



Barriers to non-technological innovation: Impact on business performance in an emerging economy

Barreras a la innovación no-tecnológica: efectos sobre el desempeño empresarial en una economía emergente

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Abstract

In the current competitive business environment, most are increasingly companies that develop processes of innovation (technological and non-technological) to achieve a good performance that translates into success, those who are not absent from barriers. This research examines the effect of barriers to innovation in the business performance between companies of different business stage, measured through the years of operation using a multiple linear regression analysis of the sectors services and manufacturing industry in Chile, a country that is in the first place for innovation in the region of Latin America and the Caribbean. The results show that organizational innovation and marketing innovation have positive, significant and higher effects on business performance in the group of companies in the introductory-growth stage that, for established companies and the barriers of cost, market and regulatory barriers are an obstacle to the development of innovation in the companies studied.

JEL Classification: O10; O30; O47.

Keywords: Barriers to innovation, Business performance, Emerging companies, Consolidated companies, Non-technological innovation.

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Resumen

En el actual contexto competitivo empresarial, cada vez más son las empresas que desarrollan procesos de innovación (tecnológica y no-tecnológica) para lograr un buen desempeño que se traduzca en éxito, los que no están ausente de barreras. La presente investigación analiza el efecto de las barreras a la innovación sobre el desempeño empresarial, entre empresas en diferente etapa empresarial, medida a través de los años de operación utilizando un análisis de regresión lineal múltiple para empresas de los sectores servicios e industria manufacturera de Chile, país que se encuentra en el primer lugar de innovación en la región de Latinoamérica y el Caribe. Los resultados muestran que la innovación de organización y la innovación de marketing tienen efectos positivos, significativos y más altos sobre el desempeño empresarial en el grupo de empresas en etapa de introducción-crecimiento y que, para empresas consideradas establecidas y las barreras de costo, de mercado y regulatorias son un obstáculo para el desarrollo de innovación en las empresas estudiadas.

Códigos JEL: O10; O30; O47

Palabras Claves: Barreras a la innovación, Desempeño empresarial, Empresas emergentes, Empresas consolidadas, Innovación no-tecnológica.

Introduction

Innovation plays a vital role in economic growth (Beynon, Jones & Pickernell, 2016). The role of companies as motors for economic development is key (Souto & Rodriguez, 2015), as innovation is one of the main factors that determine national competitiveness; in developed economies, the business sector is a catalyst for innovation (Gershman, Bredikhin & Vishnevskiy, 2016).

In this context, several studies have addressed the analysis of the internal and external factors of companies as determiners for productivity (Sánchez-Sellero *et al.*, 2014; Oh, 2015; Chowdhury *et al.*, 2014), business performance (Takata, 2016; Mir, Casadesús & Petnji, 2016; McDowell, Harris & Geho, 2016) and the competitiveness of companies (Prahalad and Hamel, 2003; Gupta *et al.*, 2016; Petrakis, Kostis & Valsamis, 2015; Guan *et al.*, 2006), where innovation has gained importance as one of the factors that influence business results (Porter, 1993; Ahuja, Lampet & Tandon, 2008; Camisón & Villar-López, 2014; Rusu, 2016). Innovation shows a strong relation with the concept of competitive advantage (Mejia-Trejo & Sanchez-Gutierrez, 2014) and presents evidence of a positive and favorable relation between economic and social development and business results (Kafouros *et al.*, 2008). However, innovation is not free of obstacles or barriers that minimize its positive effects, and while several studies have focused on the determiners of innovation (Galia & Legros, 2004), studies concerning the factors that hinder innovation in companies are scarcer.

The empirical literature on the obstacles to the innovation of companies can be grouped into two big branches of study: the first branch utilizes the obstacles to innovation as dependent variables, and focuses on the relation between the obstacles to innovation and the different characteristics of the companies; the second branch utilizes the obstacles as independent variables, and attempts to show how the propensity to innovate or the intensity of the

innovation is affected by different categories of obstacles (Amara et al., 2016). According to Souto and Rodriguez (2015), the necessary attention has not been given to those companies that face barriers to innovation nor to the existence of differences in the obstacles faced by the companies. With this, the purpose of this study is to analyze the effects of the obstacles for the development of non-technological innovation (organizational and commercialization innovation) on business performance with less than 10 years in the market versus companies with more than 10 years in the market, in the Services and Manufacturing Industry economic sectors for companies in Chile, a country that ranks 41 globally and first in the Latin American and Caribbean region in the Global Innovation Index (Dutta, Lanvin & Wunsch-Vincent, 2016).

The work is organized in the following manner: first, a theoretical framework is presented in a deliberate review of the literature that links non-technological innovation and barriers (obstacles) in the innovation process. Subsequently, the methodology is exposed, presenting the data, the defined variables and models. The following sections exhibit the results and discussions of the same, finalizing with the main conclusions.

Theoretical framework

Innovation as a multidimensional concept comprises several types. According to the Oslo Manual (OECD, 2005), product innovation is defined as the development or use of new components, characteristics and technologies to produce new products. Process innovation is defined as the improvement of the production technology processes that are required to produce a product. Organizational innovation is defined as the implementation of a new organizational method in the commercial practices of the company, the organization of the workplace or the external relations. Lastly, marketing innovation is defined as the implementation of a new commercialization method that implies significant changes in the product design or in the packaging, product placement, promotion of the product or of the price.

