Understanding the effects of non-technological innovations. The case of an emerging economy.

Track "Strategies for Global Competitiveness"

Key words: innovation, marketing innovation, organizational innovation.

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Abstract

The study of innovation processes has experienced an extensive development in the management literature. However, less attention has been paid to the non-technological innovations (organizational and marketing), especially in emerging markets context. This study addresses this gap in the literature and analyzes the interactions between non-technological innovations and technological innovations in two stages of the innovation process and in three economic sectors: agriculture, manufacturing and services.

Our results confirm that non-technological innovations are related to innovative performance and the propensity to innovate, but with differences between economic sectors. We discuss the implications for managers and policy makers, notably those working in emerging economies.

Keywords: Innovation, non-technological innovation, innovative performance, propensity to innovate, Latin America.

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1.- Introduction

In the last years the global economy has undergone dramatic changes. Developed economies face the problem of slow growth, and this has changed the role and challenges of new players, such as those in emerging economies (Mitchell & Tsui, 2012). This new world order calls for a significant reshaping of competition and innovation (Levitt, 1992; Yip, 1996). In this

changing scenario, a better understanding of firms' innovation and new business models is crucial in order to compete in the global marketplace (Johnson, 2010).

Innovation has been defined and studied from different perspectives and levels of analysis, including firm and regional approaches (Porter, 1998; Lazonick, 2006; Cooke, 2008; Damanpour et al., 2009; Crossan & Apaydin, 2010; Hall & Rosenberg, 2010). However, less emphasis has been given to the analysis of the interrelations between "non-technological (marketing and organizational)" and "technological (process and product)" innovations (Schmidt & Rammer, 2007; Gunday et al., 2011; Mothe & Nguyen, 2012). Specifically, Mothe & Nguyen (2010, p. 314) state that "it is surprising to note that little has been written on the care firms should take when considering the types of innovation that may lead to technological innovation, such as innovation in organization and/or in marketing", and they comment that further research should be undertaken to better understand the impact of non-technological innovations on performance. This is particularly relevant, given the interdependent and interactive nature of the innovation process (Tether & Tajar, 2008), and considering that the innovative process differ according to economic sector and territory (Crossan & Apaydin, 2010, Hall & Rosenberg, 2010).

While there are advances in the study of the interactions of different types of innovations, in our knowledge, few studies have focused on exploring the interrelationships of non-technological innovations in two stages of the business innovation process, such as the outcome of the process innovator named "innovative performance " and in the implementation of future innovations named "propensity to innovate" (Mothe & Nguyen, 2010; 2012). Furthermore, most of these studies have focused on the manufacturing and services sectors in developed countries (Schmidt & Rammer, 2007; Mothe & Nguyen, 2010; Evangelista & Vezzani, 2010; Gunday et al., 2011; Mothe & Nguyen 2012) . In particular, this study seeks to extend the understanding of the interrelationships of non-technological innovations in the innovative performance and the propensity to innovate. Specifically, we analyze the case of an emerging economy such as Chile, incorporating three economic sectors: manufacturing and services, because they are studied in developed countries and the agriculture sector, because it is particularly relevant in the context of Latin America (ECLAC, FAO, IICA, 2010). Additionally, in the case of the propensity to innovate, we analyze various types of future innovations (product, process, organizational and marketing). These analyzes allow us to answer questions such as: Non-technological innovations are related to innovative performance of firms and the propensity to innovate? Does the interaction between technological and non-technological innovations affect the propensity to innovate? Are there differences between economic sectors?

To address our objectives and research questions, we test the effects of non-technological in the innovative performance with three logistic models for each sector of study (Hair et al., 2010). In the case of propensity of innovate we build four logistic models, each one for a type of future innovation (product, process, marketing and organizational) and we include the economic sectors as a variable.

