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Regional Cluster, Innovation and Export Performance: An Empirical Study

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Abstract

Regional clusters and innovations in product and processes are found in the literature as important determinants of firms' export performance. However, this relationship is still controversial and very highly constrained by industry, and by regions. Based on a more integrative perspective, the aim of the present article is to investigate the role of agglomeration economies of a regional cluster on the export performance of firms. Furthermore, we will test the mediating effect of innovation and the extent by which the technological intensity of the industry can perform a moderating effect between the constructs. Based on a sample of 100 export companies operating in the manufacturing industries, we use structural equation modeling to estimate the determinants of export performance. The results reveal that the agglomeration economies of a regional cluster have been found determinant factors of the export performance, as well as a significant source to generate innovations by firms. However, we found no evidence between the innovations in products and processes and export performance. The results have also shown that there are no differences among technological intensity of the industries, suggesting that the firms will access agglomeration resources of regional cluster in a complementary way to their internal resources.

Key words: regional clusters; innovation; export performance.

Introduction

Over the past decades several scholars have investigated the determinants of export performance. However, the literature of International Business still shows heterogeneous and controversial results (Chugan & Singh, 2014; Moghaddam, Hamid, & Aliakbar, 2012; Nazar & Saleem, 2009; Srivastava, Moser, & Meijer, 2015).

Different studies have attempted to analyze the relationships between the location advantages of regional clusters and export performance of firms (Diez-Vial & Fernández-Olmos, 2014; Fernhaber, Gilbert, & McDougall, 2008), cluster and innovation (Lai, Hsu, Lin, Chen, & Lin, 2014; Tristão, Oprime, Jugend, & Silva, 2013), or innovation and export performance (Alegre, Pla-Barber, Chiva, & Villar, 2012; Becker & Egger, 2013; Tavassoli, 2013). However, it seems that there are still relative lacks of studies seeking for the establishment of the connections between the three dimensions, and to explore in depth the mediating effects of technological intensity of the industry, particularly in the case of emerging economies.

Aiming to contribute to the field of international business from the perspective of the determinants of the export performance, this study is guided by the following research question: What is the influence of the agglomeration economies of a regional cluster on firm's export performance? And in which extent this effect can be mediated by innovation and moderated by the technological intensity of industry?

The effects of regional clusters will be captured in this study by the externalities that arise from the agglomeration economies, which can provide for firms significant access to location binding specific resources. By cluster resources, we understand the set of institutional, network, and geographical proximities advantages that can spill over the performance of firms on the national and/or international levels (Delgado, Porter, & Stern, 2010; Giuliani, 2007, 2013; Glaeser & Kerr, 2009; Kukalis, 2010; Maskell, Bathelt, & Malmberg, 2006; Maskell & Malmberg, 1999; McCann & Folta, 2008; Molina-Morales & Martínez-Fernández, 2004). We suggest that as such externalities effects shape and influence the innovation of firms, we consider that the impact of these cluster resources on the export performance of firms will be mediated by the firms' innovation in product and services. This means, more specifically, that firms with high innovation performance may better benefit from such agglomeration externalities, and therefore, will also perform better in international market. With the aim to achieve our objective, we adopt a theoretical framework that is based on a more integrative approach of the contributions of regional clusters, innovation in products and processes and the export performance literatures. Thus, this research aims to contribute to the studies of export performance's determinants by several ways. First, by analyzing the relationship between regional cluster and export performance using an integrative approach. Second, we will test how such relationships can be mediated by product and process innovation. Third, by testing the moderating effect of industry's technological intensity. In addition, we will provide insights of the case of firms from an emerging economy, where the dynamic of economic agglomeration can provide important sources of competitive advantages for firms when entering and exploring foreign markets. As the forces of globalization move at a faster pace than the forces that influence the geographic sources of competitive advantage, economies will become in some ways more distinct, rather than less distinct (Enright, 1993). We consider that the geographic sources of competitive advantages, like localized human capital, presence of key suppliers, tastes of local consumers, demand patterns of industrial customers, the nature and levels of local competition and co-operation, and local institutions may operate differently from country to country, or between developed and developing countries.

