshal, 1987).

**Figure 1. A first approximation of the relation between innovation and internationalisation**



*Note:* As time passes by, the firm can use other entry modes, parting from less commitment till more commitment to the market.

Source: Self-elaborated

More precisely, this model proposes the following: when a firm chooses less commitment in the new markets there is a bigger probability to get product knowledge and develop incremental innovations, and when it chooses more commitment there is a bigger probability to get product and market knowledge and develop radical innovations. Of course, as the model also suggests, the innovations that the firm realises, help it to reach new markets so they lead to a continuous process of internationalisation. To say it in other words, the more markets the firm gets, the more innovations it realises, and the more innovations the firm realises, the more markets it gains. Reinforcing the idea of mutual phenomenon, Edquist and McKelvey (2000) and Lundvall (1992) argue that the innovation process should rather be considered as a circular and complex system embracing interactive elements.

#### **4. METHODOLOGY**

Consistent with several qualitative methodologists (Eisenhardt, 1989; Maxwell, 2005; Yin, 1994), multiple case-based investigations serve as a basis for either empirically testing previous theories or building new theoretical explanation of the researched phenomenon.

Considering the firm as the main unit of analysis, this empirical research is based upon a systematic application of the multiple case-study approach to an export context in which five Spanish exporters<sup>4</sup> were first judgementally chosen and then individually examined. The selection of the sample was made taking into consideration two important facts: firstly, the firms should be leaders in their international activity, and secondly, they should be innovative. The main source of information in order to realise the case-studies was the semi-structured interview with general managers, export/ commercial department managers and R&D managers of the selected firms. The contact was carried out by the means of a telephone call, the potential interviewees being informed about the characteristics of the investigation and being asked for the collaboration. Later on, an e-mail was sent with detailed information about the investigation and, also, the protocol of the interview was attached (see Annex 1).

The interviews, with an extent of forty minutes in average, were recorded with the consent of the interviewees, and afterwards full write-ups were constructed on each company in the form of a detailed case study, focusing on the specific characteristics of each case situation. As a requirement to achieve construct validity (Rialp *et al.*, 2005b), a combined use of multiple secondary sources of information was made such as information from the company website, internal documentation provided by the company, product and firm brochures, etc. Also, reliability requirements were assured by the use of the same protocol for each specific company and by the development of a complete database in the data collection phase. The transcription of the interviews being done, a resume of each of them was sent to the interviewees having as an objective the approval of the received information and also the revelation of the company's name.

All the data sources applied for each company were used in order to edit only one report with all the information of the company, to obtain, by this way, a clearer analysis, and to allow the comparison of the different cases (Eisenhardt, 1989).

Using sources of multiple data, as Yin (1989) proposes, it is tried to achieve the effect of the triangulation that guarantees the internal validity of the investigation. According to Rialp (1998), it should be guaranteed, any moment, the quality of the design of the study by introducing a series of methods and tests of validity and reliability along the methodological phases.

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<sup>4</sup> The authors express their gratitude to COPCA - *El Consorcio de Promoción Comercial de Cataluña* – for the kindness it showed in offering them the possibility to use its data base.



## **5. ANALYSIS OF THE CASES**

The analysis is focused on two parts: the individual analysis of the companies and the crossed analysis among the companies. In the first place, the analysis of each company is carried out, studying the information that each company provided us with. In second place, the cross-case analysis allows us to see similarities or differences among the results of all the interviewed companies.

### **5.1. Individual analysis**

In this section, a resume of each interview is presented. In order to accomplish this, every case study will be described following the same order of the items that were taken into consideration in the interview, according to the protocol of the interviews.

#### 5.1.1. Case EUROPASTRY

This is a large-sized family business which has begun its activity in the baking industry since the 50s. Nowadays, the company aims to transform the baking industry, providing agile solutions to satisfy the requirements of professionals and of customers through the use of new refrigeration technologies. Frozen dough offers an optimum, non-perishable product, achieving high quality at the best price with maximum simplicity of use. This simplifies the organisation of production processes and allows professionals to concentrate on sales. The company is the Spanish market leader in frozen dough.

The company is an innovative one due to the fact that it has introduced in the markets a variety of new and very competitive products, having an R&D department. First, it was the innovation within the firm, and afterwards, the company began to have international activities, more exactly in 1998, when the exporting department began to operate.

Due to the fact that it has been innovative since its beginning, the firm has had a propensity to become international, having the possibility to select the entry modes in every foreign market, depending on the grade of maturity of the markets (entry modes by agent, delegation, buying an existing firm). The motivation of exporting has come together with the necessity of surviving in a global world. The first countries where the firm exported were Germany, France and Portugal, and it can be said that both the geographical and the cultural factor were important. 15% of the firm's total sales are outside the Spanish market. The firm possesses a great knowledge of the foreign markets and it is able to adapt its products immediately to every market, since good product range adaptability is vital for success in these markets.

In this case, two types of entry modes in the new markets are observed: buying a firm and organic growing toward international markets. Considering the effect that an entry mode in a foreign market could have on the innovation process within the firm, it can be said that the first one discourages investments in R&D since the firm buys an existing company together with its innovation and/or its knowledge. In this case, the company needs to absorb the innovation of the bought firm and integrate it within its own innovation. The second entry mode compels to a greater innovation in order to entry into a specific market where competition exists and, in this way, the innovation is longer and more effective. The fact of developing internal R&D allows a firm to be more flexible and to have greater barriers to the imitation.

With regard to the commitment of the entry modes in new markets and the relationship it has with the innovation process of the firm, it can be commented that, as the most frequent entry mode is the one by agents, the firm chooses less commitment to the market so it has the opportunity to acquire more product knowledge and develop incremental innovations. But, considering the fact that the firm bought a subsidiary in Portugal, it also chose more commitment to the market.

It is unquestionably verified by the interviewee that the fact of being an international firm has helped it to innovate more and more, being very competitive; by adapting its products to the necessities of every market the firm is forced to innovate (in spite of the fact that the commodities are sold in the same way all over the world, the specialisation for every country is a very important factor in order to be competitive). The innovation within the company is a product, both incremental and radical one.

#### 5.1.2. Case INDO

This is a large-sized company from the optical industry which was founded in 1937. After a couple of years of activity, it began manufacturing its own products, which included optical lenses as well as eyewear. The company also implemented its own ambitious policy of technological and scientific development. The first industrial facilities for the production of frames and sunglasses were built, and the manufacture of the first fused bifocal lenses began. A great challenge for the business came when it began to export. Considering that the domestic market share of the company was very high, it was quite vulnerable to new competitors, so exporting became important for the company in order to maintain the stability and to grow. Also during that time, it took the first steps in the fusion of optical glass. During

the 1960s, the firm lived a time of considerable growth in all areas of ophthalmic optics and technological development. Afterwards, it began a process of decentralising its productive structure, as the first step toward becoming a multinational company.

The company is an innovative one due to the facts that it has introduced in the markets, along the years, a variety of new and very competitive product, and it also has two R&D&I departments for two of the three business units. For the third business unit it has a group of design and innovation. Part of ongoing R&D work focuses on finding ways to cut costs, adapt technology and improve the performance of their equipment so as to maximise the competitiveness of their existing range. In the middle 50s it began to extend its markets, due to the fact that the Spanish market share was high and the management of the company realised that it was not enough for the firm to rest in the local market. For each of three business units (lenses, eyeglasses and equipment-goods) operates a specific exporting department whose role is to reach the markets where neither the subsidiaries nor the distributors reach.

Due to the fact that the company has been an absolute leader in the home market and innovative since its inception, it has had a propensity to become international, having the possibility to select the entry modes in every foreign market (a great emphasis has been put on the differentiation of the product). The markets are selected depending on their economic potential, not so much on the geographical or cultural factors, the first countries where the firm exported being Germany, France and Morocco. 30% of the firm's total sales are outside the Spanish market, and it is in a slowly continuous growth. Besides these, the company has distribution agreements in other many countries, and, in the rest of the countries where it does not have either proxies or distribution agreement, it has exporting clients. In Spain there are two factories (one of lenses and the other of eyeglasses), and in Thailand, China and Morocco other three.

As for the grants that the firm receives from public organisms, they are very well-valued. The firm has learnt from its international activity that there is not a success formula for entering foreign markets but the capacity to adapt its product to each market. The company becoming international, has helped it in obtaining a larger vision, a greater competitiveness, and a greater power of innovation, say it differently, more propensity to the changes and more agility.

In this case, it is also unquestionable that the fact of being an international firm has helped it to continue innovating, bringing into the markets different and competitive products. The innovation within the firm is both in product and process since the process often determines the final product; both incremental and radical innovations are applied by the firm. For instance, the company has two special materials of lens which nobody has and it puts an emphasis on the design geometry of the eyeglasses. These are examples of product innovation. As for the process innovation, the firm differentiates itself from the others by having an anti-reflex treatment whose properties are different from others. In most cases, the company realises its own innovation, but there are also other institutes that are hired by the company in order to realise part of the innovation that cannot be done within the firm.

As it was commented before, the firm acts in the international environment by having different levels of commitment, in this way acquiring product knowledge and market and product knowledge. The product knowledge helps it to improve its products little by little, by incremental innovation, while the market and product knowledge help to realise radical innovations.

#### 5.1.3. Case PINTURAS LOBO/ Euroquímica

This is a small-sized company from the chemical industry that began its activity in 1972. In 1998 it was purchased by Euroquímica which kept its ideology, meaning that the employees continued to be the shareholders of the firm. As the products of the two firms were complementary, the buyer realised that if the range of products was commercialised in a higher way, then new markets were to be opened. The company began to export immediately after being purchased, that is in 1998. The motivation for its becoming international came with the idea of being competitive in the domestic market both economically and qualitative. There were also some outside stimuli which showed their interest in the products.

The first country where it exported was Portugal but only due to the fact that the Portugal person was speaking Spanish, put differently, the company had no intention to become international until its purchase. The company created an international department and endowed it with different specialised persons in whom it invested, all of them belonging to the company. As the product is a very specific one, it is very difficult to find a market which needs it or which does not already have a supplier. So, the selection of the markets is done through the creation of some concentric circles, but also taking into consideration the geographical distance. If the firm had exported around 0.5% before being purchased,

nowadays it has reached 15%, being expected to arrive at the level of 30% in the next years. As for the grants that the firm receives from public organisms, they are very well-valued.

In terms of market share, in spite of the fact that the company is a small one, it has always been a leader due to two reasons: own R&D (it has never depended technologically on someone), and self-financing capacity (it has never depending on any financial entity). An R&D department has existed within the company since its foundation so, it can surely be affirmed that it is an innovative company; even more, the fact of being an innovative firm has helped in achieving new markets and become an international one. For this reason, the firm also has the capacity to select entry modes taking into consideration the characteristics of every foreign market, the most common ones being by agents. So as to say, the company acts in the international markets not only by choosing less commitment to them but also more commitment in some cases.

Considering this, the firm is acquiring product knowledge and market and product knowledge, developing incremental and radical product innovations. For instance, the company knows that in the market exists a niche and investigates it in order to introduce a new product (radical innovation), but it also takes into account the clients' opinion regarding the improvements that can be done to one product (incremental innovation). The main product that is commercialised has three innovation factors which, together with the price, are the competitive advantages of the company and define the innovation within it. There is no doubt about the fact that the innovation within the company has helped it in achieving new markets, and also the fact of being an exporter has made the firm to be more innovative.

#### 5.1.4. Case COMEXI

This is a medium-sized family company<sup>5</sup> with leader spirit in the converting sector and specialised in printing and converting flexible packaging materials. Since its foundation, more than fifty years ago, it has been characterised by the development of innovative and highly reliable technologies, adapted to client needs and market demands. The expansion of the company has never stopped since its foundation, becoming very quickly a leader at international level and having only one serious competitor (Windmüller&Hölscher, Germany).

The firm began to export in the 60s and rapidly achieved a level of 50% of the production in the international markets. The first countries where the company exported were France and

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<sup>5</sup> This company is referred to as a family business and also as a group on the grounds that it is a family company with international leadership vocation which has become a leading group of companies very soon after it has begun its international activity.

some countries of South America. As the founder had no skills for foreign languages, the selection of the markets was done taking into consideration the semblance of the languages, but also the geographical proximity. The motivation of exporting has come together with the necessity of having a stable activity and regular sales, taking into account that the flexo-press is quite small comparing to other printing systems. The level of international sales became 90% of the firm's total sales in 2006.

Once being present in many markets with an aggressive strategy, it was indispensable to introduce to the product an innovation component to be able to continue in those markets and to keep the image of leaders. The company has always followed a policy of innovation, growth and leadership in the world market. The innovation has been achieved with creativity and flexibility. Being a leader implies continuous innovation, the R&D team of the company having a very important role in this effort. The most intelligent and "crazy" ideas of the team – as they confess – are developed: "in the company we listen to everybody; the future depends on the ability to get ahead of it; our team has been the developer of many of the latest milestones of recent years in the sector". Actually, the company has a responsible person for the innovation that coordinates all the innovation processes of the firm. As we are talking here also about a group, every firm inside the group has an R&D department, but the responsible person for the innovation belongs to the group and his/her tasks are to peek from the markets the necessity to develop things, to coordinate the firms inside the group regarding the similar challenges, and to direct the formality of the innovation process.

As the company has been a leader at international level, it has had the possibility to select different entry modes in foreign markets, taking also into consideration the characteristics of every market. So, the main tool that it has worked with is through agents who are independent and who are paid for their services. In the case of one market, the company has created a plant there because the customs fees of that country were so high that it was impossible for it to export there. The company also works with proxies in some cases; however the greatest part of the exports is realised through agents distributed in the entire world. Regarding the grants from public organisms, the company separates them into: assistance at the development of the innovation level, and assistance at the commercial level. Both of them are well-valued by the firm.

The internationalisation that the company has begun has forced it to innovate, to react regarding the technological level. Of course, once the company has an innovative product that has already been in the external market, it can take advantage of it by reaching new markets,

so it is unquestionable verified in this case, also, that the fact of being an innovative firm has helped it to extend its markets more and more, being very competitive. Recently, the firm has realised innovation in the internal processes but also in products, these last ones representing products for the customers. The company has helped its clients to be more effective regarding their products by creating first the processes. This type of innovation is an incremental one due to the fact that a process is made not a technology. But it also realises radical innovation, as it happened in 1996 when, by introducing in the process another way of work, it produced a totally revolution in the whole park of engines. As it can be seen, this firm is developing both incremental and radical innovations and both product and process one, depending on the knowledge that it acquires during its international activities, implying the entry mode used for every market. Till now a mechanic innovation has also been realised, but from now on, the company is focused on electronic innovation.

#### 5.1.5. Case TECNITOYS/ SCALEXTRIC

This small-sized company began its activity in the toy industry in 1990 and, since 1992 it has become international once it purchased a well-known international brand from the same activity, SCALEXTRIC. The motivation to become international came with the phenomenon of globalisation, so exporting becomes important for the company in order to maintain the stability and to grow. To put it briefly, the size of the firm cannot be obtained only by supplying a single market but a global one.

Due to this and also to the fact that the firm introduces into the markets around fifty new and competitive products (which imply a great work, especially in the field of the technology as the firm has to adapt it) every year, it is considered an innovative firm. Actually, it fulfils a quality rigor meaning that not only its products are high-quality, but they also respect the environment. The company has also had an R&D department since the beginning of its activity, two important characteristics of this department being that the people that work there have been hired since the 90s (so they have a great experience inside the firm) and also they are very fond of the product (the interviewee emphasise the importance of this last factor).

It is difficult to locate the moment of the beginning of the innovation process, since both the innovation and the internationalisation began about at the same moment. In its first two years of activity, the firm's objectives were to create products for the local market which was in a continuous growth, not to sell internationally. It is considered that once the firm purchased the international brand it was compulsory to innovate, even though modestly, because the boom

in the international market due to the innovation within the firm happened three years ago; nowadays the firm has in its organisation chart an export department.

Due to the fact that the firm has been a leader in the home market and innovative even since its beginnings, it has been able to select the entry modes in every foreign market, entry modes that are especially through agents and distributors. Since the company only offers a new and high-quality product in the markets where it enters, it is important to have a high innovation level, in other words, the innovation helps in achieving new markets. As for the grants that the firm could have received, they are so few that they have not been taken into consideration.

As it is a brand that can exist or not in other markets, the strategy of entering is different: in the case that the brand already exists, the firm is changing the name and competes directly through the high-quality; in the case that the brand does not exist but it is known, the firm competes through the brand; in the case that neither the brand exists nor it is known, the firm makes itself publicity by means of competitions for the public. The selection of the international markets depends on both geographical and cultural distance, and the knowledge acquired in other markets has helped the firm extrapolate in new ones, as the consumer has a global behaviour. 25% of the firm's total sales are outside the Spanish market.

Thanks to the agents the firm has all over the world, it has been able to internalise information which has helped it to keep innovating, that is, also in this case, the fact of being an international firm has helped it to continue innovating, bringing into the markets different and competitive products. The innovation within the firm is both in product and process, and both incremental and radical innovations are developed by the firm. The commitment that the company has to the markets depends on its entry modes, but, considering the above mentioned, it can be affirmed that it acts with both less and more commitment, helping this in realising the different types of innovations. The basis of these innovations stands out in the knowledge acquired, which can be product knowledge and market and product knowledge. For example, the digital version of the main product represents an incremental innovation since it is an improvement of the product. The radio controls that the firm has just introduced into the market represent a radical innovation. In most cases, the company realises its own innovation, but there are also other institutes that are hired by the company in order to realise part of the innovation that cannot be done within the firm.

A synthetic table with all the information gathered about the five companies taken under consideration in this investigation is presented in Table 2.



**Table 2. Case-studies results**

	<b>Case EUROPASTRY</b>	<b>Case INDO</b>	<b>Case PINTURAS LOBO/ Euroquímica</b>	<b>Case COMEXI</b>	<b>Case TECNITOYS/ SCALEXTRIC</b>
<b>1. Area of activity/products</b>	Baking industry: frozen dough	Optical industry: lenses, eye wears, equipments, decorations	Chemical industry: technical paintings	Converting sector: flexo-press	Toy industry: circuit cars
<b>2. Operating revenue (€)</b>	227,453,549	128,891,000	3,641,176	57,551,280	22,830,759
<b>3. Number of employees</b>	2,026	1,686	17	241	44
<b>4. Sales (€)</b>	221,045,371	127,133,000	3,634,591	56,233,127	21,439,520
<b>5. Foreign sales</b>	15%	30%	15%	90%	25%
<b>6. Foundation/Export/Innovation</b>	It was founded in the 50s. It began to export in 1998. It has always been an innovative firm.	It was founded in 1937. It began to export around 1950. It has always been innovative.	It was founded in 1972 and began to export in 1998. It has always been innovative.	It was founded in 1954; it began to export in 1960 and afterwards began to innovate.	It was founded in 1990 and began to export in 1992 when it also began to innovate.
<b>7. Innovation</b>	It has an R&D department for every product family. The innovation allowed the firm to select the entry modes in different markets. The innovation realised is a product and an incremental one.	It has an R&D&I department. The innovation allowed the firm to select the entry modes in different markets. The innovation within the firm is both in product and in process, both incremental and radical.	It has an R&D department which allows it to achieve new markets and different entry modes. The innovation realised is a product one, both radical and incremental.	It has an R&D department for every firm inside the group and a responsible person for innovation. It has the possibility to select different entry modes. It realises process, product, incremental and radical innovation.	It has had an R&D department since the beginning of its activity. The innovation allowed the firm to select the entry modes in different markets. It realises product and process innovation, incremental and radical one.

Source: Self-elaborated

Table 2 (continuation)

	Case EUROPASTRY	Case INDO	Case PINTURAS LOBO/ Euroquímica	Case COMEXI	Case TECNITOYS/ SCALEXTRIC
<b>8. Grants</b>	Non-significant	Very well-valued	Very well-valued	Very well-valued	Non-significant
<b>9. Motivation to begin exporting</b>	Necessity to survive in a global world.	Necessity to survive in a global world.	Desire to be competitive in the domestic market.	Necessity to have a stable activity and regular sales.	Important for the stability of the firm.
<b>10. Export</b>	Export department since its beginning. Both the geographical and the cultural factors have been important. It uses different modes of entry (buys a subsidiary, by agents).	Three export departments. The markets are selected depending on their economic potential. Emphasis on product differentiation. The most used entry mode is by an agent and sometimes through proxies.	Export department since its beginning. Geographical distance is important in order to select new markets. The most common entry mode is by agents.	Export department since its beginning. Both cultural and geographical proximity are important. The entry modes are by an agents, proxies and own plants.	Export department since its beginning. Both geographical and cultural distances are taken into account. The modes of entry used are through agents and distributors.
<b>11. Knowledge/ Adaptation</b>	The knowledge acquired in foreign markets enables it to adapt its products.	The firm has a great knowledge of the markets and it adapts its product immediately to every market.	The firm possesses a vast knowledge about the markets. The product cannot be adapted too much because of its specificity.	Being for so many years on the international market, it has gained experience which helps in the creation of the new products.	The knowledge acquired in other markets has helped the firm extrapolate in new ones.
<b>12. Commitment / Type of knowledge</b>	Less and more commitment. Product knowledge and market/ product knowledge.	Less and more commitment. Product knowledge and market/ product knowledge.	Less and more commitment. Product knowledge and market/ product knowledge.	Less and more commitment. Product knowledge and market/ product knowledge.	Less and more commitment. Product knowledge and market/ product knowledge.
<b>13. Mutual relation</b>	Verified.	Verified.	Verified.	Verified.	Verified.

Source: Self-elaborated

## **5.2. Cross-case analysis**

The five companies under analysis do not show marked contrast regarding the innovation and international phenomena. On the contrary, in spite of the facts that they are companies of different size (large, medium and small-sized) and their activity is developed in completely different industries (baking, optical, toy industry, converting sector and chemical industry), they share almost the same opinion about the importance of the innovation for becoming international and also the importance of being international for continuing the innovation process.