In the next sections, we discuss a literature review including types of innovations, innovation in markets and the case of Chile, and non-technological innovations and its interrelations. Next, we explain the method and data used and we conclude by presenting the results of this analysis, deriving implications for managers and policy makers in the context of emerging economies.

2.- Background

The following three subsections describe the literature that is relevant for our study. First, we describe types of innovations that are existent in a managerial framework. Second, we identify the need for research in developing markets related to innovation management. And third, hypotheses are stated bases on relevant findings about non-technological innovations which are relevant for this study.

2.1.- Types of innovations

Innovation as a key for competitiveness has been defined and analyzed from different perspectives (Crossan & Apaydin, 2010), including business approaches (Lazonik, 2006) and systemic approaches (Porter, 1998; Etzkowitz, 2002; Asheim & Getler, 2006; Cooke, 2008). These approaches emphasize the business determinants, products of innovation and networks of actors, especially in developed countries and in the manufacturing and high technology industries (Cohen, 2010; Partanen et al., 2011). However, despite all this development there has been less attention to the strategies of non-technological innovations that can lead to technological innovations (Mothe & Nguyen, 2012).

In relation to non-technological innovations, it is necessary to establish that the concept and types of innovations have evolved over time. One of the first classifications was proposed by Schumpeter (1934) including: "new products" , "new method of production", "new sources of supply", "exploiting new markets" and "new ways of organizing a business". Subsequently, the classifications move towards dual types of innovations as: "administrative and technical", "incremental and radical", "product and process". Finally, the classifications are more comprehensive (Rowley et al., 2011), such as

proposed by Bessant and Tidd (2007) or by Oke et al. (2007), who propose innovations in processes, products and services that may be radical or incremental. Additionally, there are specific innovations classifications according to different economic sectors, as is the case Ambruster et al. (2008) for the manufacturing sector that identifies "technical innovation of products and processes", "non-technical innovations in services and processes". In the case of the service industry, Oke (2007) proposed "innovations in services" and "product innovation services" and Damanpour et al. (2009) identifies "service innovation", " technological process innovations" and "administrative process innovations".

The multiple definitions and typologies of innovation have led to confusion, especially in the case of technological innovations (Garcia & Calantone, 2002). However, a consensus is achieved with the definition and typology proposed in the Oslo Manual of the OECD (2005, p. 46), widely recognized by researchers and public organizations: "an innovation is the introduction of a new or significantly improved product (good or service), process, a marketing method or a new organizational method in the internal practices of the business, workplace organization or external relations". This definition leads to four types of innovation, which in turn are grouped into technological innovations (processes, products) and non-technological innovation (organizational and marketing) (Schmidt & Rammer, 2007; Mothe & Nguyen, 2010; 2012).

The Oslo Manual (OECD, 2005; p. 48) defines a product innovation as “the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics”. A process innovation is “the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software”. A marketing innovation is defined as “the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing”, and an organizational innovation is “the implementation of a new organizational method in the firm’s business practices, workplace organization or external relations”.

- Insert Table 1 -

2.2- Innovation in emerging markets and the case of Chile

The academic literature on innovation has been mainly concentrated in two environments: a set of developed economies, mainly from USA and Europe, and high-tech industries. Yet, with an explosion in market growth rates, a burgeoning pool of fervent skilled labor, and low factor costs, countries such as China, India, Russia and Brazil have beckoned almost every

single developed country multinational to pay serious attention to the new opportunities they have unleashed (Reid, 2010). Older mind sets in the traditional multinational companies of developed economies have relied on extending product life-cycles, or making superficial adaptations of their products to meet emerging country demands (Levitt, 1983). This myopic approach begs to be replaced by a more realistic and updated approach. Firms in emerging markets may no longer survive without learning how to serve global customers as for the case of micro-multinational (Dimitratos et al, 2012).