Based on a survey data by firms operating in the manufacturing industries in Brazil, we estimate an equation structural model to test the relationships between cluster resources and export performance. The results of the empirical study show that agglomeration economies of a regional cluster have positive effect on both innovation and export performance of firms. However, innovation, in turn, shows no effect on the export performance neither as a mediator in the relationship between resources in clusters

and the export performance. On the other hand, we could establish no evidence on the moderating effect of technological intensity of the industry.

The paper proceeds as follow. In the next section, we will present the literature review and develop the hypotheses of the study. Then, we will describe the methodological procedures, estimate and discuss the results. Finally, we debate the main findings and conclude the study.

Theoretical Referential and Hypotheses

In the following section, we will review the literature on the determinant of export performance. We will, particularly, focus on the effects of regional clusters and innovation, and set up the main hypotheses of the study.

Determinants of export performance

The participation in international markets represents important motivation means to the nations as the growth of economic activity, job opportunities, increased industrial productivity, profitability increase, and other relevant economic and social impacts (Guan & Ma, 2003; Moghaddam *et al.*, 2012).

The export performance corresponds to a measurement element used by researchers to measure the company's internationalization process (Carneiro, Rocha, & Silva, 2007). Facing a great body of research in recent decades aiming at understanding the factors that led the companies to foreign markets, scholars have found heterogeneous results (Ayan & Percin, 2005; Chugan & Singh, 2014; Moghaddam *et al.*, 2012; Souza, Martínez-Lopez, & Coelho, 2008).

The Figure 1 below synthesizes the main contributions of scholars on the relationships between regional clusters, innovation and export performance. Among these studies, the effects of regional clusters spillovers (Chugan & Singh, 2014; Wheeler, Ibeh, & Dimitratos, 2008) and innovation of firms (Chugan & Singh, 2014; Souza *et al.*, 2008) have been pointed as determinants of export performance. In addition, studies have suggested other determinant factors, like organizational aspects such as company's size (Souza *et al.*, 2008; Wheeler *et al.*, 2008), international experience (Moghaddam *et al.*, 2012; Papadopoulos & Martín, 2010) and the location of firms in greater industrial regional agglomerations (Mittelstaedt, Ward, & Nowlin, 2006).