Three companies from the five taken under consideration in this investigation were created around the middle of the past century and were leaders in the local market, two of them being also extremely innovative (it is the case of EUROPASTRY and INDO); the other two firms are more recent, one of them having the innovation process highly developed (COMEXI), and the second beginning to innovate immediately after being present in other foreign markets. This last case is the one of TECNITOYS that, due to the fact that it became international almost immediately after its foundation by buying an existing international brand (SCALEXTRIC), it is difficult to affirm that the innovation had something to do with the internationalisation process of the firm. Nevertheless, it was emphasised that if the initial firm had been innovative it surely would have helped more in beginning the international activities. As the international activity of the innovative firms from the chemical, optical and baking industries has begun after many years since its foundation, it can be affirmed that the fact of being an innovative firm has helped in achieving other markets.

All the five companies in this study have well-developed R&D departments which have appeared since the beginning of the innovation process of every company. This is an important issue due to the fact that, analysing the impact of innovation on export behaviour, different firm level studies have used R&D expenditure as proxy to innovation (Kumar and Siddharthan, 1994 cited by Basile, 2001). The persons working in these departments are well-prepared, have superior qualifications, and experience in the firm, so the rate of personal rotation is quite low.

The fact of being innovative has had a strong influence on their international activities, especially on the selection of the entry modes of each of the five cases. Step by step, considering their international activities, the firms have become more innovative and this fact determines the commitment that they are willing to have towards the foreign markets. This

fact is consistent with one of the results of Eusebio and Rialp's (2002) investigation, according to which the realisation of innovations, both product and process, is positively related with the export behaviour.

As it can be seen in Table 3, all the firms innovate more in the products not in the processes, and incremental not radical. So it can be said that the firms prefer to develop more their product step by step, being this in conformity with the aspects revealed by the interviewees who put an emphasis on the customers' reactions and opinions about every new product in order to improve it.

**Table 3. Types of innovation within the companies**

Company	Innovation			
	Prod.Rad.	Prod.Increm.	Proc.Rad.	Proc.Increm.
EUROPASTRY		x		
INDO	x	x	x	x
PINTURAS LOBO	x	x		
COMEXI	x	x	x	x
TECNITOYS	x	x	x	x

Source: Self-elaborated

Following this, the firms from the optical and toy industries and also the one from the converting sector develop a complete innovation process, meaning both radical and incremental, as in product and process. In the other cases, the innovation process is a more specific one, with o focus on the product innovation. Moreover, it seems that, EUROPASTRY realises only product and incremental innovation. According to Hewitt-Dundas (2006), the development of radical new products is dominated by large, and typically, multinational enterprises. Our results coincide with this affirmation, since all the three companies from this study, which realise radical innovation, are multinationals, although only INDO has had a traditional process of internationalisation, both TECNITOYS and COMEXI being the so called Born-Global firms.

In four cases, the motivation to begin the international activities is quite the same: in a global world it is compulsory to be global and have a stable activity in order to survive. Only PINTURAS LOBO has begun to export thinking about its competitiveness in the domestic market. The selection of the markets is predominant due to the cultural and geographical distance (four cases from five); as for the other case, INDO, the economic potential of the market is more important, although it sometimes considers also the geographical distance.

The entry modes most used by all the five companies are the ones by agents. Two of the five companies (INDO and COMEXI) also use proxies in order to enter one market. Besides this, in the case of COMEXI, it is also used the purchase of some other companies or the opening of a plant in countries where it is difficult to export. TECNITOYS also uses distributors for its products, depending on the markets. As for PINTURAS LOBO, it is common to select markets through the creation of some concentric circles; therefore the selection of entry modes is quite different.

With regard to the relationship between the commitment that the firms have to the new markets and the knowledge they acquire, in all the cases, it is observed that firms entry in the new markets by modes with less commitment and, when time goes by and/or the markets are different, they choose to act with more commitment to the markets. By this way, they obtain both product knowledge and market and product knowledge, being able to develop radical product and process innovations.

As for the grants that the companies under analysis could have received, only two of the five cases (EUROPASTRY and TECNITOYS) have never received such grants, the other ones valuating the grants in a very positive way.

Taking into consideration the theory of internationalisation, more precisely the Uppsala Model (Johanson and Vahlne, 1977; 1990), it can be argued that two of the five companies have not followed a traditional process of internationalisation, beginning to export in the very following years after its foundation. We are talking about COMEXI and TECNITOYS, the firms whose main products are the flexo-press and the circuit cars. The first one started its international operations in 1960, only six years after being founded. As for the second firm, it has started to export after two years since its foundation. Both of them have sought to get significant competitive advantage from its exporting activities, putting a great emphasis on the quality of the product and, implicitly, on the innovation process. Based on the previous research made in the area regarding this phenomenon of internationalisation, it can be affirmed that we are dealing with two Born- Global firms.

Once they have internationalised, the five firms have obtained a great knowledge, and they have gained experience with the competition; these types of knowledge have been very important in order to adapt their products so they become more competitive and obtain a greater share market. As it is mentioned by one of the interviewees, good product range adaptability is vital for success in these markets, and only knowing the environment, the

adaptability is possible, thus being in conformity with Oviatt and McDougall (2005), who consider knowledge to be the core of the internationalisation process of the firm. Concerning the percentage of the export sales on the total sales, it is observed that in only one case this number is extremely high (COMEXI), representing almost the entire benefit of the firm. The other four companies show indeed a good level of the export activity, this being 15-30%.

Having in mind the objective of this investigation – if there is a reciprocal relationship between the innovation and internationalisation processes of the firms – it can be answered that, in spite of the fact that we are dealing with different-sized companies, in all the cases this relationship is observed and verified, although one of the interviewees adds that the innovation is not an indispensable condition for a firm to become international but it is a very important factor. This affirmation coincides with Hall's (1992), who emphasises the importance of innovation as a source of competitive advantage.

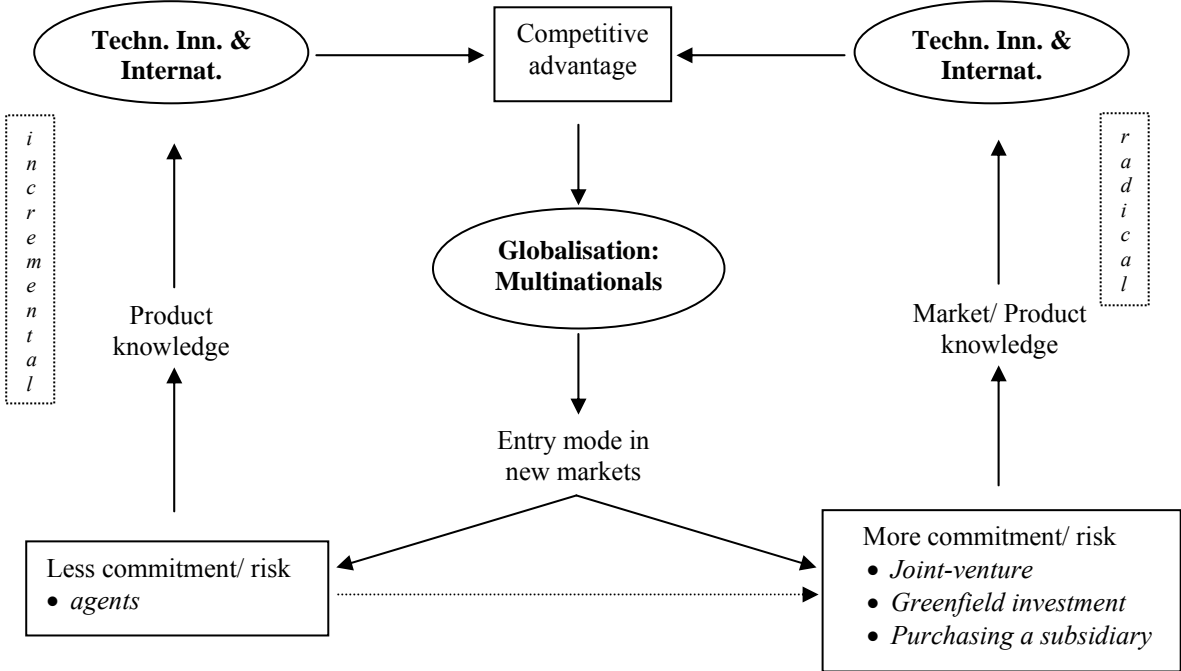
However, considering our proposed model (Figure 1) and also the results from the cross-case analysis, it is observed that in only three cases this model describes, in an appropriate way, the relationship between innovation and internationalisation, considering the moment when a firm enters a new market, these being the three traditional international companies (the companies in the baking, optical and chemical industries). For the Born-Global cases (companies from the toy industry and the converting sector), this model does not work, considering that both innovation and internationalisation start together, to put it another way, in these cases the initial idea of innovation leading to internationalisation does not apply. The companies COMEXI and TECNITOYS have become global/multinational firms which, since their foundation, have sought competitive advantage and considered as normal the fact of being present and achieving markets all over the world. As Pla and León (2006) define, this type of companies does not only belong to a global sector, but rather it represents global firms. A company is considered global when it has extended its presence to all the significant markets of the planet, it generates value in a great number of countries and it coordinates constant flows of knowledge, capitals and products among its interrelated branches.

According to Acs *et al.* (2001), firms become multinationals because they see and capture profitable international opportunities. For a multinational to compete abroad, it needs an advantage of its own to offset local firms' home court advantage. Actually, a very important issue highlighted by Acs *et al.* (2001) is that multinational firms can quickly and simultaneously introduce an innovation in many countries, greatly magnifying the innovation's return, being able to do this without exposing or losing control over their

intellectual property. Once established, multinationals have a threefold advantage in creating and marketing further innovations.

For this reason, our model will suffer some changes when considering the Born-Global firms, meaning that the innovation together with the international activity of the firm will lead to a global, multinational firm. This argument can be observed in Figure 2.

**Figure 2. A relation between innovation and internationalisation. The Born-Global case**



*Note:* As time passes by, the firm can use other entry modes, parting from less commitment till more commitment to the market.

Source: Self-elaborated

**6. CONCLUSION**

The purpose of this investigation is to analyse the existence of a relationship between the innovation and the internationalisation processes of the firm, since it is assumed that there is a mutual one, having as a theoretical background the internationalisation theory of the firm (Johanson and Vahlne, 1977; 1990), the resource-based view of the firm (Barney, 1991), and also the literature on the innovation phenomenon of the firm.

From the perspective of the resource-based view, generating and sustaining competitive advantages resides in the set of strategic resources and capabilities available to the firm, among these strategic resources being the intangible ones. Among intangible resources,

technological resources are particularly significant (López and García, 2005). These provide the firm with an innovative capacity, for both products and processes, and are important for the creation of competitive advantages based, especially, on the differentiation which give a firm a superior competitiveness to act in the international markets.

Concerning the technological resource of the firms in this study, all the five showed and/or agreed with a propensity to the internationalisation due to the innovation within their companies. On the other hand, the fact of developing international activities has influenced, in a positive way, the innovation; in other words, the first two research questions – if the innovation leads to internationalisation of the firm and vice-versa – have an affirmative answer. Actually, Basile (2001) emphasises the role of technology and innovation as one of the main factors contributing to facilitate entry into international markets, at the same time as boosting the firm's export performance. As it is mentioned by Molero (1998), in the cases of Italy and Spain, the presence abroad of non-innovatory firms suggests the existence of a relative divorce between the processes of innovation and internationalisation. Therefore, the results of our study are in line with the ones of Basile (2001) and Molero (1998), although, this idea is not supported by Wakelin (1998) who finds that being an innovative firm in the UK has a negative impact on the probability of exporting, concluding that innovative firms are more inclined to use their innovation to exploit the domestic (UK) market rather than to enter foreign markets.

Regarding the third research question – if the market entry mode of the firm lead to a different type of innovation – the answer is affirmative since it is observed that the firms use different entry modes, beginning with an agent, subsidiary and ending with the purchasing of a plant. In this last case, it is emphasised that it discourages the investments in R&D since the firm buys an existing company together with its innovation and/or its knowledge. It was verified that when the firm chooses an entry mode which implies less commitment to the market, it is more common that an incremental and product innovation will be realised. This is the case of all the five companies here analysed. On the other hand, when more commitment is chosen then the radical innovations in products are more probably, and this is the case of all the five firms. Anyway, it can be noticed that the predominant entry mode chosen by the firm is through agents, representing the first step of the internationalisation process of the firm as it is explained by Johanson and Vahlne (1977; 1990). Actually, three of the five firms have followed a traditional process of internationalisation, the remaining two being the so called Born Global firms, due to the fact that they have begun to export very soon after their



foundation. However, it would be convenient to study more in-depth this phenomenon due to the fact that it is not easy to establish an order of the entry modes.

All the companies in this investigation show a propensity to realise incremental innovations, by adapting their products from the international markets and expand these markets due to the product knowledge they gain. Actually, the need to acquire foreign product and market knowledge and the importance of organisational learning for entering or expanding in the international marketplace were recognised by several scholars, as Andersen (1993) and Zahra *et al.* (2000), among others. It is also important to mention that the motivation to extend the markets has appeared from the necessity of surviving in a global world and having a stable economic situation.

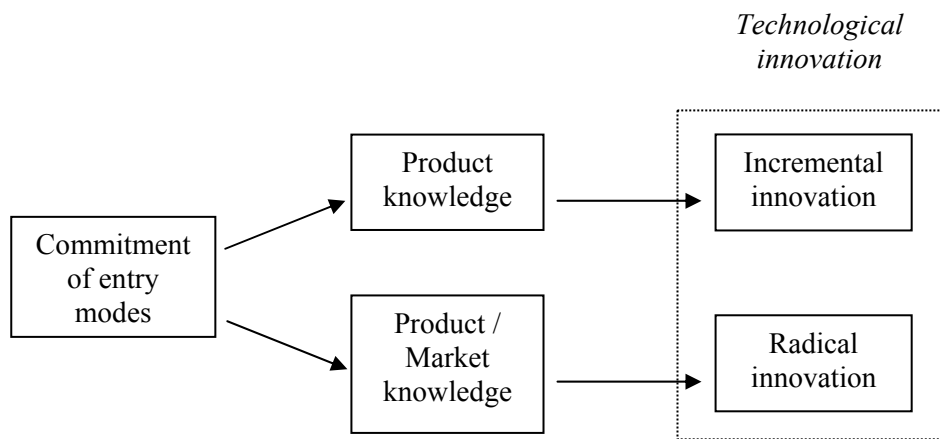
Nevertheless, the main idea that is highlighted in the results of this investigation is that once the firms have entered the foreign markets through different entry modes, depending on the level of the commitment to the markets, they have gained experience but, most of all, they have acquired knowledge – product and market knowledge – and with that knowledge the firms are able to realise more technological innovation. Furthermore, depending on the entry mode, the companies acquire a certain type of knowledge which leads to a certain type of technological innovation. For instance, if one company chooses less commitment to a market, it will gain product knowledge which will imply more incremental innovation. On the contrary, if a company chooses more commitment to a market, it will gain not only product knowledge but also market knowledge which will imply more radical innovation. This argument is pointed out in Figure 3.

Thus, besides the traditional sources of information for the technological innovation<sup>6</sup>, there are also new sources among which the commitment of entry mode in a new foreign market is considered. In other words, the internationalisation of the firm, more precisely the commitment of the entry modes in the new markets, is considered to be an important source of innovation. Actually, this idea is proposed to be more developed through quantitative methodology, as being the continuation of this investigation.

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<sup>6</sup> According to Amara and Landry (2005), the sources of information for the technological innovation are internal sources, market sources, research sources, and generally available sources of information.

**Figure 3. Entry modes as a source of technological innovation**



Source: Self-elaborated

Moreover, as future lines of research, quantitative tools are going to be used too, having as a sample a large number of Spanish exporting firms of the same size in order to obtain two models – for both traditional and Born-Global firms – that can be generally applicable.

Referring to the limitations of this investigation, there stand out those fundamentally characteristics of the methodology of the case-study. As it is collected in Rialp (1998), this methodology produces a bias introduced by the same investigator in the collection process and analysis of the information. The critics to the lack of both statistical validity and representativeness are also assumed (Rialp, 1998), but it is considered that the objective of the investigation is not the one to generalise but rather to deepen the knowledge of the thematic of the study, and, therefore, the used methodology is assumed to be correctly applied.

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## CHAPTER III

# LOOKING FOR THE CAUSALITY BETWEEN TECHNOLOGICAL INNOVATIONS AND EXPORTS

### 1. INTRODUCTION

The evolution of the international economy has revealed important changes regarding the structure of the relationships among economic agents and the variables determining the conditions of competitiveness (Fletcher, 2001). There are two main factors that stand out over many others: the first is the growing number of elements of economic organisation affected by internationalisation; the second refers to the increasing complexity of the innovative process (Molero, 1998; Rogers, 2004).

Internationalisation is an important issue for firms that often results in vital growth, useful learning outcomes and superior financial performance (Prashantham, 2005). The first important steps in firms' internationalisation process are generally assumed to be trade related, and although import activity is considered to play a role, it is export activity that is most often recognised as being the initial real step in the internationalisation process (Jones, 2001). However, this is not an easy process because international markets are characterised by a greater competitive pressure than national markets (Prashantham, 2005).

In order to survive in the competitive scene that companies have faced in recent years and which is characterised by a high level of dynamism (Teece, 1998; López and García, 2005; Díaz *et al.*, 2008), the continual renewal of competitive advantage through innovation (Cho and Pucik, 2005) and the development of new capabilities (Grant, 1996) has become necessary (Danneels, 2002; Branzei and Vertinsky, 2006). In this context, technology represents one of the most important factors in increasing the national and international competitiveness of the firms (Eusebio and Rialp, 2002), while successful technological innovation in new products and processes is increasingly more regarded as the central issue in economic development (Porter, 1998).

The purpose of this research is to analyse the existent relation between technological innovation and exports since they are vital for today's economic success, both for firms and countries (Vila and Kuster, 2007). These two features reinforce each other to the extent that

today's economic analysis has to consider both of them simultaneously when trying to account for the new dynamic of the firms operating at the international level (Molero, 1998; Zahra and George, 2002). Hitt *et al.* (1997) emphasise that it is highly important to examine the complexity of these relations both theoretically and empirically. Similarly, Prashantham (2008), who carefully develops a wide theoretical background regarding the relationship between technological innovation and internationalisation process, strongly recommends it for future analysis. Therefore, a better perception of their results and interrelation could lead to better recommendations for managers in formulating the technology and internationalisation strategies, and for public authorities in designing supporting public policies.

In terms of data, our research employs a firm-level dataset on Spanish manufacturing firms during 1994-2005 and parts from the assumption that there is a mutual, reciprocal relation between the two processes mentioned above. We argue that technological innovations may lead to a wider international activity through the creation of important competitive advantages. Consequently, a more internationally active firm will acquire experience and, implicitly, knowledge, which would lead to a continuous search and development of competitive advantages, and therefore to an increment of technological innovations.

Besides helping to clarify some arguments and theoretical relationships, this paper contributes to the literature in both empirical and methodological issues. From an empirical point of view, the use of longitudinal data for the period 1994-2005 supposes amplification to the traditional focus on cross-sectional data analysis. Put it differently, the availability of information referred to several years allows us to lag variables and, especially, to observe their historical behaviour. According to Hsiao (1985), longitudinal data facilitate econometricians to construct and test more complicated behavioural models than a single cross-sectional or time series data set would allow.

From a methodological point of view, we apply different methods of analysis, culminating with the Granger test of causality (1969), offering therefore a complete image of the causal relation between technological innovation and exports.

The remainder of the paper is as follows. The next two sections offer an overview of the state of the art of the field of technological innovation and internationalisation and provide the theoretical framework which fits the objective of this paper. Section 4 describes the data used in the analysis. The presentation of the results follows in Section 5 and finally the discussion which is given in Section 6.



## 2. RELATED LITERATURE

Innovation is the effort to create purposeful, focused change in a firm's economic or social potential (Acs, Morck, and Yeung, 2001). Furthermore, an innovative firm is one that implements technologically new or significantly improved products (OECD, 1997). Following the Oslo Manual (OECD, 1997), technological innovation is defined as an iterative process initiated by the generation of new products and processes or of significant technological improvements in current products and processes. According to Damanpour (1991), product innovations are new products or services introduced to meet an external user or market need, and process innovations are new elements introduced into an organisation's production or service operations.

Regarding firms' internationalisation, it is understood as the process through which firms increase their exposure and response to international opportunities and threats through a variety of cross-border modes of operating (Johanson and Vahlne, 1990; Prashantham, 2005; Morgan and Jones, 2009). In this context, export activity represents the initial real step and is defined as the sale of goods or services in country markets other than that of the exporting firm (Jones, 2001).

Although a lot of research is being focused on the internationalisation of the firm and the technological innovation process (see Annex 2), up to the best of our knowledge there are few researchers who have somehow considered and found a relation between internationalisation and technological innovation with a longitudinal perspective (Barrios *et al.*, 2003; Mañez *et al.*, 2004; López and García, 2005; Salomon and Shaver, 2005; Díaz *et al.*, 2008). However, there are several cross-section investigations which stand out and help us understand more about the relationship between these two processes (Zhao and Li, 1997; Molero, 1998; Wakelin, 1998; Golder, 2000; Basile, 2001; Cho and Pucik, 2005; Lachenmaier and Wößmann, 2006; Pla and Alegre, 2007; Vila and Kuster, 2007; Filipescu *et al.*, 2009; etc.). In the following sections the results of all these investigations<sup>7</sup> are going to be detailed among others.