Innovation dynamics vary according to industry and territory (Asheim & Gertler, 2006; Feldman & Kogler, 2010; Hall & Rosenberg, 2010). In order to extend existent knowledge about innovation dynamics in emerging countries, we study the case of Chile as an emerging market (MSCI, 2013). Chile is one of two Latin American countries that belong to OECD, and its economy is one of the most competitive of this region (World Economic Forum, 2012). This country shares common problems related to innovation with others Latin American and Emerging Countries. Some of them are: it suffers exogenous technological change, informality on the process of innovation, an adaptive and incremental nature of innovation, and a minimum joint work in the national innovation systems (Malevar & Vargas, 2004). The Chilean economy has an estimated size of US$ 243,000 million that rank among the 50 largest world economies (OECD, 2011). Specifically, the agricultural sector represents a 2.8%, manufacturing 10.8% and services 18.7% (including trade 7.8%; transport 4.2%, communications 2.0% and financial services 4.7%) (Banco Central, 2013). The inclusion of agriculture sector is justified, because Chile is one of top 20 countries exporting agricultural and forestry products in the world (U.S$ $12,263,142 million for 2010) (ODEPA, 2013).

2.2.- Interrelations between types of innovations, innovative performance and propensity to innovate

Over the last decade there have been increasing efforts to investigate the economic impact of innovation, especially at a firm level (Cohen, 2010). The widespread interest in micro-level studies in this research field is justified by several reasons, the most important being the diffused dissatisfaction towards aggregated analyses which are perceived to be unable to grasp the heterogeneity of firms' innovative behaviors as well as the different technological sources of firms' competitiveness (Evangelista & Vezzani, 2011).

Regarding the relationships between different types of innovations. In the first instance, it is stated that one should not exaggerate the distinction between product innovation and process, as often closely interrelated and their effects on performance difficult to distinguish. In fact , one might expect productivity gains also in the case of product innovations ,

when obsolete products are replaced by new products that meet similar consumer needs for a lower cost (Bass, 2004) . The introduction of process innovations may be accompanied by some improvement in the quality content and product performance, but despite these blurred boundaries there is a certain amount of evidence to show the distinction between product and process innovation. Research suggests that it is effective to identify the type "dominant" strategy followed by companies from different sectors and technological regimes (Crespi & Pianta , 2008 ; 0'Cass & Viet Ngo , 2011) .

In relation to the interrelationships between non-technological innovations and innovative performance. Specifically, for this study is considered innovative performance percentage of turnover (sales) of the company corresponding to innovative products for market (Cassiman & Veugelers, 2006; Arvanitis, 2008; Mothe & Nguyen, 2010; 2012).

There are several developments are in the area of interrelationships between non-technological innovations and innovative performance, for example Günday et al. (2011) stated that organizational innovations, marketing innovations and product innovations are positively and significantly related to firm performance in the manufacturing sector in Turkey. In addition, they stated that there are others relationship statistically significant: organizational innovation is related to marketing innovation and process innovation, but not to product innovation. Process innovation relates to product innovation. Meanwhile Schmidt & Rammer (2007) show that technological innovations and technology are closely linked together in various industries in Germany. Marketing Innovation often coincides with product innovation, while firms with organizational innovations often introduce new technological processes.

Evangelista & Vezzani (2010) explore the relationship between technological and non-technological innovation and its impact on business activities in Italy; they demonstrate empirically that the inclusion of the organizational dimension of innovation provides a much broader framework of the macro-innovation in the sectors of manufacturing and services. Four different modes of innovation types were identified on the basis of the combined business forms and non-technological innovations taking heavy toll on the performance of companies in both the manufacturing and service sectors. Furthermore, we found that strategies that are characterized by the joint presentation of the products, process and organizational innovations to give both manufacturing and service companies a distinct advantage vis à vis both innovative and competitive companies not companies with a focus limited to innovation. The study found only few significant differences between services and manufacturing companies in the relevance and economic impact of different types of innovation strategies. These results are in line with what was proposed by Rowley et al. (2011) that highlights the interplay between

different types of innovations and Damanpour et al. (2009), which establishes the role of the co-adoption of different types of innovations to improve business performance

Specifically in the case of agribusiness, to the best of our knowledge, there are no similar studies related to non technological innovations. Rather, they are focused only on technological innovation and other dimensions of firm performance (Rama, 1996; Earle, 1997; Herrmann, 1997; Traill & Meulenberg, 2002; Suwannaporn & Speece, 2003; Avermaete et al., 2003; Fritz & Schiefer, 2008; Furtan & Sauer, 2008; Alston, 2010; Capitanio et al., 2010; Grunert et al., 2010).