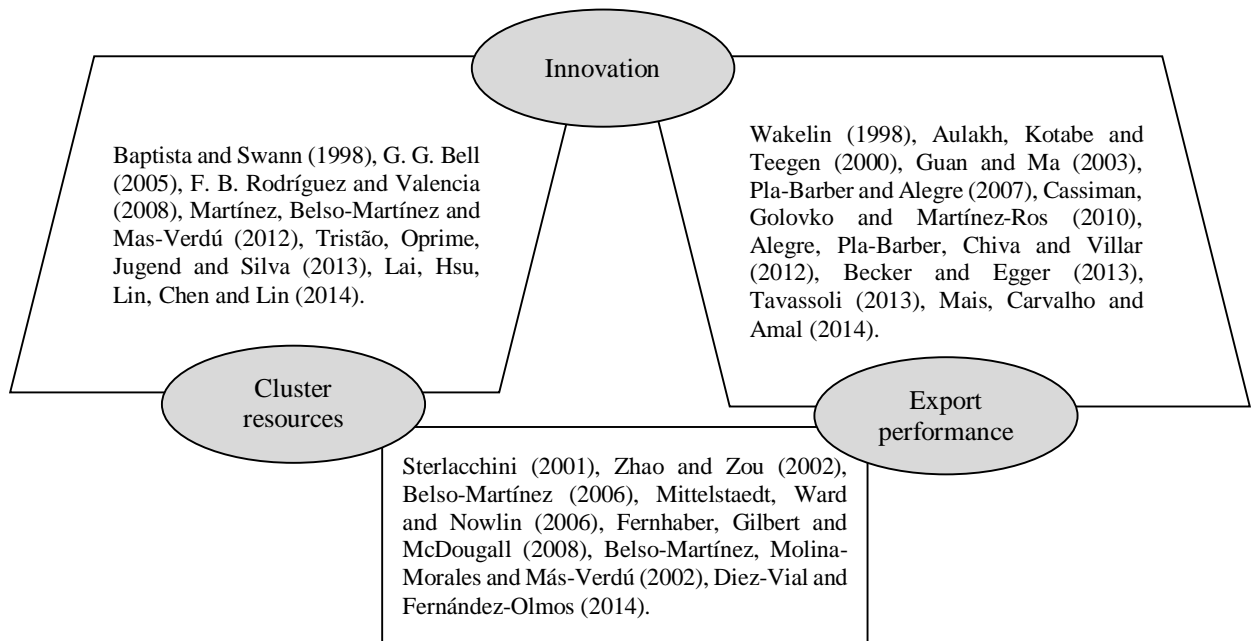


Figure 1. Empirical Studies of Cluster, Innovation and Export Performance

Source: The authors.

Regional cluster, innovation and export performance

The original discussion of industrial districts (or regional cluster) has its origins in the Alfred Marshall's (1890) book *Principles of Economics* (1890), who discussed the phenomenon of the agglomeration of specialized industries, as well the trade transactions occurring in such locations.

Marshall's work (1890) on agglomeration of industries offers four important contributions to the debate of industrial districts: (a) primarily, the location of spatial concentration of industries benefits from a pool of workers with specialized skills (access to skilled labor); (b) as a secondary contribution, this spatial agglomeration facilitates the development of specialized inputs and services; (c) provides for business opportunities of technological spillovers; and (d) access to higher market demand.

While the first three types of agglomeration externalities tend to benefit businesses by providing unique and efficient access to the provision of the necessary resources, the last advantage benefits particularly companies by increasing the demand for products or services (Marshall, 1890).

Subsequent to Marshall's work (1890), the effects of clustering were discussed by Alfred Weber (1929) in the paper entitled *Theory of the Location of Industries* (Weber, 1929). Weber (1929) distinguished three different categories of advantages in determining location of industrial production: (a) transportation costs; (b) labor; and (c) agglomeration.

More precisely, these advantages are divided into three categories. First, they can be generated by firms' economies of scale. Second, the agglomeration can occur because of the proximity to suppliers, a labor market in pool or localized knowledge diffusion. Finally, the concentration of production may give rise to external advantages, such as a highly developed infrastructure, lower energy costs, etc. - that is, which Weber calls urbanization economies (Weber, 1929).

In the economic and business literatures, several designations and concepts have been used to describe and address the phenomenon of economic agglomeration or the geographic concentration of industries: clusters, industrial districts, local cooperation networks, local productive systems, local clusters, Innovative milieu, technology parks, local innovation systems, among others. In some specific cases, the different concepts express different theoretical approaches, and in many times they are used to describe the same phenomenon, pointing to the local perspective of addressing firms' competitiveness and/or limitations

Alfred Marshall (1890) was one the first economists to highlight the advantages of industrial agglomeration. He suggested that firms can benefit in several ways from agglomeration economies, like the specialization of labor, knowledge spillovers, access to specific resources, which can support firms' growth. Marshall called such advantages as externalities of economic agglomeration.

The industrial concentrations may involve specialized suppliers, related industries and support entities (such as government institutions, governmental organizations, business associations, research centers, etc.) that, together, seek to promote and/or generate a more favorable environment for business enterprises. Thus, in an environment characterized by competition and co-operation, the companies develop various productive activities with the support of public policies and related sectors (Porter, 2009). It is important to emphasize that, under this perspective, cluster's externalities suppose a geographical concentration of specific industry and related industries, as well.