Therefore, it seems that empirical literature has become increasingly aware of the need for disentangling the direction of causality between firms' internationalisation and the technological innovations they develop, explicitly between exports and R&D intensity (Zhao

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<sup>7</sup> Moreover, for a brief resume regarding their objective, theoretical framework, methodology and findings, see Annex 2.

and Li, 1997; Zou and Ozsomer, 1999; Lachenmaier and Wößmann, 2006; Pla and Alegre, 2007, Vila and Kuster, 2007; Prashantham, 2008; Filipescu *et al.*, 2009). We show next some of the existent literature focused on the influence that technological innovation has upon internationalisation and, subsequently, on the influence that the latter has upon the former.

## **2.1. Innovation as a cause of internationalisation**

According to Vila and Kuster (2007), firms start thinking about innovation because they want to offer different things in different markets. Agreeing with this, Wakelin (1998) finds that the number of innovations used at the sector level in UK is positively and significantly related to the probability of becoming international, precisely of exporting. Moreover, she observes that firms with a large number of innovations are more likely to export, indicating heterogeneity even within the group of innovating firms. Similarly, López and García (2005) find that product and process innovations, as well as the use of patents and R&D spending intensity have a positive and significant effect on firm's export propensity and intensity. Basile (2001)'s study also shows that innovation is a very important competitive factor which helps explain firm heterogeneity in export behaviour among Italian firms.

Having as a purpose to examine the determinants of exporting, Ozçelik and Taymaz (2004) analyse Turkish firms and reach the conclusion that innovations and R&D activities are crucial for firms' international competitiveness. Furthermore, Mañez *et al.* (2004) who share the same objective, focus on a sample of Spanish manufacturing firms during the 1990s and also find a positive and significant relation between exports and product differentiation, both vertical (R&D intensity) and horizontal (advertising intensity). These results are similar with the ones of Bleaney and Wakelin (2002) and Kumar and Siddharthan (1994) who analyse the export performance of UK and, respectively, Indian manufacturing plants and find strong evidence that R&D intensity is an important determinant of whether the firm exports. A comparable result is also found by Barrios *et al.* (2003) who, using firm level panel data for Spain for the period 1990–98, examine the importance of a firm's own R&D activity and intra-sectorial spillovers on the decision to export and level of export intensity. Likewise, Sterlacchini (1999) finds that the share of exports on sales is positively affected by innovative activities. In addition, Pla and Alegre (2007) look for a better understanding of this relation and their findings confirm the importance of technology issues (such as firms' technological profile and capabilities and advantages of superior new products) over export performance.

As shown, this relationship is evident in many studies, regardless of whether the focus has been on R&D (Kumar and Siddharthan, 1994), on non-R&D innovation inputs (Sterlacchini, 1999), or on innovation outputs (Basile, 2001; Nassimbeni, 2001; Roper and Love, 2002; Wakelin, 1998). Nevertheless, there are also controversial findings regarding this relation. For instance, Vila and Kuster (2007) find only partial support for the argument which establish that internationalisation is associated with some kinds of innovation, while Alonso and Donoso (1998), Becchetti and Rosi (1998) and Lefebvre *et al.* (1998) do not find a significant influence of R&D expenditures on export intensity. Instead, other technological variables<sup>8</sup> which they employ do exert a positive and significant influence on exporting.

## **2.2. Internationalisation as a cause of innovation**

It is noticeable therefore that past researchers have proposed and found a positive relation between firms' international and innovative activities, precisely economists have proposed and empirically supported the notion that innovation leads to international expansion. However, there are strong arguments to suggest that the increment of international activities leads to innovation, many internationally diversified firms being also product diversified (Hitt *et al.*, 1997).

Unfortunately, this direction of the relation between internationalisation and innovation has not been deeply addressed, or at least not so profoundly empirically demonstrated. Hitt *et al.* (1997) examine it, among other issues, and find that there is a linear relationship between international expansion and technological innovation, depending on the level of product differentiation. Buesa and Molero (1998) find that firms' international activity is one of the main determinants of regularity in innovation. Consequently, Kumar and Saqib (1996) show an empirical evidence of a positive relation between firms' export activities and their R&D expenditures. Zahra *et al.* (2000) offer a more accurate image, focusing on the effects of internationalisation on a firm's technological learning, and finding a strong relation between them.

According to Barrios *et al.* (2003), a key component for economic growth is represented by a strong export base. Firms which sell abroad are usually considered to be high-performance firms mostly for the following two reasons: when competing in foreign markets, they face higher trade barriers, different consumer tastes and tougher competition; when exporting

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<sup>8</sup> Other technological variables such as: percentage of employees with technical and scientific backgrounds; presence of R&D collaborations with external partners; importance ascribed to innovations by the firms; and participation in external R&D labs.

additionally they become more easily aware of potential innovations taking place abroad and they may assimilate these in order to improve their position both in domestic and foreign markets. Following this last argument, Salomon and Shaver (2005) consider exports as activities which generate information, useful for a firm in order to innovate. Moreover, they argue that firms can access foreign knowledge bases and also increase innovation through export activities, exporting being related to product innovations and patent applications.

Hence, it seems that firms' international diversification may have a positive effect on their innovation processes. This is particularly true in the new competitive landscape in which increased global competition in many markets has placed more emphasis and importance on innovation as a way to develop and maintain sustainable competitive advantages (Bettis and Hitt, 1995). Specifically, international diversification can help firms use the selective advantages of multiple countries, and innovation can help overcome potential local disadvantages (Hitt *et al.*, 1997).

### **2.3. Innovation and internationalisation in a reciprocal relation**

It has already been mentioned that academicians consider technology as one of the most important factors in increasing the national and international competitiveness of firms, technological innovations representing competitive advantages that give firms the possibility to compete in a more active way in different markets. However, the international activity that firms develop can embody more innovativeness, considering that firms' presence in new markets offers new perspectives and, therefore, new knowledge acquisition (Prashantham, 2005).

Vila and Kuster (2007) state that many firms can be international or innovative, but only a small group is highly internationalised and has superior innovations, specifically those that invest abroad and use more resources to innovate in four dimensions (products, strategies, processes and markets). Although the authors bring only partial support for the first part of the relation (i.e. innovation leads to internationalisation), the empirical results appear to confirm that the extent of a firm's internationalisation influences innovation in terms of strategy and processes. Their statement is consistent with previous studies (Zou and Ozsomer, 1999) that also proposed that companies with high levels of innovation reflected a high degree of dependence on export markets and vice versa.

The reciprocal relation between R&D and exports has been demonstrated by Zhao and Li (1997), who analyse secondary data from China with the aim of explaining the effect of R&D

on export propensity and export growth. In particular, the authors' results reveal that R&D is a significant determinant of firms' propensity to export and level of export intensity and also they find a significant reciprocal dependence between R&D and exports.

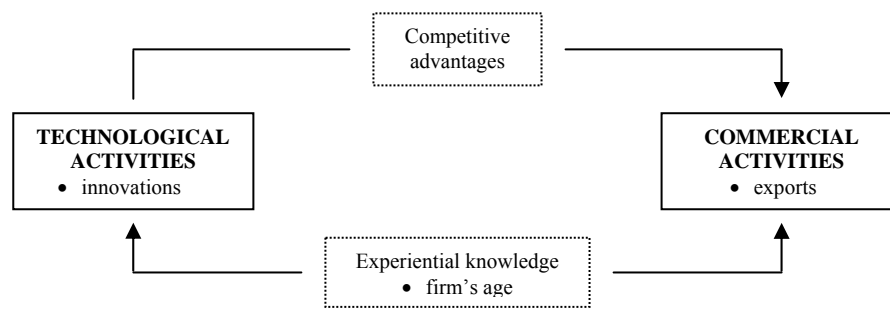
Lachenmaier and Wößmann (2006) also anticipate a mutual causation of technological innovation and exports, firstly due to the fact that the high level of competition on international markets forces exporters to improve their products and processes in order to remain competitive, leading to the increment of their efforts in innovation, and secondly because exporting firms may gain access to technical expertise from their buyers on foreign markets which non-exporting firms do not have. However, their results can show only one part of the relationship, the one in which the fact of being innovative causes firms to have substantially larger export shares than non-innovative firms in the same sector.

Recently, Filipescu *et al.* (2009) have argued that there is a reciprocal relation between the two processes and they have focused on five innovative and international firms in order to explain it. The results show that firms become international due to their technological competitive advantages (i.e. technological innovations, both in products and in processes), and consequently, the fact of being international offers them the possibility to develop more technological innovations. Therefore, these two phenomena seem to co-exist in an interdependent relation. Therefore, it is obvious that more extensive research is needed in order to accomplish the objective of this paper which is to analyse the mutual relationship between technological innovation and export-based internationalisation processes of the firms.

### **3. CONCEPTUAL FRAMEWORK AND HYPOTHESES**

As the model in Figure 4 suggests, we argue that it seems to be an interdependent, reciprocal relationship between technological innovation and internationalisation. Explicitly, the technology owned by a firm helps it innovate in order to create competitive advantages necessary to compete and succeed in international markets. Once the firm develops activities abroad, it gains knowledge about the environment and the competition that exists, being this very helpful in maintaining its competitive advantages and creating new ones. Improving and/or creating competitive advantages imply more innovation. Consequently, the relation between the two processes may be considered reciprocal and this is exactly the core of our investigation.

**Figure 4. Conceptual framework**



Source: Self-elaborated

Academics explaining firms' internationalisation and innovation have considered and used various theories (see Annex 1). Among these, stand out the gradual internationalisation theory of the firm (Molero, 1998; Vila and Kuster, 2007), resource-based view (Hitt *et al.*, 1997; Galende and de la Fuente, 2003; Knight and Cavusgil, 2004; Pla and Alegre, 2007; Díaz *et al.*, 2008; Kumar, 2009), transaction cost theory (Hitt *et al.*, 1997; Rodriguez *et al.*, 2007), and learning theory (Hitt *et al.*, 1997; Zahra *et al.*, 2000; Barrios *et al.*, 2003; Hurmerinta, 2003; Cho and Pucik, 2005).

In order to accomplish the objective of this paper, we will focus on the resource-based view (RBV), since it explains how, in the context of an innovative culture, knowledge and the resultant organisational capabilities are developed and leveraged by enterprising firms (Knight and Cavusgil, 2004). Its central focus is the exploitation of firm strategic resources to gain a sustainable competitive advantage that affords the acquirement of superior performance (Wernerfelt, 1984; Barney, 1991). Among these strategic resources the intangible ones stand out as they are the most likely to fulfil the requirements for resources to generate sustainable competitive advantages (López and García, 2005): be valuable, unique, inimitable, and immobile, reflecting the distinctive pathways of each company (Grant, 1991). Intangible resources are usually divided into technological, human, commercial and organizational resources (Hall, 1992; Galbreath, 2005, Surroca and Santamaría, 2007).

Considering all these and having in mind the objective of our investigation, we will formulate the hypotheses on the bases of the intangible resources referring to firm's technological, commercial and organizational activities. Explicitly, we will focus on firm's technological innovations, exports and experiential knowledge.

### **3.1. Technological innovations**

According to López and García (2005) and Surroca and Santamaría (2007), technological activities are essential, providing firms with an innovative capacity and developing competitive advantages based on differentiation which give firms superior competitiveness to act in international and global markets. Therefore, technological activities can generate a two-fold competitive advantage for a firm: in costs and in differentiation (López and García, 2005). The first one is acquired through the development of new and more efficient productive processes, whereas the second one is achieved by means of product innovations, allowing firms to modify products according to customer requirements, or develop products of a higher quality. Moreover, Itami (1987), Styles and Ambler (1987) and Eusebio and Rialp (2002) consider technological innovations as the key for firms' international success, being highly-knowledge intensive. These arguments lead us to pose the following hypothesis:

**H1:** Technological innovations have a positive and significant influence on the development of export-related activities.

### **3.2 Export-related activities**

According to Penrose (1959), Barney (1991) and Grant (1991), a firm should possess certain intangible assets that competitors cannot copy or buy easily, thus gaining sustainable competitive advantage in the market. Firm's relations with foreign clients (Galende and Suárez, 1999), regularly measured by its international achievements, are important intangible assets. International achievements are often considered useful for properly exploiting technological innovations (Teece, 1986). In addition, export-related activities increase the firm's need for technological inputs. As a result, a firm is induced to invest in R&D activity for continuous updating and product adaptation (Kumar and Saqib, 1996). As mentioned in the literature review, there are some studies which have considered firm's export-related activities as a determinant for achieving innovative activities and have found a positive relationship (Kumar and Saqib, 1996; Buesa and Molero, 1998; Salomon and Shaver, 2005; Vila and Kuster, 2007, etc.). From this we deduce the second hypothesis:

**H2:** Export-related activities have a positive and significant influence on the development of the innovative ones.

Hence, on one hand side there are investigations which deal with the impact that technological innovations have upon exports, being a source of competitive advantage that give firms the opportunity to gain more markets abroad and enlarge their horizon; the

majority shows a positive effect (Kumar and Siddharthan, 1994; Wakelin, 1998; Basile, 2001; Bleaney and Wakelin, 2002; Barrios *et al.*, 2003; Ozçelik and Taymaz, 2004; López and García, 2005), but there is also some opposite evidence regarding this relation (Alonso and Donoso, 1998; Becchetti and Rosi, 1998; Lefebvre *et al.*, 1998; Vila and Kuster, 2007). On other hand side, academicians focus on the other direction of the relation between technological innovations and internationalisation, explicitly on the influence that exports exert upon innovations, the results usually showing a positive and significant impact (Kumar and Saqib, 1996; Hitt *et al.*, 1997; Buesa and Molero, 1998; Zahra *et al.*, 2000; Salomon and Shaver, 2005; Pla and Alegre, 2007).

Summarizing, we have pointed out some evidence, both theoretical and empirical, regarding technology as one of the most important factors in increasing the national and international competitiveness of firms, representing sustainable competitive advantages that give firms the possibility to compete in an active way in different markets. Furthermore, the export-related activities developed by firms can embody more innovativeness, since firms' presence in foreign markets offers new perspectives and, therefore, experiential knowledge acquisition (Prashantham, 2005). So it seems somehow obvious that these two processes exist in an inter-dependent relation (Zhao and Li, 1997; Zou and Ozsomer, 1999; Lachenmaier and Wößmann, 2006; Vila and Kuster, 2007; Filipescu *et al.*, 2009).

Notwithstanding, the relation has not been deeply studied and more evidence is compulsory in order to have a broader idea concerning it. Therefore, so as to provide wider statistical evidence regarding the causal relation between innovation and internationalisation and accomplish our objective, we formulate the next hypothesis:

**H3:** There is a reciprocal relation between technological innovations and export-related activities.

### **3.3. Experiential knowledge**

Another argument of this paper is that once a firm is international, it acquires experiential knowledge useful for future development of innovations and, likewise, once a firm is innovative it acquires experiential knowledge for a wider international achievement. Theory considers firm's experience as an intangible asset which represents the basis for obtaining a sustainable competitive advantage (Nonaka *et al.*, 2000; Barney *et al.*, 2001). Firm's experience is also understood as attainment of knowledge. Consequently, achieving a differentiating level of profitability depends on the firm's capacity to acquire, generate and



exploit knowledge assets, firms enjoying competitive advantage if they know how to manage knowledge (Díaz *et al.*, 2008). It is worth underline that firm's experience is related to a better management of communication and of necessary creativity to innovate, and to a more effective capacity for absorption (Rothwell, 1986), a suitable capacity for absorbing knowledge abroad being necessary (Cohen and Levinthal, 1990). Drawn from all these, we pose the next two hypotheses:

**H4:** Firm's experiential knowledge has a positive and significant influence on export-related activities.

**H5:** Firm's experiential knowledge has a positive and significant influence on technological innovation.

## **4. METHODS**

### **4.1. Data sources, sample and time frame**

In order to accomplish the purpose of this study, we use the ESEE (the Spanish Survey on Business Strategy, from now on referred to as SBS) which is a statistical investigation carried out by SEPI Foundation with the financial support of the Ministry of Industry, Tourism and Trade, and designed by the Program of Economic Investigations of SEPI Foundation. This also supervises its annual realisation, it maintains the database and it carries out the descriptive exploitation contained in the annual reports published by the Ministry of Industry, Tourism and Trade. The reference population of SBS is represented by the companies with 10 and more employees, usually known as manufacturing industry. The survey aims to know the evolution of the characteristics and strategies of Spanish industrial firms with at least ten employees and is sixteen pages long, gathering information about markets, customers, products, employment, trade, technological activity and financial data from the balance sheets and income accounts. The responses are voluntary, the respondents being assured confidentiality and that the survey would be used to shape government policy. The response rates for different sectors, regions, and size are consistent with the overall response pattern. The sample was stratified by 20 Standard Industrial Classification (SIC) codes. One of the most outstanding characteristics of SBS is its representativeness. The initial selection of companies was carried out combining approaches of exhaustiveness and of random sampling. In the first group, companies with more than 200 employees were included, their participation in the survey being required. The second group was formed by companies with employment

between 10 and 200 workers, which were selected by stratified sampling, proportional with restrictions and systematic with random outburst.

SBS is a valuable survey since relative few data sets contain information at firm level over several years. Moreover, in the last years there have been published several publications in journals of international recognition and with a high level of impact factor which focus on firm's technological and international activities using the SBS (Barrios *et al.*, 2003; Beneito, 2003; Mañez *et al.*, 2004; Surroca and Santamaría, 2007; Díaz-Díaz *et al.*, 2008).

Our sample constitutes an unbalanced panel since some firms cease to provide information while others continue to do so every year. Next table shows a brief description of the sample, in particular the overall percentage regarding exporters, innovators, firm size and activity sector<sup>9</sup>.

**Table 4. Sample description**

Firms' characteristics	Categories	Overall percentage
Exporters	No	34,94
	Yes	65,06
Innovators	No	56,14
	Yes	43,86
Size (n° of employees)	<= 50	51,18
	> 50 & <= 200	17,37
	> 200	31,46
Activity sectors (technology intensity)	Low-Medium	71,07
	Medium -High	28,93

Source: Self-elaborated

For the current investigation, twelve years were considered, specifically firms that answered during the period 1994-2005. It is important to emphasize that all the firms which answered the survey are considered in this paper, nonchalantly if they are exporters or non exporters, innovative or non innovative. By doing this, we avoid possible bias generation (Fritsch and Lukas, 2001; Miotti and Sachwald, 2003) which some previous investigations present due to their focus only on exporting or innovative firms. After deleting outliers (missing values; unusual values like, for example, percentage over 100%; considerably higher/smaller values), we remain with a final number of observations of 8,309 corresponding to a final sample of

<sup>9</sup> SBS provides the binary variable EXPORT. Innovators' percentage is given by the junction between the two binary variables IP and IPR (product and process innovation). SBS also provides a six category variable regarding firm's size, based on the number of employees. We proceeded in joining the categories into three major ones. As for the activity sectors, we created a variable parting from OECD classification. Firstly, we formed a four-categories variable: low, medium-low, medium-high and high. After this, we combined the first two and last two, transforming the variable into a binary one (IN\_TEC\_HIGH=0/1).

696 firms. 95.11 % of the firms in the sample answered during the whole panel (twelve years), precisely 662 firms.

## 4.2. Variables

To what empirical part refers to, this investigation has three major focuses. Firstly, we aim to analyse the impact that technological innovations have on international activities. Secondly, we analyse the impact that the latter has upon the former. And thirdly, we seek to explain the inter-dependence of these two processes.

When foreign commercial activities are the dependent variable, firm's export-related achievements are considered to be a good proxy for measuring them (Surroca and Santamaría, 2007) since these activities also deal with firm's relationships with its foreign clients (Galende and Suárez, 1999). We will focus on three different variables that explain exports, considering previous investigations (see Table 2): number of main international markets (understanding by main international markets those representing at least 50% of firm's total sales – NMIM); propensity to export (ratio between exports and total sales – PX); and the exports value (employed here as its logarithm due to the high value of the variable – logVE). We think about NMIM and PX as firm's presence abroad or its export propensity and about logVE as its export intensity (Gemunden, 1991), therefore they explain different things but not less important, all being valuable for our investigation.

Three variables regarding firm's technological activities represent the independent variables: innovative intensity (ratio between R&D expenses and total sales – RDS); number of product innovations (NPI); and process innovation (PRI)<sup>10</sup>. Therefore, these innovative activities provide firms with an innovative capacity and allow them to develop valuable competitive advantages (López and García, 2005; Surroca and Santamaría, 2007). The fourth independent variable will focus on firm's experiential knowledge, firm age properly defining its experience and knowledge as well as the absorptive capacity acquired over time (Molero and Buesa, 1996; Galende and de la Fuente, 2003). We define firm's age as the difference between year  $t$  of the firm and its foundation year – AGE).

For the second part of the analysis, we will focus on the impact that international achievements will have upon the technological activities. Thus, RDS, NPI and PRI will be the new dependent variables, while the independent ones will focus on export-related activities

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<sup>10</sup> We follow Roper and Love (2002) and López and García (2005) argument, meaning that studies based solely on R&D intensity may be misleading, using a range of innovation indicators being thus more appropriate.

(NMIM, PX, logVE) and experiential knowledge (AGE). Summarizing, in each of the two analyses three models will be generated, which will allow us to determine more accurately the effect that technological innovations has upon exports and vice-versa, detecting in this way if there is any sensitivity depending on which variables are introduced in the estimations (López and García, 2005).

For both analyses we will control by firm size (number of employees) and technological intensity of sectors calculated according to OECD's (1997) classification. The same variables explaining technological and commercial activities of the firm will be maintained in order to proceed to the third part of the analysis, where we will be examining the inter-dependence between these two kinds of activities.

Moreover, lagged variables are going to be introduced in this investigation as we believe that exports in year  $t$  can be influenced by technological innovation in year  $t-1$  and, consequently, exports in year  $t-1$  would also explain the technological innovations in year  $t$ . Hence, only one year<sup>11</sup> lagged variables regarding technological innovations and exports will be introduced (without considering their values in year  $t$ ), being this the case just for the independent variables. We base these arguments not only on logic but also on Bernard and Jensen (1999) and Salomon and Shaver (2000) who advise the introduction of lags into analyses in order to reduce possible simultaneity problems and on Baum (2006) who considers lags important in order to improve prospects of valid causal inference.