The previous background allows us propose only exploratory hypothesis for the context of an emerging economy: non-technological innovations (organizational and marketing) have positive effect on innovation performance and the propensity to innovate of firms in the agricultural, manufacturing and services sectors.

3.- Method and data

This section consists of two subsections. The first one describes the source of the data and the variables and their categories used. In the second subsection, we present the models for test the relation between non technological innovation and innovative performance and propensity to innovate.

3.1 The data

The "VII Survey of Innovation in the Private Sector of Chile" was published in 2012, with records of the periods 2009 and 2010. We use this data base. Its design considers the guidance provided by OECD (Oslo Manual) and statistical representation for national level by activity and firm's size (National Institute of Statistics, Chile, 2012). The data corresponds to 3,653 companies and corporations, with annual sales exceeding US$ 107,000 approximately (excluding micro companies) and categorized into 13 activities. These activities are classified in the International Standard Industrial Classification (ISIC). From this data set, we select 2,549 firms from three sectors: agriculture 198 (7.8%), manufacturing 905 (35.5%) and services 1,446 (56.7%).

-Insert Table 2 -

With respect to the study variables, the survey does not have questions directed specifically to identify if the company conducts product, organizational and marketing innovations. Rather, there are dichotomous questions (yes / no) by subtypes or actions compose each one of innovation, so we proceed to create aggregate variables following the proposed by Schmidt & Rammer (2007) and Mothe & Nguyen (2010). For example, if a company responds positively to the achievement of one or more of the following we consider that company made marketing innovation: "significant changes in the design of product packaging", "new media or techniques for product promotion", "new methods the product distribution channels", "new methods of pricing goods or services ". The same procedure is utilized for the others innovations.

3.2 Models

The method includes two parts that discuss relationships of non-technological innovations in agriculture, manufacturing and services in the case of Chile as an emerging market. In both parts we develop regression models. In the first models, the dependent variable is innovative performance of firms and in the second models the dependent variable is propensity to innovate.

The innovative performance is considered as the percentage of total sales coming from new innovative products for the market (Cassiman & Veugelers, 2006; Mothe & Nguyen, 2010, 2012). We develop three logit models for each sector of analysis (Hair et al., 2010), with its transformations ln (Yi / (1-Yi)) and its "odds ratio" of "*Zi"*, whose functional form is:

$$Z_i = NT_i' \beta_1 + X_i' \beta_2 + \varepsilon_i$$

"Zi" takes the value of "1" if the company has a percentage of innovative performance between "0.1 and 100%", and "0" if the company has no innovative performance. In the case of the independent variables are identified as non-technological innovations "*NTi*" made by the company "*i*". Allowing, to build three models (one for each sector), which in all cases include a vector "*Xi*" of independent and control variables that have been included in several studies of determinants of innovation and business performance such as: size companies belonging to a group of companies, if the firm make exports, R & D development, among others (Table 3) (Cohen, 2010; Mairesse & Mohnen, 2010).