Authors have addressed the location advantages of regional clusters by pointing to different factors. Schmitz (1995) has highlighted the concept of collective efficiency, while Enright (2003) the importance of understanding the cluster development stage to determine the development of promotion policies (Enright, 2003). Altenburg and Meyer-Stamer (1999) have particularly emphasized that the positive economic externalities of regional clusters are driven by low transaction costs and the joint actions of firms. On the other hand, the economic agglomeration can generate a processes of collective learning (cooperation and innovative dynamics) through the join firm actions which may add specific dimensions for the competitiveness of firms to face the dynamics of market competition, as well by spreading information and knowledge to the whole society (Lastres & Cassiolato, 2003). This process can benefit the companies from the same industry, but also can strengthening other related industries operating in the same or closer locations.

The Marshallian industrial districts, characterized by a large number of companies involved in a given environment, aroused further studies of economic thought. In this sense, Becattini (2002) observed the sectorial specialization of locations in Italy highlighting the existing externalities in the formation of a given geographical area. The externalities represent an effect of environmental, social and economic change caused by formation of industrial districts.

In this perspective, Porter (1999) defines the industrial cluster as "a geographically concentrated group of interrelated companies and related institutions in a particular field, linked by common and complementary elements" (p. 211). Therefore, being located in a cluster allows contact with related technological industries, shared infrastructure, major innovations and entrepreneurial activities (Delgado *et al.*, 2010), as well as access to specialized customers and suppliers, skilled labor, universities and institutions (Glaeser & Kerr, 2009).

Maskell, Bathelt and Malmberg (2006) discuss the interaction between companies, customers, suppliers at trade shows and events as means to absorb knowledge and explain the success of companies that are outside of clusters. However, it can be noted that the connection with other external performers is complementary, but does not replace the interactions in regional clusters. In collaboration with this perspective, Glaeser and Kerr (2009) indicate the integration of the cluster agents that promotes the development of new ideas and knowledge transfer. Overall, companies located in clusters hold access to shared resources that enable superior performance compared to companies outside clusters (Molina-Morales & Martínez-Fernández, 2004).

Yet, other studies highlight the advantages and benefits of cluster's resources as learning process, knowledge creation (Maskell & Malmberg, 1999), knowledge network (Giuliani, 2007, 2013), human capital, specialized research tools, suppliers, consumers, manufacturing facilities or services, knowledge spillovers and institutions (McCann & Folta, 2008). However, Hervás-Oliver and Albors-Garrigós (2007) address singularity of resources and capabilities for each cluster, such as skilled labor, social interactions, business sophistication, supplier linkages, network or external linkages, institutional linkages (training and R&D support).

Based on the concepts above discussed, with regards to the advantages and externalities of economic agglomeration that may benefit companies operating inside an industrial cluster, we conducted a classification that summarizes these externalities as specific resources that are available for all the companies in the clusters. We identified three sets of clusters resources: local resources, institutional resources and business network resources. While local resources include professionals, infrastructure and local market; institutional resources represent educational institutions, professionals as well as cluster governance institutions; and business network resources constitute the economic cluster stakeholders such as suppliers, customers, competitors and related companies.

The relationship between access to cluster resources and the export performance has been found positive and statistically significant in several studies (Belso-Martínez, 2006; Fernhaber *et al.*, 2008; Mittelstaedt *et al.*, 2006), but other empirical investigations have come to opposite correlations, and identified negative effects (Diez-Vial & Fernández-Olmos, 2014). In this study, we consider, however, that the access to the local, institutional and network cluster resources can represent a significant source of competitiveness, and, therefore, it may stimulate the firms to establish specific strategies of growth based on international markets.

We, therefore, hypothesized that:

H1: The access to cluster's resources is positively associated with export performance.

Porter (1999) argues that companies located in regional or industrial clusters can benefit from several advantages, like advantage of information, knowledge, technological opportunities, market opportunities, in addition to the near relationship with companies and institutions. In this sense the dynamic process of interaction between firms located in the same and/or related cluster of companies, increases the degree of innovation.

On the other hand, Ferreira, Serra, Costa, Maccari and Couto (2012) show that the interaction between businesses, individuals and cluster agents are important mechanisms to facilitate innovations, although some clusters may record different results because of the heterogeneity of the available resources. This means that accessing shared resources may have a positive effect on the innovativeness of firms (Delgado *et al.*, 2010).