We present in Table 5 a summarised description of all the variables used in our analysis as well as the authors who have already supported them in empirical investigations.

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<sup>11</sup> Estimations with two-year lags for the independent variables were also run and no significant results (regarding the relation under focus) were given.

**Table 5. Description of variables**

Variable	Definition	Acronym	Calculation	Authors
Export	Number of main international markets	NMIM	Continuous	Wakelin, 1998; Sterlacchini, 1999; Basile, 2001; Nassimbeni, 2001; Bleaney and Wakelin, 2002; Roper and Love, 2002; Barrios <i>et al.</i> , 2003; Ozçelik and Taymaz, 2004; López and García, 2005; Santamaria and Rialp, 2007.
	Propensity to export	PX	Percentage of exports on total sales	
	Exports value	logVE	Logarithm of exports value	
Innovation	Innovative intensity	RDS	R&D expenses divided into total sales	Bloodgood <i>et al.</i> , 1996; Zhao and Li, 1997; Basile, 2001; Nassimbeni, 2001; Bleaney and Wakelin, 2002; Roper and Love, 2002; Barrios <i>et al.</i> , 2003; Mañez <i>et al.</i> , 2004; Ozçelik and Taymaz, 2004; López and García, 2005; Salomon and Shaver, 2005; Diaz <i>et al.</i> , 2008.
	Number of product innovations	NPI	Continuous	
	Process innovation	PRI	Binary	
Knowledge (experience)	Firm age	AGE	Firm's foundation year rested from year <i>t</i>	Zahra <i>et al.</i> , 2000; Nassimbeni, 2001; Barrios <i>et al.</i> , 2003; Mañez <i>et al.</i> , 2004; Santamaria and Rialp, 2007; Diaz <i>et al.</i> , 2008.
Control	Firm size	SIZE	Number of employees	Bloodgood <i>et al.</i> , 1996; Roberts and Tybout, 1997; Molero, 1998; Wakelin, 1998; Zahra <i>et al.</i> , 2000; Basile, 2001; Nassimbeni, 2001; Bleaney and Wakelin, 2002; Barrios <i>et al.</i> , 2003; Mañez <i>et al.</i> , 2004; Ozçelik and Taymaz, 2004; López and García, 2005.
	Technological intensity	TEC_INTENS	OECD (1997) classification	

Source: Self-elaborated

### 4.3. Empirical analysis

With the aim of contrasting the hypotheses formulated in this paper, different statistical methods with panel data will be employed. When analysing the influence that technological innovation activities have upon exports, three Tobit regressions will be run. Explicitly, since all variables regarding export-related activities are truncated ones, having the lower limit 0 for non-exporters, Tobit analysis is the most appropriate one in order to obtain unbiased and consistent estimators, as well as inferential results (Ozçelik and Taymaz, 2004). In conclusion, the general specification of this first analysis is as follows:

$$Exports_t^{12} = \beta_1 \text{Technological innovations}_{t-1} + \beta_2 \text{Experiential knowledge} + \beta_3 \text{Control} + \tau_t$$

When analysing the influence that export activities have upon the innovation ones, we will estimate three regressions as well. Firstly, Tobit regression will be ran twice, since both RDS and NPI are truncated variables, assuming the value 0 for non-innovators and positive values

<sup>12</sup> Only the value corresponding to year *t* is considered for the dependent variables (exports and technological innovations) because we do not focus in these analyses on dynamics. However, it represents a valuable future line of investigation which can be complemented with learning theories.

for innovators. Secondly, since PRI is a binary variable (it takes the value 0 if the firm does not develop product innovations and the value 1 if it does), Logit regression<sup>13</sup> is considered to be an appropriate technique. So, the general specification of this second analysis is as follows:

$$\begin{aligned} \text{Technological innovations}_t &= \gamma_1 \text{Exports}_{t-1} + \gamma_2 \text{Experiential knowledge} \\ &+ \gamma_3 \text{Control} + v_t \end{aligned}$$

Running the models above-mentioned represent a first insight of the causal relation between the two processes under analysis. In order to offer more accurate empirical support and since the main objective of this research is to find out if there is indeed a reciprocal relation between technological innovation and exports, we shall perform the Granger test of causality (Granger, 1969) since it remains the most popular methodology for evaluating the nature of the causal relation between two variables (Hood *et al.*, 2008).

Therefore, we aim to determine whether one process is useful in forecasting the other one. Explicitly, we will test whether technological innovations are “Granger caused” by exports and vice-versa. To incorporate dynamics, we will include lagged variables in this analysis as well. As a result, the model for testing Granger causality (Luo and Homburg, 2007) between technological innovations and exports will be specified as follows:

$$\begin{aligned} \text{Technological innovations}_t &= \pi_1 \text{Technological innovations}_{t-1} + \\ &\chi_1 \text{Exports}_t + \chi_2 \text{Exports}_{t-1} + v_t \\ \text{Exports}_t &= \omega_1 \text{Exports}_{t-1} + \varphi_1 \text{Technological innovations}_t + \\ &\varphi_2 \text{Technological innovations}_{t-1} + \tau_t \end{aligned}$$

According to Luo and Homburg (2007), if all the coefficients of these equations are significant, technological innovations and exports mutually lead to “Granger cause” each other. If only the coefficients of  $\chi_j$  are significant, exports “Granger cause” technological innovations. Consequently, if only the coefficients of  $\varphi_j$  are significant, technological innovations “Granger cause” exports.

Furthermore, a Wald F test will determine the significance of the equations, considering this formula:

$$F = \frac{(SSR1 - SSR2)/q}{SSR2/(n-s)},$$

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<sup>13</sup> Probit analysis could be also used since it is similar with Logit and both give similar conclusion in most applications (Nassimbeni, 2001). However, sometimes estimates from Logit and Probit models may differ substantially such as cases with an extremely large number of observations and a heavy concentration of the observation in the tails of the distribution. In this situation, Logit model is more appropriate (Liao, 1994).

where SSR1 represents the sum of squared residuals in the restricted equation (in which  $\chi_j$  and  $\phi_j$  are restricted to zero) and SSR2 is the sum of squared residuals in the unrestricted equation. Additionally,  $q$  = the number of restrictions,  $n$  = the number of observations, and  $s$  = the number of independent variables in the unrestricted equation.

## 5. RESULTS

### 5.1. Descriptive statistics for the variables

Below, Tables 6.1 and 6.2 show the means, standard deviations and correlations between the variables to be considered in both analyses, explicitly both the one where we focus on the influence that technological innovations have upon exports and vice-versa.

**Table 6.1. Means, standard deviations and correlations between variables**

Variables	Mean	Std.Dev.	1	2	3	4	5	6	7
1. NMIM <sub>t</sub>	.8408926	1.151225	1.0000						
2. PX <sub>t</sub>	20.84577	27.1898	<b>0.5929*</b>	1.0000					
3. logVE <sub>t</sub>	8.785601	6.831174	<b>0.6093*</b>	<b>0.6994*</b>	1.0000				
4. RDS <sub>t-1</sub>	.7601794	2.239202	0.1779*	0.1620*	0.2007*	1.0000			
5. PRI <sub>t-1</sub>	.3440832	.4750996	0.1752*	0.1780*	0.2419*	0.1606*	1.0000		
6. NPI <sub>t-1</sub>	2.837442	16.93018	0.0407*	0.0602*	0.0939*	0.1074*	0.0800*	1.0000	
7. AGE	26.9258	21.40507	0.1419*	0.0830*	0.2680*	0.0824*	0.0820*	0.0425*	1.0000

\* Significance level at 0.05

Source: Self-elaborated

**Table 6.2. Means, standard deviations and correlations between variables**

Variables	Mean	Std.Dev.	1	2	3	4	5	6	7
1. RDS <sub>t</sub>	.7744621	2.47896	1.0000						
2. NPI <sub>t</sub>	2.736493	16.38968	0.0940*	1.0000					
3. PRI <sub>t</sub>	.3378608	.4730095	0.1393*	0.0814*	1.0000				
4. NMIM <sub>t-1</sub>	.8344083	1.152743	0.1527*	0.0397*	0.1719*	1.0000			
5. PX <sub>t-1</sub>	20.73183	27.11618	0.1433*	0.0646*	0.1627*	<b>0.5923*</b>	1.0000		
6. logVE <sub>t-1</sub>	8.677452	6.779672	0.1826*	0.0865*	0.2291*	<b>0.6094*</b>	<b>0.7012*</b>	1.0000	
7. AGE	26.9258	21.40507	0.0959*	0.0403*	0.0819*	0.1447*	0.0792*	0.2687*	1.0000

\* Significance level at 0.05

Source: Self-elaborated

It can be observed that the majority of the correlation values is lower than 0.56 which is the maximum level a correlation is allowed to have for assessing multicollinearity analysis (Leiblein *et al.*, 2002). However, there are correlations slightly higher than the recommended level, being the case of PX<sub>t</sub> with NMIM<sub>t</sub> (0.5929), logVE<sub>t</sub> with NMIM<sub>t</sub> (0.6093) and logVE<sub>t</sub>

with  $PX_t$  (0.6994) on one hand and  $PX_{t-1}$  with  $NMIM_{t-1}$  (0.5923),  $\log VE_{t-1}$  with  $NMIM_{t-1}$  (0.6094) and  $\log VE_{t-1}$  with  $PX_{t-1}$  (0.7012) on the other hand.

In order to evaluate their impact, the variation inflation factor (VIF) test is applied, running a regression for all the variables. The highest VIF levels are 2.23 and 2.47 respectively, being substantially lower than the allowed level of 10.0 (Baum, 2006) or even 5.0 (Studenmund, 1997; Pindado and De la Torre, 2006), indicating therefore that the results will not be biased due to multicollinearity (Nester *et al.*, 1985).

## **5.2. Empirical results and discussion**

First, three Tobit regressions are estimated so as to explain the influence that technological innovations may have upon exports. Results are shown in Table 7.1. Second, two Tobit and one Logit regressions supply information regarding the effect of exports on technological innovations. Results are shown in Table 7.2. Overall, we notice that results reveal causal relation between the two processes studied here. Year dummies are included for the first two analyses.

### 5.2.1. Technological innovations as a determinant of export-related activities

As already mentioned, the first analysis is about the understanding of the impact that technological innovations have on exports. We observe in Table 7.1 that model *A*), *C*) and *D*) show a similar result regarding the influence that technological innovation activities have upon the export-related ones. Namely, both the innovative intensity ( $RDS_{t-1}$ ) and the number of product innovations ( $NPI_{t-1}$ ) present positive and significant values with respect to the number of the main international markets ( $NMIM_t$ ) and the propensity to export ( $PX_t$ ), respectively. In model *D*), the dependent variable is a factor which contains all the three export measures. This was generated so to unify the three dimensions and look for a general result. Model *B*) focuses on firm's export intensity, explained here as the logarithm of the export value ( $\log VE$ ). We detect that process innovation in year  $t-1$  is the only statistically significant ( $p < 0.1$ ) and positive innovation variable.



**Table 7.1. Results. Technological innovations as a determinant of export-related activities**

Variables		Export			
		A) NMIM <sub>t</sub> (tobit)	B) logVE <sub>t</sub> (tobit)	C) PX <sub>t</sub> (tobit)	D) Factor_Exp <sub>t</sub> (random effects)
Technological activities	RDS <sub>t-1</sub>	.0289*** (.0070)	.0322 (.0271)	.2091** (.0875)	.0091*** (.0027)
	NPI <sub>t-1</sub>	.0010 (.0007)	.0009 (.0029)	-.0045 (.0097)	.0002 (.0002)
	PRI <sub>t-1</sub>	.0543* (.0295)	.2034* (.1052)	.6749* (.4094)	.0194** (.0098)
Organizational activities	AGE	-.0011 (.0010)	.0236*** (.0044)	-.0352*** (.0116)	.0004 (.0006)
Control	SIZE 2 (med)	.6233*** (.0583)	2.609*** (.2125)	5.131*** (.6863)	.2399*** (.0258)
	SIZE 3 (large)	.9304*** (.0562)	4.781*** (.2370)	10.42*** (.5906)	.5175*** (.0342)
	TEC_INTENS	.6706*** (.0615)	2.502*** (.2397)	10.15*** (.6816)	.4583*** (.0614)
Log-likelihood		-6185.7285	-14846.354	-21036.756	n.a.
Constant		-.5591*** (.0638)	4.966*** (.2160)	11.19*** (.7099)	-.5006*** (.0391)
R-square		0.2146	0.3939	0.2049	0.3264

\*  $p < .1$

\*\*  $p < .05$

\*\*\*  $p < .01$

Standard errors into brackets

Source: Self-elaborated

Therefore, our results show that only two technological innovation indicators are important if a firm looks for increasing its presence in different markets abroad (namely, RDS and PRI). It is worth to observe that the innovation developed the previous year affects firm's export activities in the current year<sup>14</sup>.

Consequently, if a firm is interested in selling more abroad (logVE) or to have a higher propensity to export (PX), the process innovation realized a year before, and not the product one, seems to be more relevant. It is highlighted in the literature the difficulty to clearly differentiate these two types of technological innovations, but Becker and Egger (2007) underline that firms which develop process innovations, on one hand, are more interested in maintaining their international market position and firms which focus on product innovations, on the other hand, look for successful market entries.

<sup>14</sup> As mentioned in the section dedicated to the explanation of variables, we also estimated models with two-year lags for the independent variables. It was only when the dependent variable was NIM that  $IDV_{t-2}$  and  $NPI_{t-2}$  had a positive and significant coefficient. For the rest, no significant results were achieved.

Our data support therefore H1, meaning that technological innovations have a positive and significant influence on international activities. Considering our theoretical framework (RBV), H1 is in line with it since several authors classify technological innovation as the main source of firms' competitive advantage (Prahalad and Hamel, 1990; Bone and Saxon, 2000; Eusebio and Rialp, 2002; Rodriguez *et al.*, 2007). Cho and Pucik (2005) argue that innovation becomes critical in order to achieve a sustainable competitive advantage due to the rapid technological change, short product life-cycles, and increasing global competition. The effect that technological innovation has upon exports has been largely discussed, most of the academicians agreeing upon a positive and significant one (Bleaney and Wakelin, 2002; Barrios *et al.*, 2003; etc.). In this line, Basile *et al.* (2003) build an indicator of foreign expansion of Italian firms and find that firms' innovative activities are important determinants of the degree of involvement in international operations. Moreover, Castellani and Zanfei (2007)'s results show that increasing commitment to international operations is also associated with higher innovative effort, higher propensity to innovate, and a higher propensity to engage in technological collaboration within groups. On the opposite, even if Bloodgood *et al.* (1996) predict that internationalisation will be higher in new ventures in which innovation is high, they do not succeed in finding enough evidence, the relationship being marginally significant but negative.

Regarding firm's experience, measured by firm age, results do not offer us an easy remark, since AGE, even significant for  $\log VE_t$  and  $PX_t$  ( $p < 0.01$ ), appears with different signs. Explicitly, firm age has no significant impact on firm's number of main international markets and neither does on  $Factor\_Exp_t$ , but it has a positive and significant one in regard to the volume of exports, whereas its impact is negative and significant in relation to the propensity to export. These results can be understood in the sense that the younger a firm is, more propensity to export it has, finding support in Oviatt and McDougall (2005)'s argument according to whom international new ventures begin with a proactive international strategy in contrast to organisations that evolve gradually from domestic firms to multinationals (Johanson and Vahlne, 1977; 1990). On the other hand, more experienced firms have a higher volume of exports. Considering these results, we cannot generally accept H4. Our finding is in line with others, evidence being generally mixed. Barrios *et al.* (2003) and Mañez *et al.* (2004) find a positive and significant relation between firm's experience and its international activities, contrasting with the findings of Preece *et al.* (1999) who support the argument of McDougall *et al.* (1994) regarding that firms begin their international activity at an early stage.

As for the control variables, both firm size and sector show a positive and significant coefficient with respect to the three dependent variables. The relation between firm size and export behaviour has been extensively analysed in the literature, the first one being considered to be a useful and manageable approximation of firm assets which affect the latter one (Bonaccorsi, 1992). There is a wide evidence in the literature about the strong relation between firm size and export activity (Wagner, 1995; Roberts and Tybout, 1997; Barrios *et al.*, 2003; Bernard and Jensen, 2004; Mañez *et al.*, 2004), more precisely it is stated that the probability of a firm to be an exporter increases with its size. On the contrary, Pla and Alegre (2007) found that firm size is not a determinant for innovation or for export intensity. This goes in line with the findings of Bonaccorsi (1992), Calof (1994) and Preece *et al.* (1999) who focus on early-stage technology-based firms and argue that these are by necessity international from the start. Regarding the sector where the firm operates, according to López and García (2005), belonging to a particular industry may condition a firm's strategy and performance in some way. In this regard, some empirical studies, at the sector level above all (Dosi *et al.*, 1990; Verspagen and Wakelin, 1993), have shown that technology-intensive sectors tend to export a higher proportion of their output than other sectors, as a result of technological spillovers within the industry, externalities and accumulated experience, allowing it to improve its technological capacity at the firm level and thus its competitiveness.

### 5.2.2. Export-related activities as a determinant of technological innovations

The second part of the analysis separates the dependent variable into firm's innovative intensity (RDS) and activity (NPI and PRI), as it can be seen in Table 7.2.

**Table 7.2. Results. Export-related activities as a determinant of technological innovations**

Variables		Technological innovation			
		E) RDS <sub>t</sub> (tobit)	F) NPI <sub>t</sub> (tobit)	G) PRI <sub>t</sub> (logit)	H) Factor_Inn <sub>t</sub> (random effects)
Commercial activities	NMIM <sub>t-1</sub>	.0746 (.0555)	1.493*** (.5650)	.0731 (.0490)	.0258* (.0150)
	logVE <sub>t-1</sub>	.0606*** (.0142)	.8868*** (.1621)	.0264** (.0117)	.0064* (.0034)
	PX <sub>t-1</sub>	.0063** (.0030)	-.0040 (.0302)	-.0000 (.0026)	.0007 (.0008)
Organizational activities	AGE	.0122*** (.0036)	-.0172 (.0348)	.0012 (.0030)	.0020*** (.0010)
Control	SIZE 2 (med)	.6588*** (.1736)	.5403 (1.851)	.8798*** (.1592)	.2092*** (.0476)
	SIZE 3 (large)	.8238*** (.1961)	5.222*** (1.889)	1.549*** (.1733)	.3362*** (.0559)
	TEC_INTENS	2.146*** (.1847)	4.562*** (1.434)	.2390 (.1586)	.3282*** (.0570)
Log-likelihood		-8753.5645	-10997.382	-3806.4602	n.a.
Constant		-2.859*** (.1889)	-20.77*** (2.138)	-1.964*** (.1555)	-.4876*** (.0544)
R-square		0.0872	0.0074	n.a.	0.1136

\*  $p < .1$

\*\*  $p < .05$

\*\*\*  $p < .01$

Standard errors into brackets

Source: Self-elaborated

Our findings show that when firm's innovative intensity is a dependent variable (model E), both logVE<sub>t-1</sub> and PX<sub>t-1</sub> influence it in a positive and significant way ( $p < 0.01$  and  $p < 0.05$  respectively), whereas NMIM<sub>t-1</sub> has no statistically significant impact. The following two models explain the innovative activity of the firm, logVE<sub>t-1</sub> being positive and significant for both. In the case of NPI as a dependent variable, NMIM appears also as an important explanatory variable, having a high (1.493) and significant ( $p < 0.01$ ) coefficient. In order to unify the three dimensions and look for a general result, a factor which contains innovation variables was also generated (model H). After employing it in a random effects regression as a dependent variable, NMIM<sub>t-1</sub> and logVE<sub>t-1</sub> appear as significant ( $p < 0.1$ ), as well as AGE and the control variables ( $p < 0.05$  and  $p < 0.01$  respectively), whereas  $R^2 = 0.1136$ .

Therefore, more markets a firm possesses, more product innovations it will achieve, since it gains access both to new market knowledge and to different patterns of consumer behaviour. However, this does not have a direct effect on innovative intensity and neither on the process innovation advances. On the other hand, the only commercial resource that explains all

technological ones is  $\log VE_{t-1}$ . It seems extremely important how much a firm sold abroad one year<sup>15</sup> before in order to accomplish and develop more technological innovations in the current year. Therefore, when a firm is more consolidated abroad, having a high value of exports, it invests more in R&D, developing not only product innovations but also process ones, perhaps more sophisticated and radical rather than incremental.

These results are in line with some academicians who find that there are strong opinions to suggest that the increment of international activities actually leads to innovation (Hitt *et al.*, 1997; Barrios *et al.*, 2003; Cruz *et al.*, 2009). As already mentioned in the literature review section and also developed in Wakelin (1998), even if the influence that technological innovation has on export has not been so deeply addressed, there are a few studies which examined it, such as Willmore (1992) and Kumar and Siddharthan (1994) among others. Regarding the first one, no significant role for R&D expenditures as a determinant of exports was found (Willmore, 1992). In contrast, Bleaney and Wakelin (2002) consider innovation as the driving force behind exports, innovative firms having a significantly higher propensity to export than non-innovative ones. Therefore, studies have been successful in showing that there are international firms which relate their R&D activity more to exporting over time (Lall and Kumar, 1981), that the propensity to export of innovative firms tends to be higher than that of non-innovative ones (Hirsch and Bijaoui, 1985), and that the variation in export sales are well explained by the variations in innovative intensity (ratio between R&D expenditures and total sales) (Hirsch *et al.*, 1988).

As for the predicted relation between firm's age-based experience and technological innovations, we cannot generally support H5 since AGE does not have the same effect on all the dependent variables, being positive and significant only for  $RDS_t$  and  $Factor\_Inn_t$ . Therefore, more experiential knowledge a firm has, the greater its R&D expenses over sales will be. Similarly, most of the academicians find a positive impact of age on innovative activity (Kumar and Saqib, 1996; Molero and Buesa, 1996; Gumbau, 1997; Kuemmerle, 1998), except Molero and Buesa (1996), who show that younger companies rapidly acquire experiential knowledge and use it to develop more technological innovations.