As mentioned before, innovation can be implemented in different ways, and this study will consider two main types of innovation: organizational innovation and marketing innovation. This is due to the fact that two types of innovation have governed most debates and empirical studies on innovation, since they have strategic significant values and create a competitive advantage for organizations; these are: product and processes (Prajogo, 2016). The fact that the positive effects of technological innovation on business performance can be easily observed has deviated attention from the other types of innovation (Baden-Fuller & Haefliger, 2013). The knowledge of the effects of innovation on performance is of great importance for companies, especially when they face markets with different configurations (Pino *et al.*, 2016). The authors (Martínez-Román, Tamayo and Gamero, 2016) pose the issue of the scarce attention given by specialized literature to the study of the innovative activity of companies from the sectors with low technology, and which has caused important failures in the innovation policy. There are different factors that support or inhibit the survival and growth of companies (Scaringella, 2016). Given that the results are very heterogeneous, there is the need to carry out studies to better understand the phenomenon of survival and growth of companies. In general, the whole set of necessary resources and capacities to resolve the critical issues of business is often beyond the scope of the companies, especially when they are in the first stages of development (Paradkar, Knight & Hansen, 2015). Since the market is characterized by uncertainty, starter companies in the beginning stages of growth become companies with a high mortality risk in their first years

of activity. The biggest challenge for these companies is to remain essentially creative, not only concerning the innovation of products or services, but also in the management mechanisms of the company (Moroni, Arruda & Araujo, 2015). Based on the analyzed literature, the authors propose the following:

H₁: The relation between organizational innovation and marketing innovation, and business performance, is positive and greater among companies in an introduction-growth stage than it is in consolidated companies.

The use of Information and Communication Technologies influences the growth of economies and the efficiency of the companies, and facilitates innovation through diffusion processes, use practices, and commercial success. Innovation, in turn, has a direct impact on growth and competitiveness (Cuevas-Vargas, Estrada & Larios-Gómez, 2016). Innovation also depends on the access and use of information, and the available knowledge; therefore, with successful innovation, the efficient management of knowledge is achieved, which can boost innovation within the organization and lead to a better management of the same. Ošeniéks & Babauska (2014), pose the following hypothesis related to the use of information:

H₂: The relation between the use of information for innovation and business performance is lower in companies in an introduction-growth stage than it is in consolidated companies.

Obstacles to innovation

Several studies have addressed the barriers to innovation according to the economic sector, for example Education (Christie & Jurado, 2009; Rutkowski & Moscinska, 2010), Manufacturing Industry (Madrid-Guijarro, García & Van Auken, 2009), and Agroindustry (Mesías & Corchuelo, 2015), also from perspectives like size of the company (i Blasco y Carrizosa, 2010; Zhu, Wittmann & Peng, 2012), international perspective (Galia y Legros, 2004; Cordeiro & Vieira, 2012; Lagziri *et al.*, 2013; Arango-Alzate *et al.*, 2015), and a global scope (internal and external factors) (Zhu, Wittmann & Peng, 2012; Cordeiro & Vieira, 2012). Consequently, it is clear that the knowledge and understanding of the barriers that affect companies when striving for innovation can be beneficial to organizations (Hadjimanolis, 1999), not only for companies in a specific economic sector, of a specific size and/or for a specific type of innovations, as shown in the majority of studies, especially those concerning technological innovation (D'Este *et al.*, 2012).

Among the most cited factors in literature (D'Este *et al.*, 2012), considered as barriers to innovation, are the factors of cost, market, and of expertise and/or skilled personnel, even when several studies also identify other factors that are no less important: financial (Kelly & Storey, 2000; Zwick, 2002; Frenkel, 2003; Hewitt-Dundas, 2006), economic (Souitaris, 2001a; Souitaris, 2001b; Frenkel, 2003; Katila & Shane, 2005; Gordillo & Herrmann, 2005), and technological resources (Galia & Legros, 2004; Frenkel, 2003; Zwick, 2002).

Cost factors have been identified as one of the most important barriers when analyzing the results of innovation, understanding that this type of factor is perceived and associated mainly to the lack of external financing or to the low possibility to obtain it (Hadjimanolis, 1999; Garcia & Briz, 2000), to the high costs that innovation entails (Galia & Legros, 2004;

Mohnen & Röller, 2005) and, in the case of smaller companies such as the SMEs, to the lack of their own capital (Frenkel, 2003). Despite the fact that innovation is associated to a source of competitive advantage, implementing an innovation strategy requires making an investment, which is in turn subject to financial risk (Freel, 2000). Given that companies have different realities regarding their capacity to develop innovation processes, especially when it comes to non-technological innovation, in addition to their capacity to obtain financial resources, the following hypothesis concerning barriers linked to costs, is presented:

H_{3a}: In the case of an organizational and marketing innovation process, the effect of cost barriers is moderating and stronger among companies in an introduction-growth stage than it is among consolidated companies.

Several authors agree that knowledge barriers are related to the lack of information on technology and to the difficulty to establish cooperation activities, but are mainly linked to the lack of skilled personnel (Mohnen & Röller, 2005). In this sense, having skilled personnel is vital when facing innovation processes (Hadjimanolis, 1999; Baldwin & Lin, 2002; Frenkel, 2003), for the reason that information, market knowledge, technology, and the opportunities to establish cooperative activities in the market will depend on their management. For Mohnen & Möller (2005), human capital is the key factor, provided that its relation is complementary to other obstacle factors. Given the fact that in order to procure skilled personnel it is necessary to have financial resources, this becomes an obstacle for many SMEs and/or start-up companies in the market, whereas this is not the case for large or consolidated companies. Considering the foregoing, the following hypothesis is presented:

H_{3b}: In the case of an organizational and marketing innovation process, the effect of knowledge barriers is moderating and stronger among companies in an introduction-growth stage than it is among consolidated companies.