In the case of the propensity to innovate as the dependent variable, we considered the dichotomous question (yes/no) if "the company plans to perform some of the following innovations: marketing, organizational processes and products" as proposed Mothe & Nguyen (2012), creating four models. Intending logistic regression model for the type of innovation propensity, where "*Yi*" takes the value of "1" if the company will innovate and "0" if the company will not innovate and:

$$Y_i = IT_i' \beta_1 + NT_i' \beta_2 + X_i' \beta_3 + \varepsilon_i$$

In the case of the independent variables, we identify the following: technological innovations "*ITi*" and non-technological innovations "*NTi*" made by the company "*i*". It also includes the same vector of variables "*Xi*" of independent and control variables, considered for previous models. Also, it includes a variable "*economic sector*", which allows us to determine the statistical significance analysis by the sectors: agriculture, manufacturing and services.

- Insert Table 3 -

4.- Results and discussion

The results and their discussion are presented considering the type of models developed. In first term, we discuss the models related to propensity to innovate and in second term we discuss de propensity to innovate models.

The results of innovative performance by sector are shown in Table 4. The models do not have high explanatory capacity (R^2 Cox and Snell and R^2 Nagelkerke), but all the models are significant statistically evaluated with "*-2LL*" and the test "*Hosmer-Lemeshow*". Secondly, we state that the determinants of innovative performance are different for all the sectors in study. These first results, allow us confirm the need for developed innovation studies by economic sectors and specific territories (Crossan & Apaydin, 2010, Hall & Rosenberg, 2010).

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The agricultural sector shows that innovative performance is related to organizational innovation (Exp (β) = 0.05), research and development conducted in the company (*RD_firm*) and if the company exports (*exports*). This last variable is the most influential with Exp (β) = 114.50. In the manufacturing sector, the determinants are organizational innovation (Exp (β) =

0.50) and performing patents in Chile. In contrast, in the service sector there are not relationship with non-technological innovations, only with "*RD_firm*" and "*Cooperation*". These results confirm that there are differences in an emerging market from those found by Mothe & Nguyen (2010, 2012) for Luxembourg, because they state that there are not relationship between non-technological innovations and innovative performance for manufacturing and services. In short, only the service sector behaves the same way between Chile and Luxembourg.

In the case of propensity to innovate the results are show in Table 5. In first term, we state that the four models are significant with the evaluations of "*-2LL*" and the test of "*Hosmer-Lemeshow*", and the models have a higher explanatory capacity of the previous models. Also, we confirm to "*sales*" (*ln_sales*) as a control variable for this type of model (Cohen, 2010). Also, we observe the determinants are different for each type of propensity to innovate (product, process, organizational and marketing) and economic sectors, further justifying the need for this type of analysis.

- Insert Table 5 -

In the case of propensity to innovate in product, we state that product innovation (Exp (β) = 0.27) and marketing innovation (Exp (β) = 0.54) are significantly related. Both innovations are significantly associated with agriculture and services. In the case of the propensity to innovate in processes, it is significantly related to product innovation (Exp (β) = 0.56), process innovation (Exp (β) = 0.51) and organizational innovation (Exp (β) = 0.61). The relations for propensity to innovate in process are significant for all sectors analyzed. All these results indicate that non-technological innovations influence the propensity to innovate in technological innovation, but there are differences considering the type of propensity to innovate and the economic sector considered. These results are different to the provisions of Mothe & Nguyen (2010, 2012) for manufacturing and services sectors in Luxembourg, since both types of non-technological innovations (marketing and organizational) were significant. It allows us state a first difference in the case of an emerging economy. In addition, the agricultural sector is only valid in the case of the propensity to innovate in processes.

In the case of propensity to innovate in non-technological innovations, in our knowledge these are novel in the context of an emerging market. We state that propensity to innovate in organizational innovation is significantly related to process innovations (Exp (β) = 0.74), organizational innovation (Exp (β) = 0.38) and marketing innovation (Exp (β) = 0, 66). We also state that there are not relations to three economic sectors analyzed. In the case of the propensity to innovate in marketing, we state that organizational innovation (Exp (β) = 0.69) and marketing innovation (Exp (β) = 0.24), are

statistically significant and it happens only for agricultural and manufacturing sectors. These results indicate the importance of non-technological innovations in the propensity to innovate, especially for the agricultural and manufacturing sectors in an emerging market.