With respect to the control variables (firm size and the sectors' technological intensity), they represent as well important factors which allow firms to improve their technological innovation activities, showing a highly significant and positive sign ( $p < 0.01$ ) in almost all the three regressions employed to analyse the relation that exists between firm's technological

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<sup>15</sup> We also estimated models with two-year lags for the independent variables. Results were extremely similar.

innovation and its exports. The only exceptions are for the second and third model, precisely, medium firms show no significant influence upon technological innovations measured as the number of product innovations, and neither does sector for the binary variable IPR.

### 5.2.3. Results of the third analysis

Next, with the purpose to provide a greater empirical support to the estimations obtained in the previous models, and in order to investigate the existence of a reciprocal, mutual relation between technological innovations and exports, we perform the Granger test of causality (1969). This test's computed Wald F results are presented in Table 7.3.

As it can be observed, the F statistics account for extremely significant *p*-values when referring both to the impact that technological innovations have on exports and also to the impact the latter has on the former. Therefore, we can affirm that innovation “Granger causes” internationalisation and that internationalisation “Granger causes” innovation, hence giving full support to H3.

**Table 7.3. Results. F statistics from Granger test**

Indep. Var.	Dep. Var.					
	NMIM	logVE	PX	RDS	NPI	PRI
NMIM	n.a.	n.a.	n.a.	15.6***	5.759***	36.139***
logVE	n.a.	n.a.	n.a.	26.53***	6.186***	70.424***
PX	n.a.	n.a.	n.a.	14.51***	3.68**	31.25***
RDS	31.654***	11.855***	15.715***	n.a.	n.a.	n.a.
NPI	103.528***	77.385***	110.791***	n.a.	n.a.	n.a.
PRI	8.78***	15.50***	7.213***	n.a.	n.a.	n.a.

\*\*  $p < 0.05$

\*\*\*  $p < 0.01$

Source: Self-elaborated

However, there is not enough evidence in the literature regarding this finding, being few the authors who suggest but not research it, such as Zhao and Li (1997), Prashantham (2005), Lachenmaier and Wößmann (2006), Pla and Alegre (2007), Vila and Kuster (2007) among others. Moreover, Castellani and Zanfei (2007) results suggest that a two-way link exists between innovation and internationalisation. Firms invest in R&D and innovation to gain advantages and compete in international markets. On the contrary, international production favours access to foreign knowledge sources, enhancing firms' advantages.

## 6. CONCLUSION

Academicians repeatedly report the need for disentangling the direction of causality between innovation and internationalisation (Hitt *et al.*, 1997; Lachenmaier and Wößmann, 2006; Prashantham, 2008). In addition, Knight and Cavusgil (2004) highlight that innovation, knowledge and capabilities have been central themes of research on the international strategy and performance of the firm.

In this paper, we argued that both innovation and internationalisation may influence each other. The basis of this argument resides, firstly, in the fact that firms which participate in international markets must develop competitive advantages in order to survive, being these advantages potentially transferable further into technological innovations. In order to achieve the objective of this paper, we focused on RBV, analysing firms' technological and international achievements as well as their experience. Spanish Business Strategy Survey (SBS) was used, focusing on an unbalanced panel formed by 696 firms which answered during the period 1994-2005. Around 65% of the firms involved in the analysis were exporters and almost 44% were innovators. Several statistical techniques were applied since we considered both innovation and export based-internationalisation as a dependent variable. The results of these analyses revealed a preliminary causality relation between the two processes under investigation.

On one hand, the findings of our first analysis suggest that the technological activities of the firm are a key factor in its international performance, providing it with greater capacity to enter and sell products in foreign markets. Consequently, if a firm is interested in selling more abroad (logVE) or in increasing its propensity to export (PX), it seems it takes into consideration the process innovations developed a year before, and not the product ones. Even if it is hard to make a clear distinction between these two types of technological innovations, especially when it comes of chronological issues, it stands out in our analysis that firms are more interested in maintaining their international market position and not in having successful market entries (Becker and Egger, 2007).

On the other hand, the findings of our second analysis suggest that the international achievements of the firm are also a key factor in the advances achieved in technological innovations. Firstly, the higher the number of main international markets is, the more product innovations a firm will develop, since the firm gains access both to new market knowledge and to different patterns of consumer behaviour. However, this does not have a direct effect

on innovative intensity and neither on the process innovation advances. This could be due to the type of ideas involved in the development of product innovations, perhaps being handier and not so in need of R&D investments. Secondly, it seems extremely important how much a firm sold abroad in previous years in order to accomplish and develop more technological innovations in the current year. Therefore, when a firm is consolidated abroad, having a relevant value of export-sales, it develops a complete picture of technological innovations, from high R&D investment to both product and process innovations.

Furthermore, the causal relation was statistically strengthened by the Granger test of causality (1969), developed exclusively to test the reciprocity between technological innovation and exports, and bringing therefore an add value to our investigation. Results were notable, since all combinations of variables showed a very significant ( $p < 0.05$  and  $p < 0.01$ ) and positive value.

With respect to the implication of this study, firstly it provides important insights to managers regarding the causal and reciprocal relation between technological innovation activities and internationalisation ones. So, if managers are interested in increasing their firms' export propensity and intensity, they must pay a special attention to the technological activities developed inside the firms. Specifically, in order to increase their presence in the main international markets and also their propensity to export, both innovative intensity and process innovation developed the previous year represent an important input. If, on the contrary, managers seek only to increase their firms' export intensity, by selling more abroad, they first must consider developing process innovations. In the case that managers desire to improve technological innovation issues in their firms, we outline the importance of international achievements, precisely firms' export intensity measured by the value of their export-sales.

Secondly, this study has implications also for the literature, in both empirical and methodological issues. From an empirical point of view, the use of longitudinal data for a twelve-year period supposes an extension to the traditional focus on cross-sectional data analysis. By focusing on a panel data, historical behaviour can be observed since lagged variables are introduced in the analysis. Regarding the methodology used, we offer a complete image of the existent relation between technological innovation and exports since we apply different methods of analysis, culminating with the Granger test of causality (1969). And thirdly, our study presents implication also for public authorities in designing supporting public policies.



This study is not free from limitations. Some are especially regarding to the fact that we dealt with a longitudinal sample which, according to Baltagi (2007), includes problems in the design, data collection, and data management of panel surveys. It is also possible that panel data show bias due to sample selection problems and attrition (Wooldridge, 1995). Other limitations are related to the introduction and measurement of some other variables in the analyses, thus conferring a more complete image of both export and innovation activities. The inclusion of export experience and patent citation may also offer another path for future research. Moreover, the approach used to measure some of the factors may be less precise than desired.

Future research might examine whether the reciprocal relation observed in our investigation is also evidenced in alternative samples. In this way, it would reveal if institutional factors play a role in influencing the relation (Kogut *et al.*, 2002; Peng *et al.*, 2005; Kumar, 2009). Furthermore, dynamics might be introduced into the analysis, precisely single equation models could be developed, with autoregressive dynamics and explanatory variables that are not strictly exogenous, the Generalised Method of Moments estimators being widely used in this context (Bond, 2002). In order to do this, learning-by-doing literature represents a valuable academic evidence and extremely useful for developing new models. Finally, firms from specific sectors or of specific ownership could be also more in-depth analysed.

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## CHAPTER IV

### ARE FAMILY FIRMS AS OPEN-MINDED AS NON-FAMILY ONES?

#### 1. INTRODUCTION

Due to the globalisation of the markets, internationalisation and innovation strategies have become increasingly necessary for a firm in order to maintain its stability and grow, as well as to adapt to changes in markets, technology, and competition (Dougherty and Hardy, 1996). However, both represent the most complex strategies that any firm can undertake (Fernández and Nieto, 2005) since they are directly related to competitive advantages and their correct exploitation and development. Thus, if firms lack resources and perceive an uncertainty and complexity of the processes, they face difficulties in carrying out these strategies.

In the last years, researchers found important to focus more on these two processes, analysing them in relation to each other or to other constructs, both through a longitudinal data (Barrios *et al.*, 2003; Salomon and Shaver, 2005; Díaz *et al.*, 2008; etc.) as through a cross-sectional one (Cho and Pucik, 2005; Lachenmaier and Wößmann, 2006; Pla and Alegre, 2007; Vila and Kuster, 2007; Filipescu *et al.*, 2009). One of the attributes most employed in these analyses is firm's ownership (private, public and foreign), but the attention has gone more on the latter, its positive and significant influence over firm's internationalisation and innovation being obvious in most of the studies (Roberts and Tybout, 1997; Ozçelik and Taymaz, 2004; Mañez *et al.*, 2004; López and García, 2005; MacGarvie, 2006; Castellani and Zanfei, 2007). The negative relation between foreign ownership and innovation, in particular, is highlighted only in Love and Roper (2001) and Díaz *et al.* (2008) and no relation at all is found by Zahra *et al.* (2000).

With respect to the private type of ownership, the studies which focus on it are much more delimited, embracing the field called family businesses. The importance of family businesses is highlighted in many studies, especially due to the fact that they are active agents in the global economy (Casillas *et al.*, 2007). After realising an academic search on ISI Web of Knowledge, by two criteria ("family firm" and "times cited of the papers"), we observe that interests in this topic are various, but mainly they regard agency relations and costs (Schulze *et al.*, 2001), role and effect of family in business (Gómez *et al.*, 2001; Aldrich and Cliff, 2003), and succession (Le Breton-Miller *et al.*, 2004; Royer *et al.*, 2008). Nevertheless, many

family firms have recently shown an active presence in the international, competitive arena (Davis and Harveston, 2000; Zahra, 2003; Graves and Thomas, 2006; de Farias *et al.*, 2009), but, despite their increased activity, not much is known about their internationalisation and innovation strategies and the connection between them. Certain technologies can provide a family firm with an advantage that widens market opportunities and serves as a platform for expansion (Gallo and García, 1996; Davis and Harveston, 2000). Likewise, internationalisation can represent an important factor for family firm's technological flourish, generating information, useful to innovate (Salomon and Shaver, 2005).

Among others, Habbershon and Williams (1999) and Casillas *et al.* (2007) highlight that when referring to a family business one should consider its uniqueness, since it is a complex entity from both human and social point of view. From its inception, this type of firm integrates family and business life, creating several unique characteristics, such as human capital, social capital, survivability capital, patient capital, and governance structure (Sirmon and Hitt, 2003). Therefore, evidence has shown that family firms are different from non-family ones in terms of values, objectives and strategic behaviour (Donckels and Fröhlich, 1991; Singer and Donoho, 1992; Poza, 2004), although opinions regarding how they differ are quite divided. On one side, there are academicians who state that family firms are especially apt to develop distinctive core competencies (Le Breton-Miller and Miller, 2006), holding several governance and leadership conditions that encourage long-term investments and increase the resources available to invest, whereas non-family firms are not (Habbershon and Williams, 1999; Carney, 2005). On the other side, there is academic support of the idea that family firms are more risk averse, are less growth oriented, and are generally more conservative in their strategic behaviour than non-family firms (Donckels and Fröhlich, 1991; Fernández and Nieto, 2005). Following the same argument, Allen and Phillips (2000) believe that family firms might have difficulties to obtain resources, whereas non-family firms have an easier access to financial, technological or commercial resources and capabilities. However, has not been adequately explored why family firms face difficulties and how the differences between them and non-family firms affect strategic decisions such as internationalisation (Sharma *et al.*, 1997).

Summarising, the importance of family firms in the business context has been repeatedly underlined, also because the great majority of firms are considered to be family-owned and managed ones (Chua *et al.*, 2003). This fact is also highlighted in Spain by the Family Firm Institute which reveals some interesting data such as: around 85% of the Spanish firms are

represented by family firms; they realize 59% of the country's total exports; their total revenue is equal to 70% of the total Spanish GDP. However, the situation is quite different when referring to innovation in family firms, as the same institute mentions. Explicitly, according to the Family Firm Institute in Spain, family firms are not so innovative and they invest less in R&D since the environment is less favourable for them in comparison to other firms, making difficult the development of this kind of projects.

Hence, as anticipated before, we aim at comparing family with non-family firms in terms of their international involvement and technological advances, seeking for a better understanding of the differences between them. More precisely, we address the following research question:

*Do investments in technology have a different effect over the international involvement of family firms versus non-family ones?*

*Does the international involvement differently affect the investments realised in technology in family than in non-family firms?*

To do so, secondary data coming from the Survey of Business Strategy (SBS) from Spain has been used, comprising the period 1994-2005. The observations regarding family firms were separated from non-family ones, the final samples being formed by 349 family firms on one hand and 444 non-family firms on the other hand. We aim at contributing to the literature not only by trying to clarify some arguments and theoretical relationships in two types of firms through a parallel analysis, but also in both empirical and methodological issues. From an empirical point of view, the use of longitudinal data for the period 1994-2005 supposes amplification to the traditional focus on cross-sectional data analysis. Therefore, the availability of information referred to several years allows us to lag variables and, especially, to observe their historical behaviour. According to Hsiao (1985), longitudinal data facilitate econometricians to construct and test more complicated behavioural models than a single cross-sectional or time series data set would allow. From a methodological point of view, we apply a modern and outstanding methodology, precisely the Generalised Method of Moments, also known as Arellano and Bond (1991) estimators.

The investigation is set up as follows. The next section outlines the related literature and the theoretical frameworks which fit the objective of this paper. Then, hypotheses are formulated. Section 4 describes the data used in the analysis, followed by the presentation of the results and their discussion in Section 5. Finally, the conclusions, limitations and future lines of research are presented in Section 6.

## 2. LITERATURE REVIEW

Defining a family business is a challenging issue that research in this area has faced since there is still no agreement about how exactly family firms should be defined. As Sharma (2004) outlines, the lack of a clear definition might be due to the multiple difficulties in investigating the source of distinctiveness of the field (Hoy, 2003). Several efforts have been made in order to express some conceptual and operational definitions of family firms (Sharma, 2004). The focus of most of these efforts has been on defining family firms so that they can be distinguished from nonfamily firms. What is frequently used to address this question is a combination of criteria including family ownership, management by a family member, operational involvement of family members, and family member involvement across generations (Rogoff and Heck, 2003). Habbershon *et al.* (2003) describe a family business as an interactive system composed of individuals, a family, and a firm.

In this investigation we will adopt the definition of family business given by Holland and Boulton (1984). Explicitly, family businesses are characterised by having the entrepreneur founder or a family member as president or chief executive officer, employing members of the entrepreneur-founder's family, and managers defining their firms as family businesses.

Family firms have a complex set of characteristics that have not been completely addressed by classical management theory (Davis and Harveston, 2000). Firstly, their internationalisation process might need more attention, even though various academicians have begun to focus more on it lately (Gallo and García, 1996; George *et al.*, 2005; Graves and Thomas, 2006; Fernández and Nieto, 2006). It is known that, by reaching beyond its domestic markets, a family firm can benefit from market diversification, exploit differential growth rates in various markets, and diminish its risks from being excessively dependent on any single market (Davis and Harveston, 2000). International activities make family firms stronger competitors in their domestic market as they acquire knowledge from the competition, respond to different demand factors, and increase their sensitivity to cultural differences (Fernández and Nieto, 2005). However, there is support of the idea that family firms perceive internationalisation to be more risky than domestic operations (Johanson and Vahlne, 1977; Eriksson *et al.*, 1997). Most of the family firms prefer to take care after a domestic business rather than shift their focus to international growth opportunities (Lansberg, 1988; Gallo and García, 1996). Secondly, there is an important need to understand better how family firms behave in terms of R&D investments and technological advances. Too little is

known about this, though innovation represents a critical strategic decision to many organizations as it provides one relevant approach to adapt to changes in markets, technology, and competition (Dougherty and Hardy, 1996).

Table 8 provides a quick overview of the most outstanding research in the field of family business that somehow linked the familiness with internationalisation and/or innovation issues.

**Table 8. Linking familiness with internationalisation and/or innovation**

Authors	Journal	Internationalisation	Innovation	Both
Gallo and García, 1996	FBR	X		
Gudmundson <i>et al.</i> , 1999	FBR			X
Davis and Harveston, 2000	FBR	X		
Sirmin and Hitt, 2003	ET&P		X	
Zahra, 2003	JBV	X		
Zahra <i>et al.</i> , 2004	ET&P	X		
George <i>et al.</i> , 2005	JM	X		
Fernández and Nieto, 2005	FBR	X		
Nieto and Fernández, 2005	JIE			X
Craig and Dibrell, 2006	FBR		X	
Craig and Moores, 2006	FBR		X	
Fernández and Nieto, 2006	JIBS	X		
Graves and Thomas, 2006	FBR	X		
Le Breton and Miller, 2006	ET&P			X
Naldi <i>et al.</i> , 2007	FBR			X

Note: FBR: *Family Business Review*; ET&P: *Entrepreneurship Theory & Practice*; JBV: *Journal of Business Venturing*; JM: *Journal of Management*; JIE: *Journal of International Entrepreneurship*; JIBS: *Journal of International Business Studies*.

Source: Self-elaborated

As it can be observed, most of the focus is on the internationalisation process of family firms, and in the last years academicians began to consider both internationalisation and innovation.

For instance, Gudmundson *et al.* (1999) realise a comparison between family and non-family firms in terms of the strategies undertaken and how they compete in the market, linking in one point a successful innovation with the acquisition of knowledge. In the end, they highlight the lack of evidence and invite researchers to investigate more the innovation process and its application to different types of companies. Nieto and Fernandez (2005) focus on how Internet and its implication facilitate the internationalisation process of small and medium enterprises (SMEs). To do so, variables regarding the family character of the business as well as the technological innovation advances are employed. Some of the results show that the

innovative character of SMEs is positively associated with the export activity, while family ownership seems to negatively affect the decision. At the end, the authors also highlight the need for research regarding the impact that family ownership has over the strategic behavior of the firms.

Next, Le Breton and Miller (2006) try to make clearer the connection between corporate governance and sustainable competitive capabilities, proposing several leadership and governance elements that could determine a long-term orientation of the firm, such as innovation leadership. However, they do not address an explicit relation between the international activity or focus of the firm and innovation. Focusing on a sample of Swedish SMEs, Naldi *et al.* (2007) associate the risk taking with a distinct dimension of entrepreneurial orientation in family firms and find that it is positively related to proactiveness and innovation.

As a result of our literature review, no clear evidence on the relation between the internationalisation and innovation processes in a family firm has been found since the studies under discussion have just introduced somehow one of the concepts in the analysis. Next, we are going to address this relation more in-depth.

### **3. THEORETICAL FRAMEWORK AND HYPOTHESES**

The innovative character of the firms has been studied by the specialized literature. For instance, Özsomer *et al.* (1997) argue that firms with a more flexible structure will have higher rates of innovation than other firms. On the other hand, Daily and Dollinger (1992) associate family firms with more flexible structures and decision-making processes and believe they are less likely to use formal monitoring and control mechanisms than non-family firms, therefore they will be better able to adopt innovation than non-family firms (Craig and Dibrell, 2006).

Likewise, the idea that the innovative character of firms and their investments in technology positively affect firms' international involvement, nonchalantly family-owned ones or not (Bloodgood *et al.*, 1996; Eriksson *et al.*, 1997; Knight and Cavusgil, 2004), has been largely discussed. In general, most of the evidence has shown that firms focused on the use of technology are more likely to begin international activities, such as exporting (Tesar, 1977; Johnston and Czinkota, 1982), certain technologies being able to provide an advantage that widen market opportunities and serve as a platform for expansion. Explicitly, it is commented

that R&D intensity is an important determinant of internationalisation (Kumar and Siddharthan, 1994; Sterlacchini, 1999; Bleaney and Wakelin, 2002; Barrios *et al.*, 2003) and, it also stands out that firm's technological profile and capabilities lead to an advantage of superior new products on which depends firm's international achievements (Pla and Alegre, 2007).

In this regard, the resource-based view (RBV) constitutes an important theoretical framework for grounding this relationship since it stresses the importance of strategic capabilities and resources for internationalisation (Peng, 2001). It is widely known that international expansion is mainly based on the opportunities of exploiting abroad the competitive advantages firms have in domestic markets (Fernández and Nieto, 2005). Explicitly, firms which compete in international markets must have strategic resources and, in particular, deeper knowledge that will provide them with a competitive advantage over local firms. Among these strategic resources, the intangible ones stand out as they are the most likely to fulfil the requirements for resources to generate sustainable competitive advantages (López and García, 2005): be valuable, unique, inimitable, and immobile, reflecting the distinctive pathways of each company (Grant, 1991). As Gallo and García (1996) underline, technological knowledge represents a notable intangible resource for firms, both family and non-family ones.

Therefore, as flexible firms could present higher rates of innovation and family firms are considered by the literature more flexible than non-family firms, family firms should present higher rates of innovation and, consequently, show higher rates of internationalisation.

However, literature also recognizes that family firms are usually at a disadvantage when accessing resources and capabilities (Kets de Vries, 1996), tending to have a conservative attitude and be risk adverse (Ward, 1998; Davis and Harveston, 2000). This argument is also found in Lansberg (1988) and Gallo and García (1996), who highlight that the majority of the family firms' owners prefer to foster a domestic business rather than focus to new, international growth opportunities.

From a theoretical point of view, the role of ownership in creating the incentives necessary to take risky decisions is highlighted by the agency theory (Jensen and Meckling, 1976). As outlined by Chrisman *et al.* (2004), agency theory is based on the idea that managers who are not owners will not guard the affairs of a firm as conscientiously as managers who own the firm. There are mainly two problems that arise in agency relationships, as stated by

Eisenhardt (1989). The first problem relates to differences in risk preferences, while the second refers to the incongruence of goals between principals and agents.