The factors related to information and to the market, in the sense of being barriers to innovation, are related to the capacity of companies to obtain external information regarding technology in a timely manner and to the policies being developed by the government. In this sense, Galia & Legros (2004) consider these as important variables in every innovation process, which can enhance competitive advantages; however, not all companies have the resources and/or capabilities to access relevant and timely information (Hewitt-Dundas, 2006; Baldwin & Lin, 2002). Furthermore, in themselves, the competitive characteristics of the market are another important element. Among these stand out the concentration level and the domain established by companies with more experience and years of participation in the market (Coskun & Altunisk, 2002), as well as the degree of uncertainty regarding the demand of those products or services that were innovated (Baldwin & Lin, 2002; Galia & Legros, 2004). In this sense, it is important to know what happens with Chilean companies when faced with this type of obstacles. The following hypotheses are presented:

H_{3c}: In the case of an organizational innovation process, the effect of the market barriers is a driving force and stronger among companies in an introduction-growth stage than it is among consolidated companies.

H_{3d}: In the case of a marketing innovation process, the effect of market barriers is moderating and stronger among companies in an introduction-growth stage than it is among consolidated companies.

Among the barriers with less literature development are those linked to regulatory factors, mainly because their perception differs between economic sectors. The foregoing can be explained under the concept of complementarity, analyzed by Mohnen & Röller (2005); this concept relates to an effect produced between interrelated variables, which can reinforce each other (Dosi, 1988). According to Mohnen & Möller (2005), the government policies such as innovation policies and, therefore, institutions, standards and incentives, and regulations aimed towards innovation can be analyzed under the concept of complementarity.

In this sense, a current query in the governments when establishing policies to support innovation lies in the assumption that the effects of policies are different at an industrial level (Mohnen & Möller, 2005). This is not far from the truth, since a regulation or policy could be beneficial for some companies and just an expense to others, depending on the organizational characteristics of the company and on the competitive conditions of the economic sector. An example of the above is presented by Eisner, Albert & Sullivan (1984) when indicating that tax credits to promote the development of innovation and investment in R&D are beneficial to those consolidated companies, given their competitive condition and market position, but not to start-up companies that are in the initial stages of life, as they have less experience and knowledge regarding both the market and the regulatory system. Due to the above, it is possible to think that in a balanced regulation system, every company would benefit, even those that are growing, but an excess of regulations could cause the opposite effect to the motivation to carry out innovative projects. In this sense, this study presents two differentiated hypotheses concerning the analysis of regulatory barriers to innovation:

H_{3e}: In the case of an organizational innovation process, the effect of the regulation barriers variable is a driving force and stronger among companies in an introduction-growth stage than it is among consolidated companies.

H_{3f}: In the case of a marketing innovation process, the effect of the regulation barriers variable is moderating and stronger among companies in the introduction-growth stage than it is among consolidated companies.

Given that the empirical evidence shows that the impacts on the different barriers to innovation produce different effects on business management (Madrid-Guijarro, Garcia & Van Auken, 2009), the following theoretical model presented in figure 1 will allow addressing each of the hypotheses. The main queries of this study are presented in three questions: do non-technological innovations affect emerging companies and consolidated companies differently? Do obstacles to non-technological innovations have an important effect on the business performance of companies according to the number of years that they have been in the market? If so, do effects differ for organizational innovation and marketing innovation?

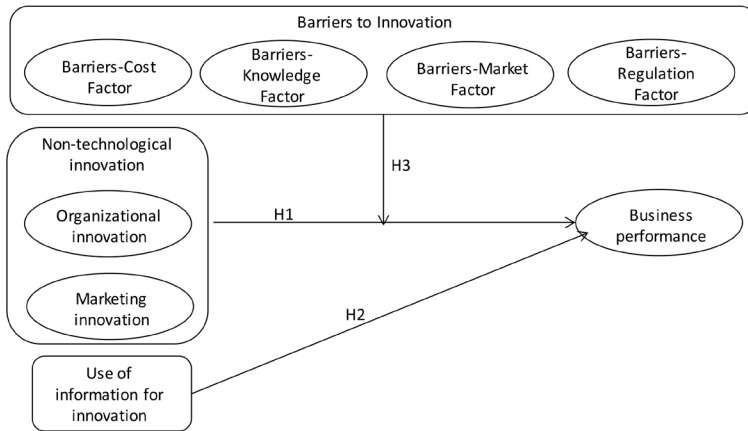


Figure 1. Theoretical model. Source: Own elaboration

Methodology

The database corresponds to the ninth innovation survey of 2015 in Chile, with records for the 2013 – 2014 period that represent national statistics according to the activity and size of the company (Ministry of Economy, 2015). The design of the form and survey methodology follows the general guidelines suggested by the OECD and the Community Innovation Survey (CIS) of the Eurostat, which are presented in the OSLO Manual; the instrument can be seen on the website of the Ministry of Economy of Chile¹. The database corresponds to 5620 companies from 13 economic sectors with sale levels above 87.342,122 American dollars (exchange rate as of December 31st, 2015). The sampling frame is built from the Directory of the National Institute of Statistics (INE for its acronym in Spanish), accounting year 2013, comprised by the records of the Internal Revenue Service (SII for its acronym in Spanish) which contain the tax payers situated within the territorial limits of the country and the internal directories of the INE survey. The sample design that was used applies a stratified probabilistic sampling (activity-size-region), with a 95% confidence level, distributing the sample proportionally to the volume of sales of each of the strata (Ministry of Economy, 2015).