In turn, Hervás-Oliver and Albors-Garrigós (2009) explore the role of combinations of internal and external resources to explain innovation performance of firms located in clusters. Based on a study using data from small and medium European companies, the results highlight the idea of internal resources as important factor to access external knowledge – called absorption capability, and to obtain innovation benefits through complementarity of internal and external resources.

Furthermore, industrial cluster environments can generate knowledge spillovers, which represent a key factor for the cluster's expansion and growth. The spillovers are understood as knowledge owners transiting inside companies operating in clusters, enabling the co-evolving of companies. Chyi, Lai and Liu (2012) investigated the cluster of high-tech Hsinchu Taiwan, and found out evidence that spillovers contribute to raising the performance of companies.

In line with the literature (Hervás-Oliver & Albors-Garrigós, 2009; Lai *et al.*, 2014; F. B. Rodríguez & Valencia, 2008; Tristão *et al.*, 2013), we consider that, through externalities and spillover effects, the agglomeration economies of a regional cluster can provide substantial resources and knowledge spillovers, that, in the long run may be converted in significant opportunity of innovation and growth.

We, therefore, hypothesize that:

H2: Access to the cluster's resources is positively associated with the degree of innovation of firms.

Innovation and export performance

Innovation has been studied intensively by researchers in different fields of study for being a multidisciplinary concept (Damanpour & Aravind, 2012). Because of all the social changes of recent decades, the term innovation has been associated with the competitiveness of companies and nations (Porter & Rivkin, 2012).

Despite the existence of various definitions of innovation, for the purpose of this study we adopted the definition of the Organization for Economic Co-operation and Development (OECD, 2005). Therefore, innovation corresponds to the implementation of a new product or service, or significantly improved; a process; a new marketing method; a new organizational practice in organizations and external relations.

Product innovation is the differentiation or improvement of a product to meet the needs of external users, while proceedings innovation is to improve the production of a product or service process (Damanpour & Aravind, 2006, 2012).

Innovations can be promoted by organization's internal resources (Rosenbusch, Brickmann, & Bausch, 2011) as well as the knowledge acquired externally (Kostopoulos, Papalexandris, Papachroni, & Ioannou, 2011; Sáenz, Revilla, & Knoppen, 2014) or even by a random set of actors combined with internal resources of the organization - called open innovation (Chesbrough, 2007; Dahlander & Gann, 2010).

In the field of International Business, scholars have sought to establish the relationships between innovation and internationalization. Monreal-Pérez, Aragón-Sánchez and Sánchez-Marín (2012) conducted a longitudinal survey by Spanish companies and identified that exporter companies are more likely to develop more innovations and thus increase their activities in international markets.

Although studies didn't find statistically significant relationship between innovation and export performance (Mais, Carvalho, & Amal, 2014), we hypothesized, in line with the empirical study of Monreal-Pérez *et al.* (2012), as well as evidences from Cassiman, Golovko and Martínez-Ros (2010), Alegre, Pla-Barber, Chiva and Villar (2012), Becker and Egger (2013) and Tavassoli (2013), that, due to the gains in the competitiveness, innovation can be seen as a strategic advantage to overcome trade barriers and to establish a significant market position, as well in the domestic as in foreign markets:

H3: Innovation is positively associated with export performance of firms.

While scholars have largely discussed the impacts of innovation on internationalization and export performance, it is noteworthy that there are still few studies that investigate the innovation as a mediator channel (Alegre *et al.*, 2012). With the insertion of a mediating variable, we seek to investigate whether the innovations generated as a function of access to regional clusters is compatible with export performance. The effect of the mediation occurs by reducing the direct effect of one hypothesis (H1), rather than the joint ratio of the two hypotheses (H2) and three (H3).