5.- Conclusions

This study contributes to research on the topic of innovation addressing non-technological innovations, especially in a context, which to our knowledge not been previously developed. Additionally, this study includes the agriculture sector to the manufacturing and services sectors analyzed in developed economies (Schimidt & Rammer, 2007; Mothe & Nguyen, 2010; Evangelista & Vezzani, 2010; Gunday et al., 2011; Mothe & Nguyen, 2012). The agriculture sector has an importance as supplier of foods and fibers and it is extremely important to the economic development of emerging economies especially those in Latin American (ECLAC, FAO, IICA, 2010).

In first term, we conclude that innovation processes are specific to each sector and territory, as indicated by Asheim & Gertler (2006), Feldman & Kogler (2010) and Crossan & Apaydin (2010). In fact, we conclude that only organizational innovation is related to innovative performance, both for agriculture and manufactures in an emerging economy, differing from a developed economy, where there is not significant relationship (Mothe & Nguyen, 2012).

Also, we conclude that non-technological innovations are related to the propensity to innovate. This relation varies according type of propensity to innovate and economic sector in an emerging market. Specifically, innovation in marketing is affecting the propensity to innovate in products (agriculture and services) and in the propensity to innovate in organizational innovations and the propensity to innovate in marketing (agriculture and manufacturing). Meanwhile organizational innovation, is significantly related to the propensity to innovate in processes (agriculture, manufacturing and services), organizational and marketing (agriculture and manufacturing). At the same time, we state that the interrelations between non technological innovations and technological innovations depend on the economic sector and the type of propensity to innovate.

Finally, we concluded that non-technological innovations have an effect on innovation performance and the propensity to innovate, noting that their analysis should be part of the elements considered as determinants of the development of

technological innovations, confirming proposed by Schmidt & Rammer (2007); Mothe & Nguyen (2010, 2012) for developed countries.

The research findings have implications for business managers and for policy makers and public programs of incentive for innovation, allowing companies to identify strategies to increase their innovative performance and to set priorities when defining the types of innovations to make. For its part for the design of public policies and programs that encourage innovation is clear that they must consider the different innovation have dissimilar effects on innovation performance, as well as the propensity to innovate, i.e. the police maker should develop specific programs each type of innovation considering in turn the economic sectorial differences.

In terms of generalizing of our findings, the context of our study should be noted. One limitation of our study is that our results and their interpretations are based on an international innovation database from Chile, which is a small open emerging economy of Latin America and distant from its major export markets. Therefore, more extensive studies in other contexts, as well as in different countries and markets are needed to assess external validity and robustness of our proposed framework and results. Another issue for further research is to compare poor- or under-performing firms with their high-growth counterparts. We recommend using longitudinal studies that examine the performance of firms over time and variations between and within innovative and non-innovative firms. Despite the limitations of this study, which provide a new opportunity to extend on the knowledge of non-technological innovations, we hope that our proposed framework and findings will serve as a reference for future investigations.

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Table 1. Types of aggregate innovations and their activities or subtype of innovations.

Types of innovation	Activities of subtypes of innovations
Product innovation	• New goods or significantly improved • New services or significantly improved
Process innovation	• A new or significantly improved manufacturing method of goods and services • A new or significantly improved logistic method, delivery or distribution of inputs, goods or services • A new or significantly improved support activity for process, like a maintenance systems or operations for purchasing, accounting or computing
Organizational innovation	• New business practices for the organization of processes (e.g. management of supply chain, process reengineering, quality management, etc.) • New methods of organization and decision-making responsibilities (e.g. new management responsibilities, restructuring, training systems, etc.) • New methods of organizing external relations with other firms or public institutions (i.e. first use of alliances, subcontracting, etc.)
Marketing innovation	• Significant changes in the design and packaging of products (goods and services). Excludes changes that alter the functionality or use of the product characteristics (this would be product innovation) • New media or techniques for product promotion (e.g. the first use of a new advertising medium, new brand image, etc.) • New methods for product distribution channels (e.g. the first use of franchising or licensing distribution, direct sales, new product concept presentation, etc.) • New methods of pricing of goods or services (e.g., the first use of variable demand price, discount system, etc.)