The sample utilized corresponds to 3.548 companies from the following sectors: Services (Commerce, Financing, Real estate activities, Social and health services) and Manufacturing Industry (Elaboration of food and drink products, Furniture manufacture, Paper production, Machinery and equipment manufacture, and other industrial goods). Of the sample, 24,63% of companies correspond to those with less than 10 years of operations, which will be referred to as companies in an introduction or growth stage (Introduction-Growth). Said limit was established according to what is posed by Balsmeier & Delanote (2015) and Chatterji, Levine & Toffel (2008); even though some authors (Sine, David & Mitsuhashi, 2007; Tether, 2005) propose different year limits to consider growth stages, the limit of 10 years has been considered to be adequate. The remaining 75,37% are considered consolidated companies with more than 10 years of operations in the economic sector. Table 1 presents a summary of the sample.

¹ <http://www.economia.gob.cl/wp-content/uploads/2016/04/Formulario-9na-Encuesta-Innovaci%C3%B3n.pdf>

Table 1.
 Description of the study sample per economic sector and stage.

Sector	SMEs		Large Companies		Operation years	Stable		Large Companies	
	Count	%	Count	%		Count	%	Count	%
Industrial	1.503	52.81%	298	42.45%	Intr-Growth.	767	26.95%	107	15.24%
Services	1.343	47.19%	404	57.55%	Stable	2.079	73.05%	595	84.76%
Total	2.846	100.00%	702	100.00%	Total	2.846	100.00%	702	100.00%

Source: Own elaboration.

The selection of the variables utilized and indicated in Table 2 are established based on the Oslo Manual (2005). Regarding the control variables, the literature has not been very precise concerning the size of the company, since in general, large companies tend to adopt innovations more easily than small companies, because they have good capabilities for risk management, available and abundant resources, and strong infrastructures. Smaller companies, on the other hand, face the issue of high competition, lack of resources, financial difficulties and the lack of professionals, which translates into difficulties in the adoption of innovation (Ko *et al.*, 2008); however, the small and/or medium sized companies have more flexibility, making it possible to better adjust to an innovation development process (Damanpour, 1991; Miles; Miles & Snow, 2006).

The technique used was multiple linear regression and the analysis of the Kendall Taub-b correlation, composite reliability index, t-test, and f-test (Pérez, 2004; Hair *et al.*, 2010) statistics to prove hypothesis H_0 , which states that all coefficients are not significant.

The existence of some moderating effect of said variable through the types of non-technological innovation is analyzed in order to evaluate the effects of the “obstacles to innovation” variable on business performance.

For the analysis and determination of the effects proposed in the theoretical model (Fig. 1), the regression equations (1) and (2) and the requirements to be complied following the methodology proposed by Hoetker (2007) are established in the following manner:

$$DE = \beta_0 + \beta_{11} * INNOrg + \beta_{12} * INNMkt + \beta_2 * UI + \beta_3 * FCost + \beta_4 * FConoc + \beta_5 * FMdo + \beta_6 * FReg + \beta_7 * TEmP + \beta_8 * SECTOR + \varepsilon \quad (1)$$

$$DE = \beta_0 + \beta_{11} * INNOrg + \beta_{12} * INNMkt + \beta_2 * UI + \beta_3 * FCost + \beta_4 * FConoc + \beta_5 * FMdo + \beta_6 * FReg + \beta_{31} * INTER_{31} + \beta_{32} * INTER_{32} + \beta_{41} * INTER_{41} + \beta_{42} * INTER_{42} + \beta_{51} * INTER_{51} + \beta_{52} * INTER_{52} + \beta_{61} * INTER_{61} + \beta_{62} * INTER_{62} + \beta_7 * TEmP + \beta_8 * SECTOR + \varepsilon \quad (2)$$

Table 2.
Description of the variables

Variable	Unit of Measure	Description	Question
Business Performance (DE)	%	Percentage change (%) of sales in the 2013-2014 period	Indicate the net amount of annual sales for 2013 and 2014.
Organizational Innovation (INNOrg)	(1, 0)	1: If the company has introduced new business practices for the organization of processes, organizational method of responsibilities, and/or organizational method of the external relationships with other companies in the period of 2013-2014. 0: If the company has not introduced new business practices for the organization of external relations with other companies in the 2013-2014 period.	Did your company introduce, in the years 2013 and/or 2014 (indicate with an X) any of the following?: New business practices for the organization of processes (e.g., supply management, process reengineering, quality management); New organizational methods for responsibilities and decision making (e.g., new responsibility, restructuring, training methods, etc.); and/or new organizational methods of the external relations with other companies or public institutions (e.g., first use of alliances, subcontracting, etc.).
Marketing Innovation (INNMkt)	(1, 0)	1: If the company has introduced significant changes in the design, packing of the product, new promotional tools, new methods for the distribution channels, and/or new methods for the pricing of the goods or services in the 2013-2014 period. 0: If the company has not introduced significant changes in the design, packing of the product, new promotional tools, new methods for the distributions channels, and/or new methods for the pricing of the goods or services in the 2013-2014 period.	Did your company introduce, in the years 2013 and/or 2014 (indicate with an X) any of the following?: Significant changes in the design, packing of products (goods and services). Excluding changes that alter the functionality or characteristics of use of the product (this corresponds to the innovation of a product); New tools or techniques for the promotion of the product (e.g., the first use of a new promotional tool, new brand image, etc.); New methods for the distribution channels of the product (e.g., the first use of franchises or distribution of licenses, direct sales, new concept of product presentation, etc.) and/or new pricing methods for the goods or services (e.g., the first use of bid price, discount system, etc.).
Use of Information for Innovation (UI)	(1, 0)	1: If the company used any source of information, internal or external, for innovation activities in the 2013-2014 period. 0: If the company did not use any source of information, internal or external, for innovation activities in the 2013-2014 period.	Indicate if the company used some external or internal source of information for innovation activities in the years 2013 and/or 2014 (indicate with an X).