We assume that the more innovative companies are more likely to access greater intensity of cluster resources and, therefore, to sustain higher export performance. Through this assertion it can be inferred that the clustering of industrial activities is relevant not only to strengthen the competitiveness of companies in international markets, but represents a generating mechanism of innovation, which can promote higher export performance.

In other terms, it is assumed that companies that record higher innovation performance in products and processes are more likely to possess specific capabilities to access on a higher intensity the shared resources of an industrial cluster, and consequently achieve higher export performance levels. For the purpose of testing the innovation as a mechanism of mediating relationships between regional cluster externalities and export performance, we will test the following research hypothesis:

H4: Innovation mediates positively the effects of cluster resources on companies export performance.

However, it seems that the spillovers and externalities generated by agglomeration economies are not uniform among industries. Empirical studies have found differences in the internationalization process according to the technological intensity of industries. Stoian, Rialp and Rialp (2011), in an empirical study of small and medium-sized (SMEs) Spanish companies, have found evidence that SMEs operating in high and medium-high technology industries recorded better export performance than firms in medium-low and low-tech industries.

These findings corroborate the J. Bell, Crick and Young (2004) and López-Rodríguez and García-Rodríguez (2005) studies. In addition, a literature review points to strong evidences of the effect of the technological intensity as a feature of relevant industry to explain the export performance of companies (Wheeler *et al.*, 2008).

In accordance with previous studies, technological intensity is considered in this study as a relevant variable to moderate the model's relationships. Therefore, we will test the fifth hypothesis:

H5: The technological intensity of the sector moderates positively the relationship between cluster resources, innovation and export performance.

Control variables

According to the literature review, the size of the company (Chugan & Singh, 2014; Wheeler *et al.*, 2008), international experience (Chugan & Singh, 2014; Moghaddam *et al.*, 2012) and the location in high industry agglomeration regions (Chugan & Singh, 2014) are important control variables to explain the export performance of organizations.

In addition, studies indicate organizational aspects such as company size (Souza *et al.*, 2008; Wheeler *et al.*, 2008), international experience (Moghaddam *et al.*, 2012; Papadopoulos & Martín, 2010) and the fact of companies based in regions with higher industrial concentration (Mittelstaedt *et al.*, 2006) as important factors that may influence the export performance of firms. Thus, we will control for size, international experience and industrial concentration for the relationships between cluster resources, innovation and export performance. In the following illustration, we will present the operational model of our study, with the corresponding hypotheses as discussed in the literature review.