Generally speaking, agency costs arise when firm's actions disregard owners' interests or when resources are employed in order to guarantee that firm actions do not contravene owners' interests (Chrisman *et al.*, 2004). More precisely, Jensen and Meckling (1976) refer to "agency costs" as the costs of all activities and operating systems designed to align the interests and/or actions of managers (agents) with the interests of owners (principals). It is traditionally assumed in the literature that family firms have either zero or insignificant agency costs (Jensen and Meckling, 1976; Ang *et al.*, 2000) because family members tend to be altruistic toward each other (Stewart, 2003). Altruism could moderate some agency costs but, unfortunately, it could also create a different type of agency problems, unique to family firms because family relationships make it more difficult to resolve certain kinds of conflicts and restrain uncreative behaviours (Schulze *et al.*, 2001; Schulze *et al.*, 2003). Thus, family involvement in a firm might influence negatively the economic performance since it is hard for families to replace a certain ineffective family member (Handler and Kram, 1988).

On the other hand, internationalisation and innovation within a family firm might be associated with risky decisions, and even though they might be a source of value creation for all shareholders, founders of the firms are discouraged because of the potential uncertainty which can lower their own wealth (Chrisman *et al.*, 2004). So, the division between business and personal objectives might suppose a conflict of interests (Schulze *et al.*, 2001) because there is a need to satisfy both family and business objectives while preserving family harmony (Davis and Tagiuri, 1991; Schulze *et al.*, 2002). As a result, family firms might suffer from especially high agency costs rooted in altruism and self-control (Schulze *et al.*, 2003), leading to management taking decisions that are counterproductive for the firm.

Therefore, non-family firms with a technological advantage are encouraged to expand overseas since they can use that advantage at little or no marginal cost over the cost of developing the advantage in the domestic market (Davis and Harveston, 2000), while family firms with such technological advantage could be growing slower and devoting themselves more to the local market instead of the foreign ones (Gallo and García, 1996).

Yet, despite of the incentives that family firms develop in order to expand their territory, they also face some important problems which find their roots in the agency theory (Jensen *et. al.*, 1976). Explicitly, CEOs will be conservative in their attitude towards internationalisation,



aiming to protect their wealth and minimize their own risks (George *et al.*, 2005). Besides the risks coming from the interaction with different environments (economic, social, political, cultural and legal), they face risks which may also arise from revealing the owners' know-how and skills to competitors (Dess *et al.*, 1995).

Summarizing, there is evidence highlighting that family firms can be more innovative than non-family and could be focused on expanding territories, but also there is evidence showing that they lack resources and/ or are risk adverse. Due to disadvantages when accessing resources and its risk adverse trait, the connection between internationalisation and innovation in family firms could not be so clear as in non-family firms.

Due to all these evidences that are not going in the same direction, we formulate the following hypothesis and the available data will indicate if the assumed direction is the right one in the context we analyse:

**H1:** Investments in technology will have a similar influence over international involvement in non-family firms than in family ones.

Another argument of this investigation is that once involved in international activities, firms will acquire knowledge about the competition, markets, products, etc. This knowledge is very helpful in order to maintain their strength abroad but also to increment their presence in international markets and it is translated into more investments in technology.

When referring to non-family firms, it has been shown that the increment of international involvement lead to the increment of technological activities (Hitt *et al.*, 1997; Buesa and Molero, 1998; Kumar and Saqib, 1996; Zahra *et al.*, 2000). Explicitly, the increment of firms' presence in international boost the returns to their innovative efforts (Alvarez and Robertson, 2004), as well as it may lead to a more rapid capitalization of R&D and innovation cost. Moreover, by being exposed to international markets, firms have access to new information about technologies and products not available in the home markets which is useful in developing innovative activities through investments in technology, since constant innovation is required to sustain competition (Salomon and Shaver, 2005; Aw *et al.*, 2007).

However, it is argued that some family firms lack the managerial capabilities required to manage a development process (Gallo and García, 1996), which in the international arena could mean that they lack the abilities for taking advantage of the acquired knowledge in foreign markets. Gallo and García (1996) stated that family firms usually have a low level of

qualified staff, preferring to employ family members in managerial positions even though they may be insufficiently qualified or lack experience.

In this sense, the investments made by the family firms could not be as convenient as expected and they might have an impact on firms' resource endowment and its ability to sustain a competitive advantage (Fernández and Nieto, 2006), because they are done considering that the owners could be reluctant to lose control of their business or to develop certain strategies (Storey, 1994).

Since the generation of new knowledge can be a long process with uncertain results (Itami, 1987), where factors such as luck and decision-makers' expectations play a part (Barney, 1986), the accumulation of intangible resources requires riskier investments (Balakrishnan and Fox, 1993) which family firms might not desire to assume. Hence, we formulate the second hypothesis:

**H2:** International activities will have a higher influence over investments in technology in non-family firms than in family ones.

## **4. METHODS**

### **4.1. Data sources, sample and time frame**

In order to accomplish the purpose of this study, we once again use the SBS, a statistical investigation carried out by SEPI Foundation with the financial support of the Ministry of Industry, Tourism and Trade, and designed by the Program of Economic Investigations of SEPI Foundation. The period under investigation remains the same, 1994-2005. Since in this chapter we focus on the dynamism of the sample, we consider the general recommendation by the existent literature regarding dynamic panels. Explicitly, there should be considered for the analysis only firms which have answered for a continuous period of at least three years (Roodman, 2006). Therefore, we proceeded to clean our original sample, by verifying the answering years of the firms. Since there were firms with missing intermittent observations (due to non-response or disappearance), we dropped them and kept only those observations with at least three consecutive years.

Next, we proceeded to the separation of samples, based on the variable OF (Owners and family help in the managerial process of the firm), which refers to whether or not there are owners and family members who have a managerial position within the firm. The results were

two final samples formed by 349 family firms and 444 non-family firms, respectively. They both constitute unbalanced panels since some firms cease to provide information while others continue to do so during the whole period of twelve years.

Next table shows a brief description of the samples, in particular the overall percentage regarding exporters, innovators, firm size and activity sector, as well as the coefficient of Pearson's chi-squared in order to observe the relation between the qualitative variables. SBS provides the binary variable EXPORT and the innovators' percentage is given by the junction between the two binary variables IP and IPR (product and process innovation). SBS also provides a six category variable regarding firm's size, based on the number of employees. We proceeded in joining the categories into three major ones (small, medium and large companies). As for the activity sectors, the SBS classifies firm industry in 20 different industries according to the CNAE-93 classification but we reclassified the industries as low, medium-low, medium-high and high. After this, we combined the first two and last two, transforming the variable into a binary one (IN\_TEC\_HIGH=0/1).

**Table 9. Descriptive statistics<sup>16</sup>**

Firm's characteristics	Categories	Family business				Pearson chi <sup>2</sup>
		No	%	Yes	%	
Exporters	No	988	39.62	1506	60.38	529.41***
	Yes	3340	67.49	1609	32.51	
Innovators	No	2215	53.61	1917	46.39	78.76***
	Yes	2113	63.82	1198	36.18	
Size (n° of employees)	<= 50	1233	33.25	2475	66.75	2.0e+03***
	> 50 & <=					
	200	955	73.52	344	26.48	
	> 200	2142	87.86	296	12.14	
Activity sector (technology intensity)	Low-Medium	2770	52.22	2534	47.78	266.98***
	Medium-High	1560	72.86	581	27.14	

\*\*\* p < 0.01

Source: Self-elaborated

Based on the high levels of Pearson's chi-squared and their high significance (p < 0.01), we notice that there is a relation between the fact of being a family firm and the export and innovative activities (however, only 32.51% of the exporters and 36.18% of the innovators are family firms). As for firm's size, we observe that 66.75% of the small firms are represented by the family firms whereas 87.86% of the firms with more than 200 employees are

<sup>16</sup> The descriptive statistics from Table 9 represent an overall average of the whole sample (1994-2005).

represented by the non-family firms. A significant relation is also observed between family-firms and the high level of their activity sector.

It is important to emphasize that all the firms which answered the survey are considered in this paper, nonchalantly if they are exporters or non exporters, innovative or non innovative. By doing this, we avoid possible bias generation (Fritsch and Lukas, 2001; Miotti and Sachwald, 2003) which some previous investigations present due to their focus only on exporting or innovative firms.

#### **4.2. Variables**

This investigation has two major focuses: firstly, it aims to analyse whether the impact of the investments in technology over international involvement is the same in family firms as in non-family ones; and secondly, it analyses the impact that the latter has upon the former in both samples in order to look for differences between the two kinds of ownership.

Even if there are three main international strategies (exporting, licensing and foreign direct investment) as Hill (2009) highlights, we will focus only on the first one, not only because it is most often recognized as being the initial real step in the internationalisation process (Jones, 2001), but also because it is the most common strategy adopted by firms to enlarge their territory (Molero, 1998; Pla, 2001).

For the first part of the analysis, the dependent variable will be the number of main international markets (NMIM) a firm has, employed here as representing the level of internationalisation involvement or the extent of internationalisation (Bloodgood *et al.*, 1996). We will introduce into the dynamic model the first lag of the dependent variable as an independent one ( $NMIM_{t-1}$ ), as well as one year lag of the variable related to investments in technology, here exemplified by the logarithm of R&D expenses ( $\log RD_{t-1}$ ). Moreover, in order to capture the knowledge of the firm, we introduce the number of employees with superior studies (engineers and bachelors) (NESS) as well as firm's age (AGE). We control by firm's size, measured here by the total number of employees (TNE), and by the activity sector of the firm (Ac\_HTI).

For the second part of the analysis, the dependent variable will be logarithm of R&D expenses ( $\log RD$ ) realised by the firm. This time, the independent variables will be the first lag of the dependent one ( $\log RD_{t-1}$ ) as well as the first lag of the variable regarding the international involvement of the firm ( $NMIM_{t-1}$ ). The others variables are going to be the same as in the

previous analysis. Both analyses are going to be done for the two samples, family and non-family firms, aiming to observe the differences, if any, between these two types of firms.

### 4.3. Empirical analysis

In order to reach the objective of this paper, dynamic panel data analysis will be employed, precisely the Arellano and Bond (1991) estimators, also known as the Generalised Method of Moments (GMM). These estimators are increasingly popular and are designed for situations with few time periods and many individuals; with independent variables that are not strictly exogenous, meaning correlated with past and possibly current realizations of the error; with fixed effects; and with heteroskedasticity and autocorrelation within individuals (Roodman, 2006).

Explicitly, we will use GMM system estimation which was proposed by Blundell and Bond (1998). The GMM system estimator extends the model by using moment restrictions of a simultaneous system of first-differenced equations and the equations in levels. In the first differenced equations one uses the lagged level values of the variables as instruments like in the GMM difference estimator. In the levels equations one uses differences as instruments. Blundell and Bond (1998) have shown, that a mild additional stationarity assumption on the initial condition allows the use of these instruments. Since the moments used in the GMM difference approach are a strict subset of the instruments used in the GMM system estimation, the validity of the additional instruments can be tested by a Sargan difference test (Blundell and Bond, 1998). In our case, since we perform a robust estimation, Hansen J statistic is reported instead of the Sargan, with the same null hypothesis (H0: “the instruments as a group are exogenous”).

The general specifications of the above-mentioned, related to our objective, are as follows:

$$NMIM_{i,t} = \alpha_0 + \alpha_1 NMIM_{i,t-1} + \beta_1 \log RD_{i,t-1} + \beta_2 NESS_{i,t} + \beta_3 AGE_{i,t} + \beta_4 TNE_{i,t} + \beta_5 Ac\_HTI_t + \nu_t + v_{i,t}$$

$$\log RD_{i,t} = \alpha_0 + \alpha_1 \log RD_{i,t-1} + \beta_1 NMIM_{i,t-1} + \beta_2 NESS_{i,t} + \beta_3 AGE_{i,t} + \beta_4 TNE_{i,t} + \beta_5 Ac\_HTI_t + \nu_t + v_{i,t}$$

where  $i = 1, \dots, N$  and  $t = 1, \dots, T$  and represent the cross-sectional units and the time periods, respectively, while  $\nu_t$  is the time-specific effect and  $v_{i,t} = \varepsilon_i + \sigma_{i,t}$  is the error term containing an unobserved time-invariant, firm-specific effect ( $\varepsilon_i$ ) that controls for

unobservable heterogeneity, and a stochastic error term varying cross-time and cross-section ( $\sigma_{i,t}$ )<sup>17</sup>.

## 5. RESULTS

### 5.1. Mean, standard deviations and correlations between variables

Below, Tables 10.1 and 10.2 show the means, standard deviations and correlations between the variables to be considered in both analyses, explicitly both the family firms sample as for the non-family firms.

**Table 10.1. Descriptive statistics and correlations for family firms' sample**

Variables	Mean	Std.Dev.	1	2	3	4	5	6	7
1. NMIM <sub>t</sub>	1.115163	1.251918	1.0000						
2. NMIM <sub>t-1</sub>	1.120685	1.259545	<b>0.8969*</b>	1.0000					
3. logRD <sub>t-1</sub>	6.128226	5.944338	0.3540*	0.3562*	1.0000				
4. NESS <sub>t</sub>	25.11384	56.32119	0.0831*	0.0889*	0.3621*	1.0000			
5. AGE <sub>t</sub>	30.92701	23.15298	0.0694*	0.0704*	0.1733*	0.2072*	1.0000		
6. TNE <sub>t</sub>	326.6783	450.1757	0.2400*	0.2390*	0.4376*	<b>0.6040*</b>	0.1741*	1.0000	
7. Ac_HTI <sub>t</sub>	2.386275	3.777589	0.2197*	0.2249*	0.3564*	0.1931*	0.0705*	0.1569*	1.0000

\* Significance level at .05

Source: Self-elaborated

**Table 10.2. Descriptive statistics and correlations for non-family firms' sample**

Variables	Mean	Std.Dev.	1	2	3	4	5	6	7
1. NMIM <sub>t</sub>	.5177942	.9069545	1.0000						
2. NMIM <sub>t-1</sub>	.5043073	.8977227	<b>0.8815*</b>	1.0000					
3. logRD <sub>t-1</sub>	2.150412	4.18841	0.0831*	0.3883*	1.0000				
4. NESS <sub>t</sub>	2.518648	12.21088	0.0694*	0.0732*	0.2936*	1.0000			
5. AGE <sub>t</sub>	22.04572	17.55112	0.2400*	0.2108*	0.2854*	0.1250*	1.0000		
6. TNE <sub>t</sub>	66.3966	133.8972	0.2197*	0.2075*	0.4533*	<b>0.5691*</b>	0.2687*	1.0000	
7. Ac_HTI <sub>t</sub>	1.214923	2.933127	0.1744*	0.1803*	0.3088*	0.0989*	0.0946*	0.0846*	1.0000

\* Significance level at .05

Source: Self-elaborated

<sup>17</sup> Since we are going to estimate a system GMM model, we calculate the accumulated value of the binary variable Ac\_HTI as well as of the variable YEAR (year\*a), which is also introduced in the analysis as a control variable. GMM estimator uses the levels equation to obtain a system of two equations: one differenced and one in levels. By adding the second equation additional instruments can be obtained. Thus the variables in levels in the second equation are instrumented with their own first differences, increasing therefore the efficiency (Mileva, 2007).

It can be observed that the majority of the correlation values is lower than 0.56 which is the maximum level a correlation is allowed to have for assessing multicollinearity analysis (Leiblein *et al.*, 2002). However, there are correlations higher than the recommended level, being the case of  $NMIM_t$  with  $NMIM_{t-1}$  (0.8969 and 0.8815, for family firms and non-family firms respectively), and TNE with NESS (0.6040 and 0.5691, for family firms and non-family firms respectively). In order to evaluate their impact, the variation inflation factor (VIF) test is applied, running a regression for all the variables. The highest VIF levels are 3.93 and 4.81 respectively, being substantially lower than the allowed level of 10.0 (Baum, 2006) or even 5.0 (Studenmund, 1997; Pindado and de la Torre, 2006), indicating therefore that the results will not be biased due to multicollinearity (Nester *et al.*, 1985).

## **5.2. Empirical results and discussion**

First, we focus on the influence that investments in technology have upon international involvement, both for the family firms sample as for non-family ones. Results are shown in Table 11.1. Second, we look for the significance of the relation between international involvement and investments in technology, precisely on the effect that the former has upon the latter. Results are shown in Table 11.2.

**Table 11.1. Results. Firms' investments in technology as a determinant of their international involvement**

Variables		<i>Dependent NMIM<sub>t</sub></i>	
		Family firms	Non-family firms
<i>Independent</i>	NMIM <sub>t-1</sub>	.7427*** (.0517)	.6792*** (.0367)
	logRD <sub>t-1</sub>	.0103** (.0050)	.0103** (.0052)
	NESS	.0010 (.0020)	-.0009 (.0005)
	AGE	.0015 (.0024)	.0008 (.0022)
<i>Control</i>	TNE	.00004 (.0001)	.0002* (.0001)
	Ac_HTI	.0071 (.0049)	.0161*** (.0052)
<b>Constant</b>		.0546 (.0485)	.2691*** (.0831)
<b>Observations</b>		2639	3545
<b>Number of firms</b>		348	437
<b>Hansen Value (° of freedom)</b>		343.05 (389)	408.25 (393)
<b>Hansen p-Value</b>		.955	.287
<b>AR (1)</b>		-4.67***	-6.63***
<b>AR (2)</b>		1.58	0.12

\*  $p < .1$ ; \*\*  $p < .05$ ; \*\*\*  $p < .01$

Standard errors into brackets

Source: Self-elaborated

At a first glance, Table 11.1 allows us to observe that there are no differences in the behaviour of family firms versus non-family ones, at least not when referring to the effect that investments in technology (measured here as the logarithm of R&D expenses) have over firms' international involvement (represented by the number of main international markets). Explicitly, logRD<sub>t-1</sub> appears with a positive sign and a similar coefficient, at a significance of 95% in both samples. However, a more in-depth look at the coefficients is necessary, in order to sustain the first hypothesis. Hence, T test is performed in order to see whether there is any significant difference between the two coefficients. Based on the P-value, this difference is considered to be not statistically significant.

For this reason, H1, according to which investments in technology will have a similar influence over international involvement in non-family firms than in family ones, is accepted. Therefore, our results show that investments in technology have a similar influence over international involvement for both family and non-family firms, being in line with various academicians who repeatedly stated that investments in technology represent the main source



of firms' competitive advantage (Prahalad and Hamel, 1990; Bleaney and Wakelin, 2002; Barrios *et al.*, 2003; Cho and Pucik, 2005; etc.).

In our case, family firms are not so conservative as well as risk adverse, behaving similarly as non-family firms. This means that the first group has understood the challenges of globalization and the need to take advantage of its know-how and therefore, of its technological advances. Family firms adapt to the requirements of a global economy and face competition as well as a non-family firm. This is not according to George *et al.* (2005), since they state that owners would favour a more conservative approach to internationalisation, aiming to minimize the uncertainty regarding the competition and their income.

As exposed by Zahra (2003), family firms behave differently. In USA, for instance, family firms are slow to respond to increased foreign competition (Dertouzos *et al.*, 1989), avoiding somehow the international expansion due to major resources commitment, while in Europe there are plenty of successful family firms which have had a strong global orientation, attaining a high percentage of sales from foreign markets (McKibbin and Pistrui, 1997; Fernández and Nieto, 2006; Naldi *et al.*, 2007).

Overall, family firms are considered to be an important source of growth and economic development (Zahra *et al.*, 2004) as they create value through product, process and innovations that stimulate growth and lead to prosperity. Even if it is commonly known and accepted that they are different than non-family firms, it is just this difference that makes them as competitive and global-seeking as non-family businesses. To put it more clearly, their long-term nature allows them to dedicate the resources required for innovation and risk taking, thereby fostering entrepreneurship. Furthermore, the kinship-ties that are unique to family firms are believed to have a positive effect upon entrepreneurial opportunity recognition (Barney *et al.*, 2003).

As for the variable related to the number of employees with superior studies, it shows no significant coefficient in either sample, the same happening when firm's age is an independent variable. Therefore, we can formulate that firms' internationalisation process is not affected either by the level of studies of their employees (which can be translated into personnel knowledge) or by firms' age. Instead, we can observe some differences between family and non-family firms when referring to other control variables, such as firm's size (expressed by the number of total employees) and the activity sector (high-technological sectors). Both variables are positive and significantly related to the increment of international

activities ( $p < .1$  and  $p < .01$ , respectively), but only for the case of non-family firms. These results are interesting, since we can argue that family firms do not mind to extend their markets even if they are small or their activity sectors are not technologically high. It is highlighted in the literature that firms' size represents a significant component of the analyses regarding their internationalisation process (Cavusgil and Naor, 1987). However, according to Gallo *et al.* (2004), family firms are older and have lower sales, fewer employees, as well as fewer full-time employees on permanent contracts.

Regarding to the effect that firms' international involvement have upon investments in technology, we can see from Table 11.2 that both family firms and non-family ones have again a very similar behaviour.

**Table 11.2. Results. Firms' international involvement as a determinant of their investments in technology**

Variables		Dependent logRD <sub>t</sub>	
		Family firms	Non-family firms
<i>Independent</i>	logRD <sub>t-1</sub>	.5706*** (.0528)	.7124*** (.0293)
	NMIM <sub>t-1</sub>	.5278*** (.1606)	.2265** (.0888)
	NESS	.0096 (.0167)	.0016 (.0024)
	AGE	.0180 (.0131)	.0007 (.0131)
<i>Control</i>	TNE	.0037** (.0016)	.0011** (.0005)
	Ac_HTI	.1524*** (.0363)	.1192*** (.0245)
Constant		.0119 (.2459)	.7841* (.4580)
Observations		2636	3537
Number of firms		348	437
Hansen Value (° of freedom)		346.63 (389)	416.41 (390)
Hansen p-Value		.940	.171
AR (1)		-5.56***	-7.48***
AR (2)		0.18	0.78

\*  $p < .1$ ; \*\*  $p < .05$ ; \*\*\*  $p < .01$

Standard errors into brackets

Source: Self-elaborated

The lagged value of the dependent variable has a positive and very significant sign ( $p < .01$ ), which confirms the logic according to which the investments in technology realised a year before positively affect the investments in the current year. Moreover, firms' former international activity (one year lagged) is positive and significantly related to the current expenses in R&D for both family firms as non-family ones. Even more, we observe that the

first coefficient is slightly higher, which offer us some interesting remarks. Nevertheless, we compute a T test in order to seek for significant difference between the coefficients regarding the exporting behaviour of the family and non-family firms (.5278 versus .2265, respectively). Based on the P-value, there is a difference between coefficients, statistically significant at 90%. Accordingly, we reject H2 which stated that in non-family firms, international activities have a higher effect over investments in technology than in family ones.