Barrier to innovation- Cost Factor (FCost)	(1, 0)	1: If this factor is perceived as an obstacle or disincentive to innovation in the company. 0: If this factor is not perceived as an obstacle or disincentive to innovation in the company.	What factors do you perceive as obstacles or disincentive to innovation in your company? (indicate with an X):
Barrier to innovation- Knowledge Factor (FConoc)	(1, 0)	1: If this factor is perceived as an obstacle or disincentive to innovation in the company. 0: If this factor is not perceived as an obstacle or disincentive to innovation in the company.	Cost factors (e.g., Lack of own funding, Lack of financing external to the company, very high innovation cost)
Barrier to Innovation-Market Factor (FMdo)	(1, 0)	1: If this factor is perceived as an obstacle or disincentive to innovation in the company. 0: If this factor is not perceived as an obstacle or disincentive to innovation in the company.	Factors linked to knowledge (e.g., Lack of qualified personnel, Lack of technological information, Lack of information on the market, Difficulty to find the cooperation of partners for innovation).
Barrier to Innovation-Regulatory Factor (FReg)	(1, 0)	1: If this factor is perceived as an obstacle or disincentive to innovation in the company. 0: If this factor is not perceived as an obstacle or disincentive to innovation in the company.	Market factors (e.g., Market dominated by consolidated companies, Uncertainty regarding the demand of innovative goods or services). Regulatory Difficulty Factors.
Size of the company (TEmp)	(1, 0)	1: If the company had less than 200 workers in 2013. (Small – Medium sized) 0: If the company had more than 200 workers in 2013. (Large)	Indicate the total number of workers of the company (annual average), for the years 2013 and 2014, according to their level of education.
Economic Sector (SECTOR)	(1, 0)	1: If the company belonged to the industrial sector in 2013. 0: If the company belonged to the service sector in 2013.	Indicate the activity or turnovers of the company by order of importance, where: 1: Most important; 2: Important; 3: Less important
			Exploitation of natural resources (agriculture, forestry, livestock, fisheries, mining). Manufacturing industry (elaboration or manufacture of products for sale) and Construction. Commerce (buying and selling without altering the product that is being marketed). Service delivery (sale of intangible goods, even when the service includes materials or spare parts). Any other activity not indicated above.

Source: Own elaboration. Based on the OSLO Manual, 2005.

Where INTER_{ij} corresponds to a vector that represents the interaction variables with the purpose of identifying the presence of moderating effects in the relation between the types of non-technological innovation and the barriers to innovation, the composition of which is:

$$\begin{array}{ll} \text{INTER}_{31} = \text{INNOrg} * \text{FCost} & \text{INTER}_{51} = \text{INNOrg} * \text{FMdo} \\ \text{INTER}_{32} = \text{INNMkt} * \text{FCost} & \text{INTER}_{52} = \text{INNMkt} * \text{FMdo} \\ \text{INTER}_{41} = \text{INNOrg} * \text{FConoc} & \text{INTER}_{61} = \text{INNOrg} * \text{FReg} \\ \text{INTER}_{42} = \text{INNMkt} * \text{FConoc} & \text{INTER}_{62} = \text{INNMkt} * \text{FReg} \end{array}$$

To detect the presence of a moderating effect, the introduction of the explicative variables is established step by step (Cohen *et al.*, 2013). In this case, the steps to follow are two: first, the control and direct explicative variables will be introduced (equation 1), then the interaction variables will be introduced (INTER_{ij}) (equation 2); Aiken, West & Reno (1991) indicate that it is probable that the introduction of the variables that cause interaction effects manifest the existence of multicollinearity or cause this problem to increase due to said introduction of variables. Considering the above, and in order to address the hypotheses that were presented (H₁ and H₂), the parameters associated with the explicative variables of equation (1) must be statistically significant for both secondary samples (group of Companies in Introduction or Growth stages and Consolidated Companies).

For the analysis of the moderating effect (H_{3a}, H_{3b}, H_{3c}, H_{3d}, H_{3e} and H_{3f}), it is necessary that the INTER_{ij} explicative variables in equation (2) present statistically significant parameters in the regression, said parameters should at least comply with one of the following conditions (Muller *et al.*, 2005):

$$\begin{array}{l} H_0: \beta_{ij} = 0; \text{ for every } i= 3, 4, 5 \text{ y } 6; j= 1, 2 \\ H_1: \beta_{ij} \neq 0; \text{ for every } i= 3, 4, 5 \text{ y } 6; j= 1, 2 \end{array}$$

To determine the internal consistency, Cronbach's Alpha is utilized, which is a method used to measure consistency in the quantification of reliability, as it estimates the internal coherence of the test (Cronbach, 1951). Cronbach's coefficient proposes a theoretical range of 0 to 1. If α is close to 0, then the quantified questions are not reliable, whereas if it is close to 1 then the level of reliability is high. As a general rule, if $\alpha \geq 0,8$, the answers are considered excellent, and over 0,65 they are considered acceptable (Köttner Jan, 2010).

To avoid the presence of variance in the common method, the statistical "Confirmatory Factor Analysis" treatment was carried out (Companies in the Introduction-Growth stage and Consolidated Companies), proposed by several authors, such as Podsakoff & Organ (1986); Podsakoff *et al.* (2003); Pavlou, Liang & Xue (2006); and Morata-Ramírez *et al.* (2015). Furthermore, the Kaiser-Meyer-Olkin (KMO) analysis was also done, as well as Barlett's sphericity test to measure the acceptability condition of the level of significance acceptable to proceed with a factor analysis (Bagozzi & Yi, 1988; Hair *et al.*, 1995).