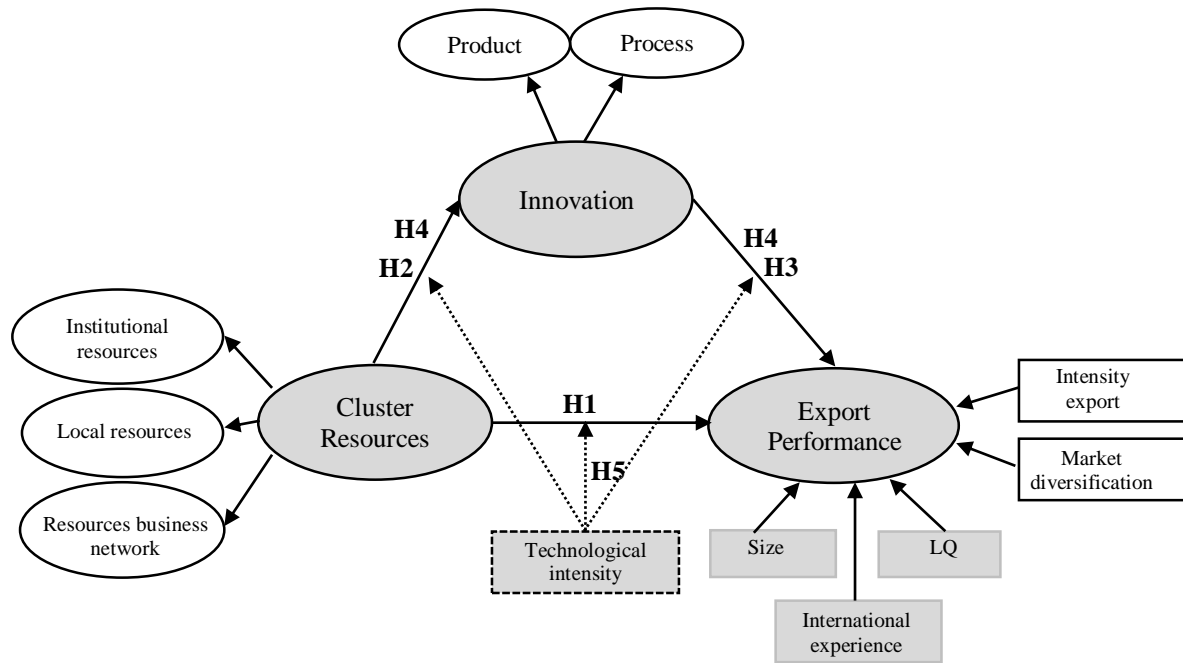


Figure 2. General Framework of Export Performance Determinants

Source: The authors.

Method

In order to estimate the relationships between regional cluster resources, innovation and export performance of firms we adopt a quantitative approach, using structural equation modeling, which provides simultaneously the relationships between the variables.

For the selection of our sample, we adopted the following criteria: (a) companies operating in the manufacturing industry; (b) 100% Brazilian capital companies; (c) exporting in the last three years. We conducted a survey by firms operating in the manufacturing industries, and located in the State of Santa Catarina (south of Brazil). Before sending the questionnaire, we contacted our participants by telephone with the aim to explain the objective of our study, and also to identify the adequate respondent for our questionnaire. Then we sent an electronic questionnaire by e-mail to firms located in the State of Santa Catarina/ Brazil.

The measurement of research variables is performed by Likert scale 1-5, while the variables size, international experience and location quotient are continuous variables. Data were collected directly from companies, but the value of the location quotient, which were collected in 2013 from primary data at the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística* [IBGE]), and processed in accordance with the calculation of the location quotient (Fernhaber *et al.*, 2008). The variables are shown in Table 1.

Table 1

Variables Description

Construct 1^aorder	Construct 2^aorder	Variable	Description of variables
EXPORT PERFORMANCE	Export intensity	INTEXP	Export intensity (last three years)
		SATEXP	Satisfaction with export revenues (last three years)
	Market diversification	DIVEXP	Market diversification (last three years)
		SATDIV	Satisfaction with the export intensity (last three years)
INNOVATION	Product innovation	INPRD1	New product for the company, but existing in the international market
		INPRD2	New product for the international market
		INPRD3	Technological improvement in the product
		INPRD4	Improvement in existing product specifications (materials, components and other features)
		INPRD5	Improvement in existing product features
	Process innovation	INPRC1	New technological process for the company, but existing in the industry
		INPRC2	New technological process for the industry
		INPRC3	Acquisition of specialized machinery and equipment
		INPRC4	Reducing operating costs
		INPRC5	Quality improvement in the production process
CLUSTER RESOURCES	Institutional resources	RINST1	Institutions of technological research (example: Universities, FIESC and others).
		RINST2	Professional institutions related to core activity of the respondents' company (associations, cooperatives end others).
		RINST3	Institution that promotes governance cluster
	Local resources	RDLOC1	Local logistic infrastructure (distribution of products and access to the suppliers)
		RDLOC2	Access to local service
		RDLOC3	Access to credit (specific credit for industry producers)
		RDLOC4	Availability of skilled worker in the region
		RDLOC5	Reputation region (value of the reputation of the region)
	Business network resources	RRDNG1	Relations of horizontal cooperation between companies (the existence of partnerships or companies in the sector network)
		RRDNG2	Relations of vertical cooperation in the region (existence of partnerships or cooperation networks with suppliers, distributors and/or institutions in the region)
		RRDNG3	Customers in the region
		RRDNG4	Competitors in the region
		RRDNG5	Consulting companies
		RRDNG6	Fairs and exhibitions
CONTROL VARIABLE		SIZE	Size
		EXPINT	International experience
		QL	Location quotient

Note. Source: Research data.