Source: Oslo Manual (OECD, 2005) and VII National Survey of Innovation of Chile (INE, 2012). Adapted by authors.

Table 2. Economic sectors – activities

Sector/activities	Sales ($ millions)

	N	Frec.	($)	S.D.
Agriculture				
Agriculture, hunting and forestry	198	100%	17,97	160,49
Subtotal	198	100%		
Manufactures				
Manufacture of food products and beverages	212	23%	26,23	71,45
Manufacture of electrical machinery and apparatus NCP	31	3%	2,77	4,40
Manufacture of basic metals	27	3%	77,28	209,01
Manufacture of paper and paper products	56	6%	60,11	239,79
Manufacture of fabricated metal products, except machinery and equipment	118	13%	8,39	22,89
Manufacture of chemicals and chemical products	88	10%	20,31	45,22
Manufacture of wood and of products of wood and cork, except	81	9%	10,84	40,00
Rest of manufacturing	292	32%	72,90	878,88
Subtotal	905	100%		
Services				
Real estate activities, business and rental	406	28%	16,61	104,63
Wholesale and retail trade, repair of motor vehicles	492	34%	46,39	214,45
Transport, storage and communications	354	24%	27,79	143,24
Financial intermediation	194	13%	176,22	1080,82
Subtotal	1.446	100%		
Total	2.549			

Table 3.Variables

Variable	Descriptor	Escale	N	Average	S.D.

IINNOVATIVE_PERF	Sales of new products to the markets	Nominal (O,1)	445	0,46	0,50
PROPENSITY_PDT	Will make product innov. (Yes, No)	Nominal (O,1)	2,549	0,42	0,49
PROPENSITY_PROCESS	Will make process innov. (Yes, No)	Nominal (O,1)	2,549	0,46	0,50
PROPENSITY_MKT	Will make marketing innov. (Yes, No)	Nominal (O,1)	2,549	0,34	0,47
PROPENSITY_ORG	Will make organizational innov. (Yes, No)	Nominal (O,1)	2,549	0,45	0,50
INN_PDT	Product innovation	Nominal (O,1)	2,549	0,17	0,38
inn_goods	Goods	Nominal (O,1)	2,549	0,13	0,34
inn_services	Services	Nominal (O,1)	2,549	0,11	0,31
INN_PROCESS	Process innovation	Nominal (O,1)	2,549	0,22	0,42
inn_production	Production	Nominal (O,1)	2,549	0,12	0,33
inn_logistic	Logistic	Nominal (O,1)	2,549	0,08	0,27
inn_support	Support	Nominal (O,1)	2,549	0,16	0,36
INN_ORG	Organizational Innovation	Nominal (O,1)	2,549	0,21	0,41
inn_bus_practices	Business practices	Nominal (O,1)	2,549	0,15	0,36
inn_org_methods	Organizational methods	Nominal (O,1)	2,549	0,17	0,37
inn_ext_relations	External relations	Nominal (O,1)	2,549	0,08	0,27
INN_MKT	Marketing innovation	Nominal (O,1)	2,549	0,15	0,36
inn_design	Design	Nominal (O,1)	2,549	0,07	0,25
inn_promotion	Promotion	Nominal (O,1)	2,549	0,11	0,32
inn_distribution	Distribution	Nominal (O,1)	2,549	0,06	0,24
inn_pricing	Princing	Nominal (O,1)	2,549	0,06	0,23
num_establisments	Number of establishments	Interval	2,549	5,72	36,31
group_firms	Belongs to group of firms	Nominal (O,1)	2,549	0,37	0,48
RD_firm	Do R+D in firm	Nominal (O,1)	2,549	0,16	0,36
cooperate	Cooperate with others organizations	Nominal (O,1)	1.003	0,19	0,40
Chile_patent	Patents in Chile	Nominal (O,1)	2,549	0,03	0,17
Export	Do exportations	Nominal (O,1)	2,549	0,21	0,41
Sales	Sales (average 2009-2010)	Interval	2,549	44.390.826	442.862.470
Exportation	Exportations (average 2009-2010)	Interval	2,549	3.227.060	34.514.896
Employ	Employ direct (average 2009-2010)	Interval	2,549	334	1.381
Expenses_inn	Total expenses in innovation	Interval	2,549	889.330	6.876.054