Results

We present the calculations of the statisticians that allow inferring the compliance of the conditions to determine the presence of a different impact on business performance and of some

moderating effect on the study variable. Table 3 corresponds to the matrix of correlations; the values of said correlations, even when these are small, indicate an acceptable, discriminatory validity base for the variables (Cohen *et al.*, 2013; Kemp, 2003).

Table 3.
Kendall's Tau_b correlation matrix

	Mean	Business Performance	1	2	3	4	5	6	7	8	9
Business Performance	10.5413	1.000									
1. Organizational Innovation	.27	.359**	1.000								
2. Marketing Innovation	.21	.364**	.575**	1.000							
3. Use of the Information for Innovation	.41	.260**	.628**	.552**	1.000						
4. Obstacle.: Cost Factor	.77	-0.219	.122**	.118**	.166**	1.000					
5. Obstacle.: Knowledge Factor	.78	-0.218	.131**	.104**	.162**	.642**	1.000				
6. Obstacle.: Market Factor	.73	-0.136	.068**	.080**	.114**	.581**	.611**	1.000			
7. Obstacle.: Regulation Factor	.64	-0.142	0.013	0.024	0.016	.371**	.409**	.504**	1.000		
Control Variables											
8. Size of the Company	.80	.114	.150**	.147**	.193**	-0.159	-0.151	-0.17	-.034	1.000	
9. Economic Sector	.51	-.149**	-.141**	-.069**	-0.04	.098**	.089**	.112**	.089**	-.206**	1.000

* The correlation is significant at 0,05 (bilateral).

** The correlation is significant at 0,01 (bilateral).

Source: Own elaboration.

The results of the Kaiser-Meyer-Olkin (KMO) analysis and Bartlett's sphericity test show an acceptable level of significance, complying with the necessary condition to proceed with a factor analysis. The secondary sample in the "Introduction-Growth" stage shows a KMO index of 0,774 and its Bartlett's sphericity test had a significance of 0,000 (g.l. = 21), while the group of companies classified as "Consolidated" had a KMO value of 0,748 and their Bartlett's sphericity test had a significance of 0,000 (g.l.= 21). The result of the confirmatory factor analysis indicates that all the items of the related factors present a level of significance ($p < 0,001$), the factor loads of which are greater than 0,60 evidencing its convergent validity with respect to the composite reliability index (CRI). A value above 0,6 is convenient and desirable, and both secondary samples in this study comply with this. Furthermore, the average variance

extracted (AVE) calculated for the constructs was above 0,60 for all factors (Bagozzi & Yi, 1988), Tables 4 and 5 present the detail of this analysis for each group of companies.

Table 4.

Factor analysis, intense reliability and convergent validity. Companies in the Introduction-Growth stage

Variables	α	Factor Load	CRI ₁	AVE ₁	CRI ₂	AVE ₂
Obstacle: Knowledge Factor		.876				
Obstacle: Market Factor	0.844	.874				
Obstacle: Cost Factor		.847	0.896	0.684		
Obstacle: Regulation Factor		.698				
Use of Information for Innovation		.875				
Organizational Innovation	0.813	.859			0.885	0.720
Marketing Innovation		.812				

Extraction method: Main components analysis. Rotation method: Varimax Kaiser Normalization. a. The rotation converged into 4 iterations. KMO = 0,774. (sig. =0,000). Explained variance = 70,841%. p < 0,001.
 Source: Own elaboration

Table 5.

Factor analysis, internal reliability and convergent validity. Consolidated Companies

Variables	α	Factor Load	CRI ₁	AVE ₁	CRI ₂	AVE ₂
Obstacle: Knowledge Factor		.843				
Obstacle: Market Factor	0,798	.822				
Obstacle: Cost Factor		.799	0,87	0,628		
Obstacle: Regulation Factor		.696				
Use of Information for Innovation		.866				
Organizational Innovation	0,805	.845			0,824	0,701
Marketing Innovation		.830				

Extraction method: Main components analysis. Rotation method: Varimax Kaiser Normalization. a. The rotation converged into 4 iterations. KMO = 0,748. (sig. =0,000). Explained variance = 67,283%. p < 0,001.
 Source: Own elaboration

Table 6 shows the results of the relation between the non-technological innovation types and business performance, and the relation between barriers and business performance for both of the study samples.

Table 6 shows the level of statistical significance of the variables in the Sig. column (Level of significance at the bottom of the table). In this sense, the variables that are significant in model 1 are the same regardless of the stage in which the company is (Introduction-Growth or Consolidated). However, it stands out that the level of significance is different depending on the stage of the company, with the following innovation variables being noteworthy: organizational, marketing, and cost factor obstacle. Another element that stands out is that the knowledge factor perceived as a barrier to innovation by companies is not a significant variable in model 1.