This is an outstanding result considering that family firms have been characterised in the literature as suffering from the conflict of interests (Schulze *et al.*, 2001), while the owners are reluctant to lose control of their business or to develop growth strategies (Storey, 1994). In our investigation, it seems that family firms not only follow the same cycle of development (in terms of technological advances and international expansion) as non-family ones, but they take more advantage of their international involvement in order to develop technological innovations than non-family firms.

According to Craig and Dibrell (2006), innovation involves considerable risk taking, the successful implementation of an innovation strategy requiring significant systemic changes in a firm. However, family firms from our sample are not at all risk-averse, understanding that once present in other markets investing in technology represents the perfect way of continuing their activities abroad. Although the research investigating the role of innovation within family firms is limited, it has been suggested that family firms could be very innovative and aggressive in their markets (Aronoff, 1998).

International involvement is often considered useful for properly exploiting technological innovations (Teece, 1986), increasing firms' need for technological inputs. As a result, firms are induced to invest in R&D activities for continuous updating and product adaptation (Kumar and Saqib, 1996). Evidence has shown that firms' international activities are a determinant for achieving innovative activities (Kumar and Saqib, 1996; Buesa and Molero, 1998; Salomon and Shaver, 2005; Vila and Kuster, 2007; Filipescu *et al.*, 2009).

Moreover, in this second analysis, the variables referring to the number of employees with superior studies and firm's age show no importance at all with respect to the increment of the investments in technology, neither for family firms nor for non-family ones. It is a controversy result since most of the academicians find a positive impact of age on technological advances (Kumar and Saqib, 1996; Kuemmerle, 1998), except Molero and Buesa (1996), who show that international young companies rapidly develop technological

innovations. So we can argue that firms, nonchalantly family or non-family ones, continue to realize investments in R&D whenever they consider it necessary, not considering their age or human experience as a requirement for doing so.

As for firm's size and activity sector, both variables show a positive and significant sign ( $p < .05$  and  $p < .01$ , respectively) for both samples, representing important aspects that a firm should consider when desiring to increase its investments in technology. We understand from this that firms are more prone to invest in technology as they grow and also if they develop activities in a sector which technological intensity is medium-high.

## 6. CONCLUSION

The great majority of firms in nearly every country in the world are considered to be family firms (Chua *et al.*, 2003). The high importance of family firms in the business world is nevertheless sharply contrasting to the rather small proportion of research on the topic in the world of science. It has also been reported the need for comparative studies along with longitudinal studies (Brockhaus, 2004). Comparisons between family and non-family firms are particularly useful, and the field will gain a lot if the studies are made taking a long-term perspective (Ibrahim *et al.*, 2008).

This is what we aimed at accomplishing in this research: to compare family with non-family firms in terms of their international involvement and technological advances, considering a long-term perspective. In particular, we looked for a better understanding of the relation between these two factors, depending whether it was a family-owned and managed firm or not. To do so, we used secondary Spanish longitudinal data, covering 12 years consecutively (1994-2005). We separated the original sample by familiness, obtaining in the end two samples of 349 family firms versus 444 non-family firms. Moreover, we applied the GMM estimator (Arellano and Bond, 1991) in order to realise the analyses of the two dynamic panel data.

Firstly, we addressed the following question: Do investments in technology have a different effect over the international involvement of family firms versus non-family ones? Results allowed us to state that both family and non-family firms consider investments in technology valuable competitive advantages in order to expand their frontiers. In our investigation, family firms prove not to have a conservative attitude and be risk adverse as Ward (1998) stated.

Secondly, we looked for the answer of the following question regarding family and non-family firms: Does the international involvement differently affect the investments realised in technology in family than in non-family firms? Differences were observed, but this time family firms have shown to take more advantage of their presence abroad in order to reach a higher level of technological advances than non-family ones. By developing activities abroad and gaining more markets, firms need to maintain their competitiveness, so they are induced to invest in R&D activities for continuous updating and product adaptation (Kumar and Saqib, 1996). It is highlighted in the literature that firms' international involvement is often considered useful for properly exploiting technological innovations (Teece, 1986; Kumar and Saqib, 1996; Salomon and Shaver, 2005).

Furthermore, competition among firms arises as they try to increase profits by devoting resources to creating new products and developing new ways of making existing products (Parkin *et al.*, 1997). Our results are in line with Sharma *et al.* (1997), who stated that family firms are more prone to have multiple, complex, and changing goals rather than a singular, simple, and constant goal. In order to survive, family firms must build capabilities that see them able to be responsive to changing business and family-related demands (Craig and Dibrell, 2006). As outlined by Craig and Moores (2006), family firms appear to give considerable importance to innovation practices and strategy, not only selecting attitudes based on environment and innovative strategy, but also adopting them over time.

With respect to the implications of this study, firstly it provides important insights to managers, nonchalantly owners or not, regarding the importance of technology in order to become international and have presence in more than one market, on one hand, as well as the relevance of international experience for developing more innovative activities through investments in technology.

Secondly, this study presents implications for the literature as well, in both empirical and methodological issues. From an empirical point of view, the use of longitudinal data for a twelve-year period supposes an extension to the traditional focus on cross-sectional data analysis. By focusing on a panel data, historical behaviour can be observed since lagged variables are introduced in the analysis. From a methodological point of view, we employed an econometric method, Generalised Method of Moments. GMM procedure introduces the lagged dependent variable to control for serial dependence in this variable, and it can build instruments for those variables that are potentially endogenous.

This study also presents limitations, mainly due to the fact that we dealt with a longitudinal sample which, according to Baltagi (2007), includes problems in the design, data collection, and data management of panel surveys. Other limitations are related to the introduction and measurement of some other variables in the analyses, thus conferring a more complete image of both internationalisation and technological advances. Moreover, the approach used to measure some of the factors may be less precise than desired.

Regarding future lines of research, we consider interesting to continue the comparison between family and non-family firms, and look for other factors that make these two kinds of firms different from each. The effect that these factors have on firms' performance is also an interesting issue to research. Even more, it would be enriching to consider familiness as a continuous shape of the firm by not separating the samples into family firms and non-family ones. However, other criteria to separate the data based on size and/or sector of activity will offer a more in-depth view which can be acknowledged. For instance, focus only on medium firms or on high-technological sectors and seek for thoughtful evidence. Also, one may look for similar evidence in alternative samples. In this way, it would reveal if institutional factors play a role in influencing the relation (Kogut *et al.*, 2002; Peng *et al.*, 2005; Kumar, 2009).

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## **CHAPTER V**

### **CONCLUSION**

The internationalisation strategy is an outstanding factor regarding firm's performance and its correct and complete development can lead to enhanced knowledge acquisition – either about competition, markets or products – as well as to vital growth (Prashantham, 2005). Moreover, the technological innovations are deeply related with the firms' ability of putting into practice the knowledge acquired in national and international markets, also being considered as necessary as internationalisation for companies which seek the preservation of their competitiveness and stability (Dougherty and Hardy, 1996).

Even if somehow treated in the literature (Zhao and Li, 1997; Lachenmaier and Wößmann, 2006; etc.), the relation between these two processes of the firm has not been deeply addressed, academicians repeatedly reporting the need for disentangling the direction of causality between innovation and internationalisation (Hitt *et al.*, 1997; Prashantham, 2008).

The main objective of the dissertation here concluded was to fill the gap highlighted in the literature and analyse therefore whether or not there was a reciprocal relation between the internationalisation and innovation processes of the firm.

#### **1. SUMMARY OF THE DISSERTATION**

This dissertation is formed by three inter-dependent studies, one qualitative and two subsequent quantitative.

The qualitative analysis was firstly developed in order to understand better how the concepts related to export and innovative activities connected to each other in the real life and listen to managers' personal opinion and experience, having as basis theoretical and empirical evidence. The first set of information obtained was helpful in order to develop our initial model of reciprocity, observing that firms behaved differently depending on whether they followed a traditional process of internationalisation or not (e.g. Born-Global firms). Explicitly, after realising a cross-case analysis, we concluded that firms acquired different types of knowledge and therefore behaved differently in terms of innovation advances once they choose a certain entry mode in the foreign market. Put it clearly, a company which chose

to expand its national territory through an agent would have access to limited information about the market, competition and products. Thus, the knowledge it would acquire would be helpful to develop incremental innovations (understood as little improvements in the product or process the firm is commercialising/ developing abroad). Instead, companies which were surer of their resources and were not adverse to risks, would choose to enter a foreign market either through a subsidiary or through a joint-venture with a domestic firm. By electing these entry modes, the information available on the new market would be faster accessed and better employed in the development of broader innovations, more radical than incremental.

The first study being concluded, a further quantitative one was developed, based on longitudinal data from the Spanish Survey on Business Strategy (SBS), during the period 1994-2004. In order to obtain an as complete as possible image of the relation between exports and technological innovation, we separated the analysis into three: firstly, we focused on the effect that different variables related to the innovative capability of the firms would have over other variables which explained the export behaviour; secondly, we put on the left hand side of the equation the innovation variables, trying to explain them through the export ones. Even if the results of both analyses made us forecast that reciprocity indeed existed between the constructs – being strengthened by theoretical evidence –, we aimed at offering an extensive image and therefore applied the Granger (1969) test of causality. The findings of this test confirmed our hypothesis according to which there was a reciprocal relation.

Having proved the interdependence of export and innovative activities, we next directed our attention to a specific sector: the family business. The idea behind this decision was twofold: firstly, we aimed at observing if the type of ownership affected the results obtained by the firm, comparing family firms with non-family ones in terms of international involvement and investments in technology; secondly, we were attracted by some of the academic evidence which emphasised the lack of managerial capabilities required for international growth as well as a risk adversity in family-owned companies (Davis and Harveston, 2000). After running a Generalised Method of Moments (Arellano and Bond, 1991), we obtained interesting results, controversial however with most of the existent literature. Firstly, both family and non-family firms considered investments in technology valuable competitive advantages in order to expand their frontiers. In our investigation, family firms proved not to have a conservative attitude and be risk adverse as Ward (1998) stated. Secondly, family firms showed to take more advantage of their presence abroad in order to reach a higher level of technological advances than non-family ones.

## **2. CONTRIBUTION OF THE DISSERTATION**

The present thesis has important implications for literature, management and public policy, which are explicitly developed in the following sections.

### **2.1. Contribution for the literature**

By addressing the reciprocity of the relation between two of the main important processes in the firm nowadays – internationalisation and innovation – this dissertation has gathered notions from previous academic evidence, seeking synergies in both disciplines. Firstly, the internationalisation literature was informed by concepts of innovation literature, and secondly, we aimed at enriching the latter with notions and evidence about the internationalisation process of the firm. Next, we present in detail the contributions – theoretical, empirical and methodological – to both fields of investigation, as observed in Table 12.1.

#### 2.1.1. Theoretical contribution

This dissertation contributes to the internationalisation literature firstly by trying to offer a clearer description of the internationalisation process of the firm. Even if the internationalisation process of the firm has been largely studied, we initially tried to focus only on different types of entry modes in a new market (e.g. agents, joint-ventures, subsidiary, etc.), and the effect that the selection of one of them had over the international behaviour of the firms. We succeeded in offering in the first study an improved model of internationalisation, integrating the technological innovations with the internationalisation process of the firms, affected by the international knowledge acquisition.

Secondly, previous evidence regarding the traditional process of the internationalisation (Johanson and Vahlne, 1997) and the Born-Global view (Knight and Cavusgil, 2004) were integrated within the innovation literature, concluding that firms could reach different types of technological innovation (radical or incremental) whether or not they chose an entry mode in a new foreign market which implied a more or a less commitment towards that market.

We also included the resource-based view and its related approach of dynamic capabilities (Teece *et al.*, 1997), since it explained how, in the context of an innovative culture, knowledge and the resultant organisational capabilities were developed and leveraged by enterprising firms (Knight and Cavusgil, 2004). Within this framework, the intangible strategic resources stood out as being the most likely to fulfil the requirements for resources to generate sustainable competitive advantages (López and García, 2005): be valuable, unique,

inimitable, and immobile, reflecting the distinctive pathways of each company (Grant, 1991). Precisely, we focused on technological, commercial and organizational resources (Hall, 1992; Galbreath, 2005, Surroca and Santamaría, 2007).

Regarding the contributions that this dissertation offers to the innovation field, firstly it considers the commitment of an entry mode in a foreign market as a new source of technological innovation, as stated in the end of the qualitative study. Thus, besides the traditional sources of information for the technological innovation that Amara and Landry (2005) outline – internal sources, market sources, research sources, and generally available sources of information – there are also new sources among which the commitment of entry mode in a new foreign market is highlighted as quite important.

Secondly, the dissertation enriches the evidence from this field of research by relating the resource-based view with the capability of the firms to develop technological innovations, integrating as well different types of innovation advances within the internationalisation process, explicitly with export activities as explored in the second study.

Thirdly, by focusing on family firms, we had the opportunity to include in our framework the agency theory and relate it with distinct concepts of innovation, as well as to the resource-based view. Precisely, by introducing the familiness of the firm in the analyses, we offered an image of how family firms behave in comparison with non-family ones when it comes to investments in technology, on one hand, and to international advances, on the other hand. The outstanding conclusion we arrived at showed that family firms found a greater support in their international experience in order to invest more in technology than non-family ones.

#### 2.1.2. Empirical contribution

By first beginning with a general illustration of firms' internationalisation and innovation processes in the qualitative study, and second realising two subsequent more specific quantitative studies, we offered a complete image of the relation extant between exports and technological innovations. Thus, we empirically demonstrated the influence that advances in innovation had over the export behaviour of the firms and vice-versa. This dissertation contributes to empirical studies from both fields of interest, emphasising the reciprocity of the relation here under discussion.

Moreover, from a family business perspective, we realised a comparison with non-family firms, introducing into the equation variables referring to the innovative and export behaviour of the firms. Though the internationalisation process of family firms has attracted many



researchers (Gallo and García, 1996; Davis and Harveston, 2000; Zahra, 2003; Graves and Thomas, 2006; de Farias *et al.*, 2009), their advances in innovation have been little addressed. Applying the initial proposed model to family firm, we linked the acquired international knowledge with exports and technological innovations, using a large longitudinal sample of manufacturing family firms.

### 2.1.3. Methodological contributions

One important contribution made to both fields of investigation is that we employed distinct variables – truncated or dichotomous – carefully chosen considering previous evidence, in various regressions with the objective of observing all the effects that the two processes had over each other. In addition, we employed longitudinal data that, even if it is not a novel technique, it is in our field of investigation since there is a lack of longitudinal studies which emphasise the relation between technological innovations and export activities in comparison to some evidence reflecting cross-section studies. By having a panel data it was possible to observe the historic behaviour of the variables and moreover, we could account for dynamic effects through the inclusion of lag variables in the equations.

Consequently, by integrating qualitative and quantitative research, we considered the recommendation of academicians, who repeatedly highlighted the importance of their simultaneous use in research (Rialp, 1998). As for the quantitative studies, diverse econometric methods were applied in order to reach a better understanding of the phenomena, culminating with the application of two sophisticated techniques for the literature – the Granger (1969) test of causality and the GMM estimators (Arellano and Bond, 1991). This last procedure introduces the lagged dependent variable to control for serial dependence in this variable, and it can build instruments for those variables that are potentially endogenous.

**Table 12.1. Contributions to literature**

Internationalisation literature	Innovation literature
<b>Theoretical Contributions</b>	
<ul style="list-style-type: none"> <li>• Develops a clear description of the internationalisation process of the firm by focusing mainly on different entry modes in a new foreign market.</li> <li>• Integrates diverse theoretical approaches of the internationalisation process of the firm.</li> <li>• Integrates the resource-based view with the internationalisation theory, applied to different concepts of innovation.</li> </ul>	<ul style="list-style-type: none"> <li>• Considers the commitment of an entry mode in a new foreign market as a new source of technological innovations.</li> <li>• Relates the resource-based view with the capability to develop technological innovations.</li> <li>• Integrates distinct types of technological innovations within the internationalisation process of the firm.</li> <li>• Integrates the agency theory with different innovation concepts.</li> </ul>
<b>Empirical Contributions</b>	
<ul style="list-style-type: none"> <li>• Offers an in-depth view of the internationalisation process by the development of a qualitative study.</li> <li>• Empirically demonstrates the influence that innovation advances have on the internationalisation process of the firm.</li> <li>• Examines the existence of a reciprocal relation between internationalisation and innovation and demonstrates it.</li> <li>• Contributes to empirical studies emphasising the positive influence that technological advances have on the international behaviour of the firms.</li> <li>• Contributes to existent literature focused on family firms' internationalisation, introducing into the equation the innovation realised and comparing them with non-family firms.</li> </ul>	<ul style="list-style-type: none"> <li>• Offers an in-depth view of how innovation is appreciated and carried out in international firms, by developing a qualitative study.</li> <li>• Empirically demonstrates how the internationalisation process affects the technological innovations.</li> <li>• Examines the existence of a reciprocal relation between innovation and internationalisation and demonstrates it.</li> <li>• Contributes to empirical studies which forecasted a positive and significant impact of the internationalisation process over the development of technological innovations.</li> <li>• Addresses the innovation process within family firms, analysing it with regards to the export advances; contrasts them with non-family firms.</li> </ul>
<b>Methodological Contributions</b>	
<ul style="list-style-type: none"> <li>• Integrates both qualitative and quantitative research.</li> <li>• Operationalises the two processes through the employment of distinct variables, truncated or dichotomous, based on previous empirical evidence.</li> <li>• Employs longitudinal data and develops distinct econometric models in order to reach a better explanation of the internationalisation and innovation processes and test the hypothesis, being this a novelty in regards to the existent cross-section studies.</li> <li>• Applies two sophisticated techniques in the internationalisation and innovation fields: the Granger test of causality and the GMM estimators.</li> <li>• Introduces lag variables in the regressions to account for dynamic effects.</li> </ul>	

## **2.2. Contribution to management**

This dissertation has significant contributions to management, both of family firms and of non-family ones, as described in Table 12.2.

Firstly, we highlight the importance that managers should give to technological innovation when thinking of their companies' national and international competitiveness. They should develop their learning skills and take advantage of the knowledge acquired in international operations. As empirically demonstrated, experiential knowledge represent an outstanding input for the development of extensive innovations and control over the competition. Moreover, managers should understand how important is the selection of a specific type of entry mode in a foreign market, since depending on it, they have access to different sources of information which affect the magnanimity of their innovations. This dissertation shows that the selection of an entry mode which implies less commitment can lead to the development of incremental innovations, whereas the selection of a more committed entry mode is necessary if the company aims at realising more radical innovations.

When referring to family firms, their owners must appreciate the importance of the globalisation and the disappearance of frontiers, daring to learn and achieve experience from international markets and competitors. This can be obtained by the progress realised in the innovation process, being this considered as an outstanding intangible resource of the firm. Family firms should not give attention to their recognition of being risk-adverse and show that they are open-minded, with an international vision and also able to learn from competitors. Being an international firm is important in order to grow and/or maintain the firm's stability (Prashantham, 2005). Internationalisation represents an easy way to gain more knowledge in order to further develop competitive advantages which will be next helpful to gain more foreign markets (Molero, 1998; Zahra and George, 2002). Because family firms have important unique characteristics that differentiates them from other firms, i.e. such as human capital, social capital, survivability capital, patient capital, and governance structure (Sirmon and Hitt, 2003), they should lose all risk adversity that some of them still boast and compete in the global markets.

## **2.3. Contributions to public policy**

We have continuously highlighted in this dissertation the importance of technological innovations in the export activity of the firms as well as the vice-versa, not only basing some of our affirmations in previous research but enriching it with qualitative and quantitative

evidence. Therefore, we formulate the following recommendations to the public policy in order to foster a proper development of these processes.

Firstly, since companies have shown high aptitudes to learn and absorb the information found abroad, we consider that public policies should reinforce this capability of the firms and give incentives to firms in order to take advantages of all the knowledge acquired. Since innovations can be achieved either internally or externally, through collaborations with technological partners (Jones *et al.*, 2001; Cruz *et al.*, 2009), we consider that public policies should foster the cooperation and mobility within foreign markets (Archibugi and Ianmarino, 1999), especially for those firms which do not have enough resources to develop innovations internally. In line with our results, public policies should give incentives to companies in order to select more committed entry modes in new markets, achieving in this way a broader knowledge and experience.

Moreover, for the high-tech companies should receive more encouragement and incentives to continue developing radical innovations and also expand their national borders. As for family firms, the public policy must support and motivate them to become more competitive in the national market and more confident regarding the international expansion.

And last but not the least, in order to upgrade the scientific competencies of the domestic firms as well as to apply the knowledge to the production, we follow the previous recommendation of Archibugi and Ianmarino (1999); precisely, a special attention should be given to infrastructures for techno-collaborations, such as industrial and scientific parks, or collaboration with Universities.