Table 4. Innovative performance.

Innovations	Agriculture		Manufacturing		Services	
Variables	β	Exp(β)	β	Exp(β)	β	Exp(β)
INN_ORG	-3,01*	0,05	-0,70**	0,50	0,08	1,08
INN_MKT	-0,54	0,59	-0,04	0,96	-0,14	0,87
group_firms	-3,31	0,04	-0,31	0,73	-0,46	0,63
RD_firm	4,74**	114,50	-0,47	0,63	-0,82***	0,44
Export	-4,98**	0,01	0,36	1,44	-0,15	0,86
Cooperate	-1,59	0,20	0,00	1,00	-0,86***	0,43
Chile_patente	-0,93	0,39	-0,78*	0,46	0,02	1,02
ln_sales	0,36	1,44	0,06**	1,06	0,08**	1,08
Cases	27		192		226	
R^2 Cox & Snell	0,51		0,09		0,14	
R^2 Nagelkerke	0,68		0,12		0,19	
"-2LL"	18**		248**		279***	
Hosmer Lemeshow (sig)	0,93		0,58		0,30	

Wald's Test: Statistical significance at * 90%, ** 95% and *** 99%.

Tabla 5. Propensity to innovate.

Propensity to innovate	Product		Process		Organizational		Marketing	
Variables	β	Exp(β)	β	Exp(β)	β	Exp(β)	β	Exp(β)
INN_PDT	-1,31***	0,27	-0,59***	0,56	0,02	1,02	-0,19	0,83
INN_PROCESS	0,02	1,02	-0,69***	0,51	-0,30**	0,74	-0,04	0,96
INN_ORG	-0,23	0,80	-0,50***	0,61	-0,97***	0,38	-0,38***	0,69
INN_MKT	-0,61***	0,54	-0,27	0,77	-0,42***	0,66	-1,41***	0,24
SECTOR								
Agriculture	*		***				***	
Manufacturing	-0,25	0,77	0,60*	1,82	-0,33	0,72	-0,96***	0,39
Services	0,32**	1,37**	0,83***	2,30	-0,09	0,92	0,05	1,05
group_firms	0,19	1,21	0,16	1,17	-0,01	1,00	0,07	1,07
RD_firm	-0,55***	0,58***	-0,71***	0,49	-0,31*	0,73	-0,21	0,82
Export	0,13	1,14	0,21	1,23	0,47***	1,61	0,21	1,23
Cooperate	-0,011	0,99	-0,23	0,80	-0,241	0,79	0,06	1,06
Chile_patent	-0,32	0,72	0,17	1,19	0,06	1,07	-0,34	0,71
ln_sales	0,16***	1,17	0,13***	1,14	0,106***	1,11	0,11***	1,11
Cases	1003		1003		1003			1003
R^2 Cox & Snell	0,26		0,31		0,20			0,17
R^2 Nagelkerke	0,35		0,41		0,27			0,23
"-2LL"	1090***		1017***		1164***			1201***
Hosmer Lemeshow (sig.)	0,67		0,37		0,52			0,424

Wald's Test: Statistical significance at * 90%, ** 95% and *** 99%.