Table 6.
Business Performance Relation

	Model 1						Model 2 Moderating effect					
	Companies in the Intro- duction-Growth stage			Consolidated Companies			Companies in the Intro- duction-Growth stage			Consolidated Companies		
	β	Sig.	E.T.	β	Sig.	E.T.	β	Sig.	E.T.	β	Sig.	E.T.
Constant	22.045	*	10.204	9.110	**	2.915	23.478	*	11.153	9.678	**	3.092
Organizational Innovation	8.483	**	13.189	1.659	*	2.873	-13.354	*	30.368	2.122	*	7.442
Marketing Innovation	5.855	**	13.317	.713	*	2.856	53.668	*	41.938	-4.086	*	7.977
Use of Information for Inno- vation	-6.082		12.847	2.947		2.468	-7.855		13.055	2.978		2.474
Obst.: Cost Factor	55.595	***	15.778	-2.328	*	2.877	73.376	***	19.275	-1.238	*	3.362
Obst.: Knowledge Factor	-1.962		16.035	1.400		3.094	-22.023		21.378	.740		3.590
Obst.: Market Factor	-49.726	**	15.279	.452	*	2.812	-48.328	*	20.107	.400	*	3.367
Obst.: Regulation Factor	-12.567	*	10.642	.585	*	2.217	-12.547		13.900	-.639		2.707
Org. Innov. *Cost Factor							-28.514	*	39.116	-7.836	*	8.054
Org. Innov. *Knowledge Factor							24.459		40.647	.147		9.289
Org. Innov. *Market Factor							15.274	**	35.991	2.276	**	7.333
Org. Innov. *Regulation Factor							20.935	*	26.020	6.474	*	5.755
Mkt. Innov. *Cost Factor							-45.684	*	49.770	5.697	*	8.689
Mkt. Innov. *Knowledge Factor.							29.508		40.788	4.782		9.634
Mkt. Innov. *Market Factor							-9.182	**	40.804	-2.940	**	7.964
Mkt. Innov. *Regulation Factor.							-30.956	*	28.962	-2.974	*	6.158
Control Variables:												
Size of the Company	5.751	*	6.472	-.028	*	2.284	3.971	*	5.358	-.095	*	2.298
Economic Sector	11.512		9.586	-6.852	*	1.864	10.495		9.726	-6.823	*	1.871
N	874			2.674			874			2.674		
R2	0.309			0.303			0.361			0.325		
Adjusted R2	0.272			0.267			0.316			0.302		
P-value	0.005			0.009			0.040			0.049		
Statistic F	2.783			2.461			1.723			1.489		
Durbin-Watson	1.898			1.871			1.762			1.893		

Level of significance (Sig.): * $p < 0,05$; ** $p < 0,01$; *** $p < 0,001$

Source: Own elaboration

Regarding model 2, which allows analyzing the moderating effect (interaction variables), the levels of significance are more similar in the different variables regardless of the stage of the company. It is worth noting that in this model, the regulation factor variable that is perceived as a barrier to innovation stops being significant, unlike model 1.

To prove whether the incorporation of interaction variables (moderator effect) significantly contribute to the explanation of the behavior of business performance, both secondary samples compare the explained variables (R^2_{adj} values) through the F test (Atuahene & Li, 2006). For the group of companies in the Introduction-Growth stage, the resulting increase is significant at 95% ($\Delta F= 1,06$; $p<0,05$). For the group of consolidated companies, the resulting difference in the statistic is also significant at 95% ($\Delta F= 0,972$; $p<0,05$).

Discussion

Both models are significant as a whole even when the R^2_{adj} coefficients are low; this can be explained by the absence of explicative variables in the model as determiners of the competitiveness degree of SMEs, which have been studied by some authors (Antolín-López, Martínez-del-Río & Céspedes-Lorente, 2013; Camisón & Villár-López, 2014; López-Torres *et al.*, 2016). These are: types of technological innovation, types of cooperation, and intensity of the competition.

The result shows that organizational innovation ($\beta_{11} = 8,483$; $p < 0,01$) and marketing innovation ($\beta_{12} = 5,855$; $p < 0,01$) have positive, significant and greater effects on business performance in the group of companies in an Introduction-Growth stage than for companies considered to be consolidated ($\beta_{11} = 1,659$; $p < 0,05$ and $\beta_{12} = 0,713$; $p < 0,05$ respectively), which empirically proves that the predictors of non-technological innovation (Organizational innovation and marketing innovation) comply with hypothesis H_1 .

Although the effect of the use of information for innovation in companies in an Introduction-Growth stage ($\beta_2 = -6,082$) is smaller for consolidated companies ($\beta_2 = 2,947$), the beta coefficient is not significant; therefore, it is not possible to accept hypothesis H_2 . If we consider that the information used by companies comes mainly from external sources, it is possible to consider the use of information as a collaborative instance among companies; therefore, the results obtained do not match the conclusions reached by other authors, such as Vrgovic *et al.* (2012) and Ozer, Demiskan & Gokalp (2013).

The analysis of the barriers by cost factors, relating to organizational innovation on business performance, indicates that for companies in an early stage (Introduction-Growth) the effect is moderating and greater ($\beta_{31} = -28,514$; $p < 0,05$) than it is among consolidated companies ($\beta_{31} = -7,836$; $p < 0,05$). This can be explained by the lack of own funding, external financing and/or the elevated cost of innovation, as relevant factors for the development and success of an innovation that pursues the improvement of the competitiveness level for the first type of companies, unlike those companies with a longer trajectory. Concerning marketing innovation and the barriers in its cost factor, the result for companies in an Introduction-Growth stage ($\beta_{32} = -45,684$; $p < 0,05$) is moderating and greater than it is for consolidated companies ($\beta_{32} = 5,697$; $p < 0,05$). The explanation for this can relate to the development of a new product (or service) or to a new commercial strategy that is very different to the usual, which, in addition to outputs, translates into uncertainty regarding the success of the project; something that for younger companies represents a greater risk. Due to the above, hypothesis H_{3a} is acceptable.

Regarding the barriers that relate to knowledge factors, the results show that the impact is negative and greater in companies at an Introduction-Growth stage ($\beta_4 = -1,962$) than it is in

consolidated companies ($\beta_4 = 1,400$); when obtaining a better business performance, however, both results are not statistically significant. Concerning the existence of the moderating effect of the “barriers in the knowledge factor” variable, it is also not possible to empirically demonstrate the existence of moderation, as it does not comply with what was established by Cohen *et al.* (2013). Furthermore, according to Mohnen and Möller (2005), human capital is the key factor in every relation of other barriers with innovation processes, which suggest the existence of complementarity in the results obtained for both secondary samples. Therefore, it is not possible to validate hypothesis H_{3b} .