**Table 12.2. Contribution to management and public policy**

<b>Contribution to Management</b>	
<b>Non-family firms</b>	<b>Family firms</b>
<ul style="list-style-type: none"> <li>• Consider technological innovation as an important input with respect to national and international competitiveness.</li> <li>• Take advantage of the knowledge acquired in international operations and develop extensive innovations.</li> <li>• Understand the utility of the commitment level of a new entry in a foreign market and its effect over the type of innovation to be developed.</li> </ul>	<ul style="list-style-type: none"> <li>• Be aware of the globalization process and the disappearance of frontiers, and dare to expand the national territory through the advances of technological innovations.</li> <li>• Forget about risk-adversity and be open-minded, learn from competition and international experience and become more innovative.</li> <li>• Successfully compete with non-family firms by understanding the value and uniqueness of their own resources.</li> </ul>
<b>Contributions to Public Policy</b>	
<ul style="list-style-type: none"> <li>• Reinforce the absorptive capacities of the national firms to assimilate and obtain international knowledge, regarding foreign markets, competition and products.</li> <li>• Foster the cooperation and mobility within foreign markets.</li> <li>• Promote the cooperation between national firms and leading firms in the field.</li> <li>• Give incentives in order to selected foreign direct investment as an entry mode.</li> <li>• Provide export incentives for high-tech industries.</li> <li>• Encourage and help family firms to become more competitive, at national and international level.</li> <li>• Develop infrastructures for techno-collaborations in the national territory.</li> </ul>	

### **3. LIMITATIONS AND FUTURE RESEARCH LINES**

Firstly, there stand out those limitations which are fundamentally characteristics of the methodology of the case-study. As it is collected in Rialp (1998), this methodology produces a bias introduced by the same investigator in the collection process and analysis of the information. The critics to the lack of both statistical validity and representativeness are also assumed (Eisenhardt, 1989), but it is considered that the objective of the investigation is not the one to generalise but rather to deepen the knowledge of the thematic of the study, and, therefore, the used methodology is assumed to be correctly applied.

Some other limitations are especially regarding to the fact that we also dealt with a longitudinal sample which, according to Baltagi (2007), includes problems in the design, data collection, and data management of panel surveys. It is also possible that panel data show bias due to sample selection problems and attrition (Wooldridge, 1995). Other limitations are related to the introduction and measurement of some other variables in the analyses, thus conferring a more complete image of both export and innovative activities. The inclusion of

export experience and patent citation may also offer another path for future research. Moreover, the approach used to measure some of the factors may be less precise than desired.

As for future research lines, it would be interesting to be able to realise comparisons between similar studies. By replicating these investigations in distinct geographical contexts, results could be generalised to larger populations. In this way, it would reveal if institutional factors play a role in influencing the relation (Kogut *et al.*, 2002; Peng *et al.*, 2005; Kumar, 2009). It also worthies looking more in depth to some issues related to the international marketing strategy of the firm as well as to its innovation one, putting an emphasis on special markets, as the emerging ones, since there is few academic evidence related to them.

Regarding the continuation of the comparison between family and non-family firms, one could look for other factors that make these two kinds of firms different from each. The effect that these factors have on firms' performance is also an interesting issue to research. Even more, it would be enriching to consider familiness as a continuous shape of the firm by not separating the samples into family firms and non-family ones. However, other criteria to separate the data based on size and/or sector of activity will offer a more in-depth view which can be acknowledged. For instance, focus only on medium firms or on high-technological sectors and seek for thoughtful evidence.

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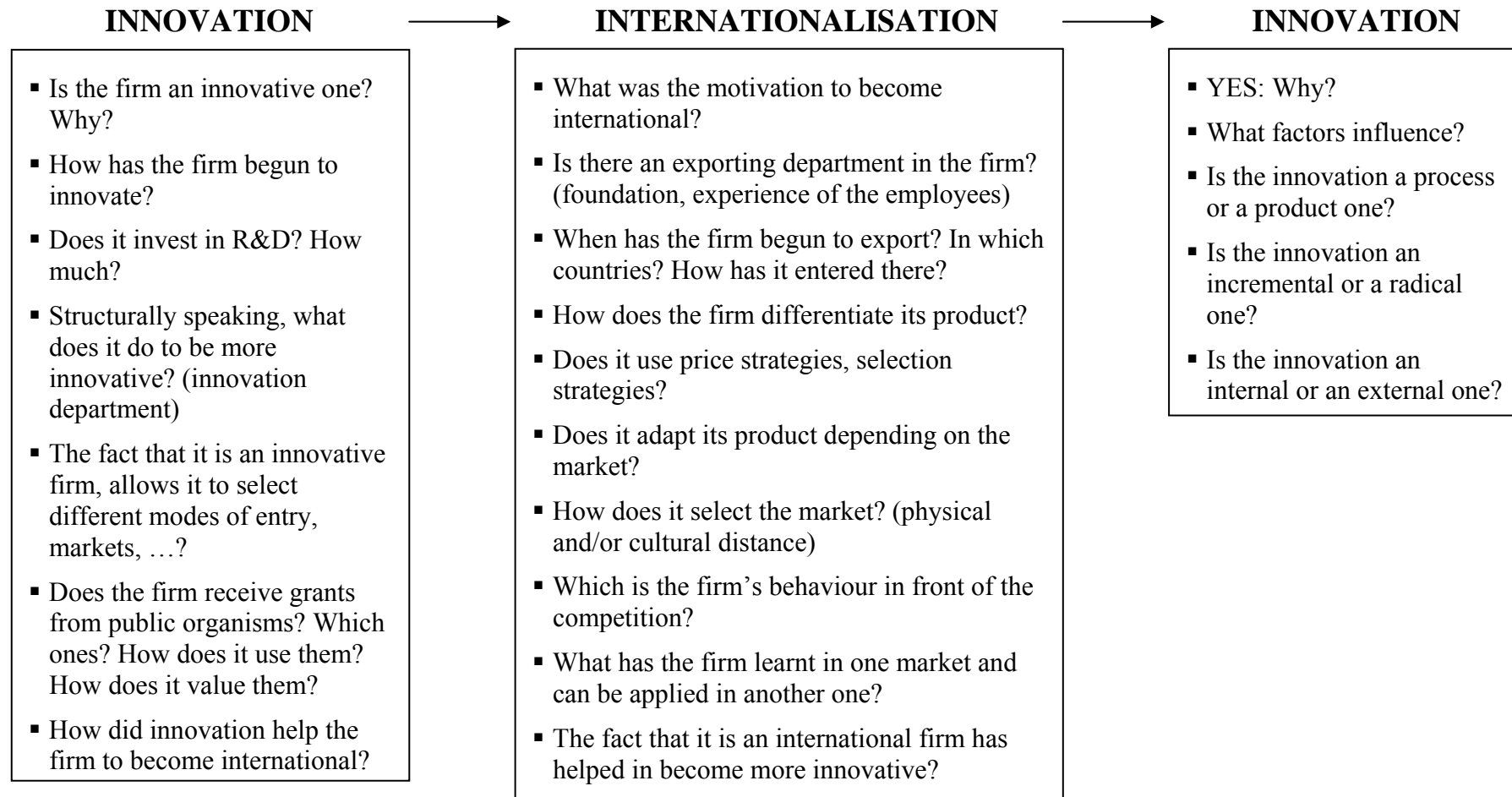
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## ANNEX 1

### In-depth interviews' structure



## ANNEX 2

N°/ Author (Year)	Main objective	Theoretical frameworks	Data and empirical methodology	Main results and conclusions
1. Bloodgood <i>et al.</i> (1996)	Examine the antecedents and outcomes of the internationalisation of new-high potential U.S. firms.	Monopolistic advantage theory; stage theory of internationalisation; resource-based view.	61 new venture capital-banked U.S. firms. Linear multiple regressions	Internationalisation is directly related to the use of product differentiation as a source of competitive advantage; negative relation between the degree of innovation and internationalisation.
2. Hitt <i>et al.</i> (1997)	Examine the relation between international diversification and performance and innovation.	Resource-based view; learning theory and transaction costs theory.	Data from Compustat: 295 firms. Regressions.	There is a curvilinear relationship between international diversification and performance and a linear one between the first and innovation, depending on the level of product differentiation.
3. Roberts and Tybout (1997)	Quantify the effect of prior exporting experience on the decisions of firms to participate in foreign markets.	A theoretical model of entry and exit with sunk cost.	Data from the Colombian manufacturing census for the years 1981-89. Develop and estimate a dynamic discrete-choice model.	Sunk costs are significant and prior export experience increases the probability of exporting by as much as 60 % points.
4. Zhao and Li (1997)	Analyse the role of R&D in explaining export propensity and export growth.	Neotechnology theory of trade; economics of technological innovation.	Secondary data from China Statistic Institute. Logistic and simultaneous analyses.	The influence of R&D on both export propensity and growth are significant and positive. There is a reciprocal relationship between R&D and export.
5. Clerides <i>et al.</i> (1998)	Analyse the casual links between exporting and productivity.	Learning by doing (by exporting).	Balanced panel (1984-1989) from Colombia, Morocco, and Mexico. Granger test; FIML; GMM.	Exporters are more efficient than non-exporters; plants that cease exporting are typically less efficient; data from Colombia and Morocco are inconsistent with the causality pattern.
6. Molero (1998)	Contribute to the debate about the factors determining the growing internationalisation of SMEs.	Theory of innovation; technological foreign trade; reviewed versions of international investment-Uppsala model.	Two sources of information: data bank of innovatory firms (814 companies) and a survey (205 valid cases). Discriminant analysis and logit models.	Learning through trade is neither a determinant nor a precondition for firms to develop further more complex strategies. Technological tasks developed abroad have some effects on acceding to the complete form of internationalisation.
7. Wakelin (1998)	Extend to a firm level the analysis of the influence of innovation on the export behaviour.	Characteristics of innovation and review of empirical work concerning the determinants of export.	Microeconomic data set of UK firms Tobit model (Cragg's specification) and probit model.	Considerable differences between innovating and non-innovating firms; large innovative firms are likely to export and smaller innovative firms with one or two innovations are less likely to export.
8. Bernard and Jensen (1999)	Analyse the interaction between exporting and firm performance.	Not applicable.	Unbalanced panel (1984-1992). Descriptive statistics; regressions; dynamic models; Granger test.	Ex-ante success, firm size and wages, increases the probability of exporting; firms that become exporters grow faster; significant differences between exporters and non-exporters.
9. Galende and Suarez (1999)	Evaluate the effect of internal or organisational factors on R&D activities.	Resource-based view.	Financial statements, final sample of 100 firms. Choice-based sampling. Binomial logistic regression model.	Intangible factors are the main determinants of the probability of a firm carrying out internal R&D.
10. Preece <i>et al.</i> (1999)	Explain the impact of a number of attitudinal and structural variables on the international market activities of ESTBFs.	McDougall's theory for ESTBs: ideas from international business, strategic management and entrepreneurship.	Data from Innovation Ontario, sample of 75 firms. Regressions.	Attitude of managers, resources, government assistance are a significant factor in explaining international intensity; attitude and strategic alliances are not a significant predictor for global diversity but resources, age and size are.

Nº/ Author (Year)	Main objective	Theoretical frameworks	Data and empirical methodology	Main results and conclusions
11. Sterlacchini (1999)	Analyse the degree of non-R&D activities intensity in small firms and study their impact on exports.	Not applicable.	Questionnaire to 143 firms. Tobit; probit; truncated regressions.	The probability of being an exporter depends positively on firm size and negatively on its nature as a sub-contractor; the share of exports on sales is positively affected by innovative activities.
12. Zou and Ozsomer (1999)	Investigate coordination and concentration of firms' global product R&D and their effect on the firm's global strategic position.	Global R&D strategy.	Primary data. Confirmatory factor analysis; generalised least squares procedure.	Coordination of R&D is a key determinant of the firm's global strategic position and it is influenced by internal organisational resources. Concentration of R&D is influenced by human resource flexibility.
13. Golder (2000)	Examine new product development practices in an international context.	Discovery-oriented approach.	In-depth interviews with 64 executives in 5 countries.	Managing and disseminating knowledge throughout the company is very important during new product development. Firms adhere to several mechanisms that limit competition and make concerted efforts to use standardised brand names and positioning.
14. Zahra <i>et al.</i> (2000)	Examine the effects of international expansion on a firm's technological learning and the latter's effects on the firm's financial performance.	Theory upon technological learning acquisition.	Survey and secondary data. Tests of the hypotheses; moderated regression analyses.	Strong relationship between international diversity and mode of market entry and the breadth, depth, and speed of a new venture firm's technological learning and these are related to new venture firm performance.
15. Basile (2001)	Analyse and compare the relationship between innovation capabilities and export behaviour of firms.	Microeconomic model of export behaviour.	4000 Italian firms, random and stratified sample. Multivariate analysis, tobit model (Cragg's specification) and probit model.	Firms that introduce product and/or process innovations and that are part of a business group are more likely to export; innovation is an important competitive factor and helps to explain firm level heterogeneity in export behaviour.
16. Nassimbeni (2001)	Analyse the export attitude of small manufacturing firms in terms of technological and innovation factors.	Traditional view of the internationalisation process.	Survey approach. Final sample of 165 small manufacturing companies. ANOVA; logistic regression; OLS; tobit model.	The propensity of small units to export is strictly linked to their ability to innovate the product and develop valid inter-organisational relations, while it is less related to the technological profile.
17. Bleaney and Wakelin (2002)	Investigate the relationship between the innovative activity of firms and their export behaviour.	Trade and product cycle theories.	Data from SPRU survey (UK) and Datastream. Probit and regressions.	Innovators have a significantly higher propensity to export than the non-innovators do; difference between innovators and non-innovators regarding size; probability of being an exporter is positively correlated with the number of innovations.
18. Eusebio and Rialp (2002)	Identify the factors that approach the activities of technological innovation.	Empirical evidence on the effect of the technological investments in the added export flows.	Data from SBS for 1998. Descriptive analysis, lineal and logistic regression.	Investments in R&D positively affect export propensity and intensity. Product and process innovations have a positive effect on the export intensity.
19. Fahy (2002)	Examine how firms attain a sustainable competitive advantage in a global environment.	Global business strategy; economic perspectives of global competitive advantage; resource-based view.	Data from USA, Japan, UK and Ireland. Confirmatory factor analysis, discriminant analysis.	Capabilities and barriers to duplication are very important within the firm-specific group. Tangible assets are more important than intangible ones.
20. Roper and Love (2002)	Examine the impact of firms' actual innovation decisions on their export performance.	"Neo-endowment" and technology based models.	Data from the PDS (UK and Germany). Tobit, probit and truncated regressions.	Product innovation has a strong effect on the probability and propensity to export.
21. Barrios <i>et al.</i> (2003)	Examine a firm's decision of whether or not to export and the determinants of the export ratio.	Based on cost functions (Aitken <i>et al.</i> , 1997). Learning by doing literature.	Data from SBS over the period 1990-98. Econometric analysis, random effects probit estimation and tobit model.	Firms are more likely to be exporters the older and larger they get, the more productive and more skill intensive are and if they are located in export oriented sectors; a firm's own R&D intensity is an important determinant of whether the firm exports.

Nº/ Author (Year)	Main objective	Theoretical frameworks	Data and empirical methodology	Main results and conclusions
22. Galende and De la Fuente (2003)	Investigates the determinants of a firm's innovative activities.	Evolutionary theory; resource-based view.	Data from CDTI and secondary sources: 152 firms. Factor analysis; explanatory analysis and multiple regressions.	Internal factors affect the configuration of the firm's innovative process.
23. Hurmerinta (2003)	Analyse the role of time in criticism of internationalisation research.	Theory of innovation diffusion; learning theory approach.	Not applicable.	Linear and cyclical dimensions of time are relevant to the development of internationalisation. Innovation perspective addresses the timing of export adoption.
24. Bernard and Jensen (2004)	Examine the factors that increase the probability to export.	Dynamic framework based on previous research.	Data from ASB for 1984-1992. Binary-choice nonstructural approach; probit with random effects; GMM estimator.	Entry costs are significant for U.S. plants and plant heterogeneity is substantial and important in the export decision.
25. Knight and Cavusgil (2004)	Focus on the phenomenon of early internationalisation.	Evolutionary economics (organizational capabilities); resource-based views.	Qualitative/quantitative methodology. Exploratory and confirmatory factor analysis; formula of composite reliability.	The strongly innovative nature of BGs supports them in developing particular types of knowledge. Specific key organizational capabilities engender international success.
26. Mañez <i>et al.</i> (2004)	Analyse the determinants of the decision to export	Not applicable.	Data from SBS over the period 1992-2000. Panel data probit model with maximum-likelihood techniques.	Regional, local spillovers and firm characteristics are important determinants of the decision to export; public sector oriented sales have a significant and negative impact.
27. Ozçelik and Taymaz (2004)	Examine the determinants of export performance of firms.	Neofactor and neotechnological trade theories; Schumpeter's theory; evolutionary theory.	Secondary data. Descriptive statistics. Tobit estimation.	Innovations and R&D activities are crucial for the international competitiveness. Public ownership shows up as one of the most potent determinants of export intensity in Turkey.
28. Cho and Pucik (2005)	Examine the relationship between innovativeness, quality, growth, profitability, and market value at the firm level.	Intangible resources (RBV); organizational learning (March, 1991).	The Fortune Reputation Survey (1983); Structural Equations Model.	Direct relation between innovativeness/quality and firm performance measures; Innovativeness had a direct relation with market value, and the mediation effect of quality existed between innovativeness and market value.
29. Galbreath (2005)	Discuss the results of exploratory research conducted in the context of the firm's overall resource portfolio.	Resource-based view.	Questionnaire to 56 managers in an MBA program. Varimax rotation. Cronbach alpha.	RBV is prescriptive. Capabilities are the most important resource; Tangible assets contributed more to firm success than intellectual property assets.
30. López and García (2005)	Analyse the relationship between the firm's technological capacity and its export behaviour.	Resource-based view (competitive advantages and technological resources)	Data from SBS for 1998-1999. Descriptive and parametric test statistics. Multiple regression models (Logit and Tobit).	Innovations in products and processes, the use of patents and R&D spending intensity have a positive and significant effect on the likelihood a firm will start to export and on its export intensity.
31. Prashantham (2005)	Integrate the internationalisation process model and international new venture perspective.	Knowledge-based view; social capital theory.	Not applicable.	Direction for extending the internationalisation literature through an eclectic approach combining knowledge-based and social capital theories.
32. Salomon and Shaver (2005)	Analyse if exporters can access diverse knowledge inputs not available in the domestic market.	Focus on innovative outcomes.	Data from SBS for 1990-97. Nonlinear GMM estimator.	Exporting is related to <i>ex post</i> increases in two measures of firm innovation: product innovation and patent applications.
33. Lachenmaier and Wößmann (2006)	Identify whether innovation causes exports.	Product-cycle trade model; Global-economy growth models.	981 firms from 2002 Ifo Innovation Survey (Germany). OLS estimations, Tobit regression.	Innovation is a driving force for industrialized countries' exports; causal effect of innovative activity on exports.

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34. MacGarvie (2006)	Investigate how knowledge diffusion (patent citations) is related to exports and imports at firm level.	Models of endogenous growth.	Firm-country-year combined data for 1986-1992. Random- and fixed-effects regressions; negative-binomial regressions.	Importing firms' patents are significantly more likely to be influenced by technology in the exporting country than are the patents of firms that do not import from that country. Firms that export do not cite so more patents from their destination countries.
35. Castellani and Zanfei (2007)	Provide evidence on the relation between firm heterogeneity and internationalisation modes.	International trade theory.	Secondary data (Italy) for 1996 and balance sheet. Cobb-Douglas production cost; OLS; tobit and probit estimators.	A higher international involvement is associated with a higher productivity and efficiency for any given level of innovativeness of firms.
36. Pla and Alegre (2007)	A better understanding of the relation between export intensity, innovation and size	Technology-based models of international trade; resource-based view.	121 French biotechnology producers. Structural equation modelling and confirmatory factor analysis.	Firm size is not a determinant for innovation or for export intensity; there is a positive and significant link between innovation and export intensity.
37. Rodriguez <i>et al.</i> (2007)	Confirm the endogeneity of the relationship between a firm's technological resources and the direction of its diversification.	Resource-based and knowledge-based views; strategic and transaction cost theories.	983 firms from INFOTEL database. Probit model and state-based-sampling.	Initially reject the endogeneity of the relationship: innovation drives diversification, not the reverse; knowledge assets are not related to the diversification mode.
38. Surroca and Santamaría (2007)	Examine the impact of technological cooperation on firm performance.	Resource-based view.	Data from SBS for 1998-2002. Panel data logit and random effects estimations.	Innovation positively impacts on firm performance. Vertical cooperation has both a direct and indirect effect on firm performance. Horizontal cooperation exerts a negative effect on innovation results as well as on firm performance.
39. Vila and Kuster (2007)	Analyse the importance of innovation for firms involved in international marketing.	Traditional view of the internationalisation process; Innovation framework.	154 firms from ARDAN database. Univariate (ANOVA) and multivariate (discriminant analysis) methods.	Internationalisation is not dependent on "product innovation", "market innovation" but it is dependent on "strategy innovation"; "process innovation" is dependent on internationalisation and "firm age" is not.
40. Díaz <i>et al.</i> (2008)	Examine the relationship between TKAs and performance.	Resource-based and knowledge-based views.	Data from SBS for 1998-2002. Random effects regression and logit panel model.	TKAs have a positive indirect effect on financial performance mediated through innovation and a negative direct effect on performance, except licences.
41. Filipescu <i>et al.</i> (2009)	Examine the relation between internationalisation and technological innovation.	Internationalisation theory; resource-based view.	Qualitative study. 5 in-depth interviews.	There is a reciprocal relation between the two processes. Firms innovate more in products than in processes, and they are more of incremental than radical nature.
42. Kumar (2009)	Examine how growth along the product and international dimension are interrelated in the short run.	Resource-based view; absorptive capacity.	Data from Compustat for 1993-97. Simple and Simultaneous estimations of hypotheses (OLS/ 3SLS).	Firms may face various opportunities to expand and diversify due to economies of scope, but the extent to which these opportunities can be exploited over a certain period is limited by short-run constraints.