The barriers formed by market factors are present in two instances. On the one hand, we have the control of consolidated companies, and on the other is the uncertainty regarding the demand for innovation in the goods or services. In this case, the results obtained in both secondary samples indicate that the realization of organizational innovation by companies in an Introduction-Growth stage, especially the small and medium sized companies, has a greater impact on business performance than it does in consolidated companies, provided that the degree of flexibility and adaptive capacity to the market that they possess (Miles, Miles & Snow, 2006; González-Loureiro and Figueroa, 2012) are utilized as a strength in their adaptation processes; for example, a new methodology in business practices and/or the use of relationships with the stakeholders for the benefit of organizational innovation. This is appreciated in the beta coefficient of companies in the Introduction-Growth stage ($\beta_{51} = 15,274$; $p < 0,01$), which is greater than the one obtained by more stable companies ($\beta_{51} = 2,276$; $p < 0,01$). The above allows accepting hypothesis H_{3c} .

In the case of the relation between market barriers and marketing innovation concerning business performance, the empirical evidence of the study shows that it is possible to accept hypothesis H_{3d} , considering the values of the coefficients and their level of significance in companies in the Introduction-Growth stage ($\beta_{52} = -9,182$; $p < 0,01$) versus consolidated companies ($\beta_{52} = -2,940$; $p < 0,01$). The explanation can be supported by the complications faced by younger companies when developing a new marketing concept or a new innovative commercial strategy, given that generally this requires significant changes in the design of the product, the promotional strategy or, even more complex, in the innovative development of a positioning strategy (Park, Nepal & Dulaimi, 2004). This contrasts with companies that are consolidated and stable in the market. The foregoing makes it possible to conclude that companies in an Introduction-Growth stage are more negatively affected—and to a greater extent—by a barrier that relates to market factors in the development of marketing innovation. Therefore, the evidence supports hypothesis H_{3d} .

The effect produced by barriers of a regulatory nature concerning non-technological innovation (organizational innovation and marketing innovation) on business performance is comprised by two elements. On the one hand, every standard and/or regulation is transversal and mandatory for the entire business sector, therefore, it affects all companies. However, it is less threatening to those companies with greater and better conditions to organizationally incorporate such changes (strengths), which allows them to obtain better results, a condition essentially complied with by SMEs (Miles, Miles & Snow, 2006), all the more if they are in an early development stage (Tether, 2005). The results give an account of this, by presenting a greater and positive beta coefficient in companies in an early stage of development ($\beta_{61} = 20,935$; $p < 0,05$) versus the coefficient shown by consolidated companies ($\beta_{61} = 6,474$; $p < 0,05$). On the other hand, in most cases, this same type of barriers concerning the development

of marketing innovations imply the disbursement of monetary and time resources for the achievement of results. In this sense, larger companies with a longer stay in the market are more favored. Empirically, the results obtained in this study support the above, showing better regression coefficients for consolidated companies ($\beta_{62} = -2,974$; $p < 0,05$) than for the other group of companies ($\beta_{62} = -30,956$; $p < 0,05$). The foregoing validates hypotheses H_{3e} and H_{3f} .

Empirically speaking, it is possible for a smaller sized company (SME), in an Introduction-Growth stage, to produce a greater effect on business performance than a larger company in the same operational phase when facing non-technological barriers ($\beta_7 = 3,971$; $p < 0,05$); whereas in a stage with more years of operation (≥ 10 years), it is the larger companies that present a better result in performance, even when said difference is marginal ($\beta_7 = -0,095$; $p < 0,05$). Regarding the economic sector, this is not significant for the group of companies in an Introduction-Growth stage, whereas the companies established in the services sector present a better business performance in comparison with the manufacturing sector ($\beta_8 = -6,823$; $p < 0,05$).

Conclusions

In this work, we studied how barriers to innovation affect the relation between business performance and non-technological innovation (organizational innovation and marketing innovation) in companies that are in different business stages, measured through the operation years in the economic sector. From the analysis of the 3.548 companies through the 9th Innovation Survey, 2015, the empirical results establish that non-technological innovation positively affects business performance, presenting a greater impact on companies that are in the Introduction-Growth stage than on consolidated companies (with more years of operation in the economic sector). However, when barriers to innovation are present, the business performance of those companies in early operation stages is negatively affected. Conversely, the opposite occurs with more stable companies in the market, even when the positive effect is marginal.

This study shows significant evidence that the influence of cost factor barriers to organizational innovation causes a moderating effect in the business performance of both groups of companies, but has a greater impact on those that are in early operation stages. However, with market and regulation barriers, the effect enables organizational innovation and has a greater impact on those companies that are in an Introduction-Growth stage.

Concerning marketing innovation and its relationship with business performance, cost and market barriers as well as regulation factors have a moderating effect that is significantly greater in those companies in early operation stages. The opposite is true for more stable companies, where the moderating effect is present only in the barriers associated to market and regulation factors.

Another important element is the effect of the barriers to innovation with respect to the size of the companies, as they cause a negative effect on the business performance of smaller companies (SMEs) and of those that belong to the industrial sector.

Finally, this work has implications for businesspeople, company managers, and those responsible for public policies, as it presents evidence of internal and external factors in organizations that affect business results and thus the recommendation is to pay attention to them at the moment of establishing business strategies, especially those based on innovation processes.

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