Regarding the analysis of the data, the statistical method of structural equation modeling (SEM) will be used, aiming to establish the relationships between variables, and to explore both mediating and moderating effects of the variables in a single model simultaneously (Hoyle, 1995; Kline, 2011; Koufteros, 1999). We used the SmartPLS3 software version 3.1.5 to estimate the model.

Our sample is composed by 100 firms that responded the survey questionnaire, from a general population of export companies located in the State of Santa Catarina/Brazil, of over 1100 export companies with export activities at least confirmed in the last three years. Therefore, a return rate of 9.09%.

We identified the clusters according to the calculation of the location quotient (Fernhaber *et al.*, 2008) by indicating the specialization degree of industries about a geographic region. This index explains that 76% of firms are located in clusters and other 24% are located in relatively low agglomerated regions. Using a Likert scale from 1 to 5, we collected the perceptions of the respondents about the geographic region, identified the development level of resources in specific clusters, as well the intensity of using such cluster and agglomeration resources by firms (local, institutional and business network resources).

The research sample consists of firms that belong to medium and low-tech industries, according to the classification of the OECD (2003). We adapted this classification by highlighting two main groups: group of firms operating in the lower-middle industries, and firms operating in medium-high technology. This classification in two groups is due to our limited sample of firms. A table of descriptive statistics is provided in Appendix A.

In order to check for robustness and quality of the variables, we run a Confirmatory Factor Analysis (CFA), which allows to analyze the relationships between constructs, through factor loadings and reliability indices (Hair, Black, Babin, Anderson, & Tatham, 2009; Kline, 2011). This technique provides evidence of the variables that do not collaborate for model explanation, and also to check whether the model presents internal convergence of the constructs.

Therefore, we used the standard load parameters > 0.7 , and the $R^2 > 0.5$, average variance extracted > 0.5 , p-value < 0.05 (Hair *et al.*, 2009), Cronbach's alpha > 0.7 and composed Reliability > 0.7 (Kline, 2011). In addition, we removed four variables from the pattern since they do not collaborate with the internal consistency of the constructs, as shown and outlined in Appendix B.

Four variables were used to measure the export performance: two objective variables, export intensity and market diversification, in line with other empirical previous studies (Mais *et al.*, 2014; Souza *et al.*, 2008), and two subjective variables by considering the managerial perception of export performance (Wheeler *et al.*, 2008). However, since the CFA has indicated that **export intensity** and **satisfaction with market diversification** do not have internal consistency, we decided to remove them from our model.

Considering the answers collected simultaneously, we accept only one respondent by firms, and in order to reduce the risk of common method, we adopted the following criteria: (a) preserving the anonymity of the respondents; (b) not allowing the respondents to, through their answers, put in risk their personal or professional positions; and (c) applying the one-factor test of Harman (1967). In according with loading factorial unrotated of six factors, we found an explanatory power of 71.32% of all explicated variance, while the first factor contains 36.76%. Considering one more factor it was extracted, the first one counts with less than 50% of all variance, therefore, we can conclude that this data do not suffer from common method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

Results and Discussion

In the following section, we will discuss the results based on the structural models estimates. The information in the structural model represents the factor loadings and the p-value in brackets, as well as the explanation of the statistical relationship through R^2 located within the constructs.

In Figure 3 we can observe the factor loadings and the p-values of the variables that reflect the first order constructs. Institutional Resources, Local Resources, Resources business network, Innovation in Product and Process have been found strongly correlated and statistically significant (p-value <0.001). In the same way, the constructs of innovation are highly correlated and statistically significant with factor loadings above 0.85 (p-value <0.001).

In turn, the variables market diversification and satisfaction with market diversification demonstrated development power to construct export performance with a factor loading of 0.839 and 0.788 (p-value <0.05) respectively.

In the following sections, we will present and discuss the main findings of our model estimates.

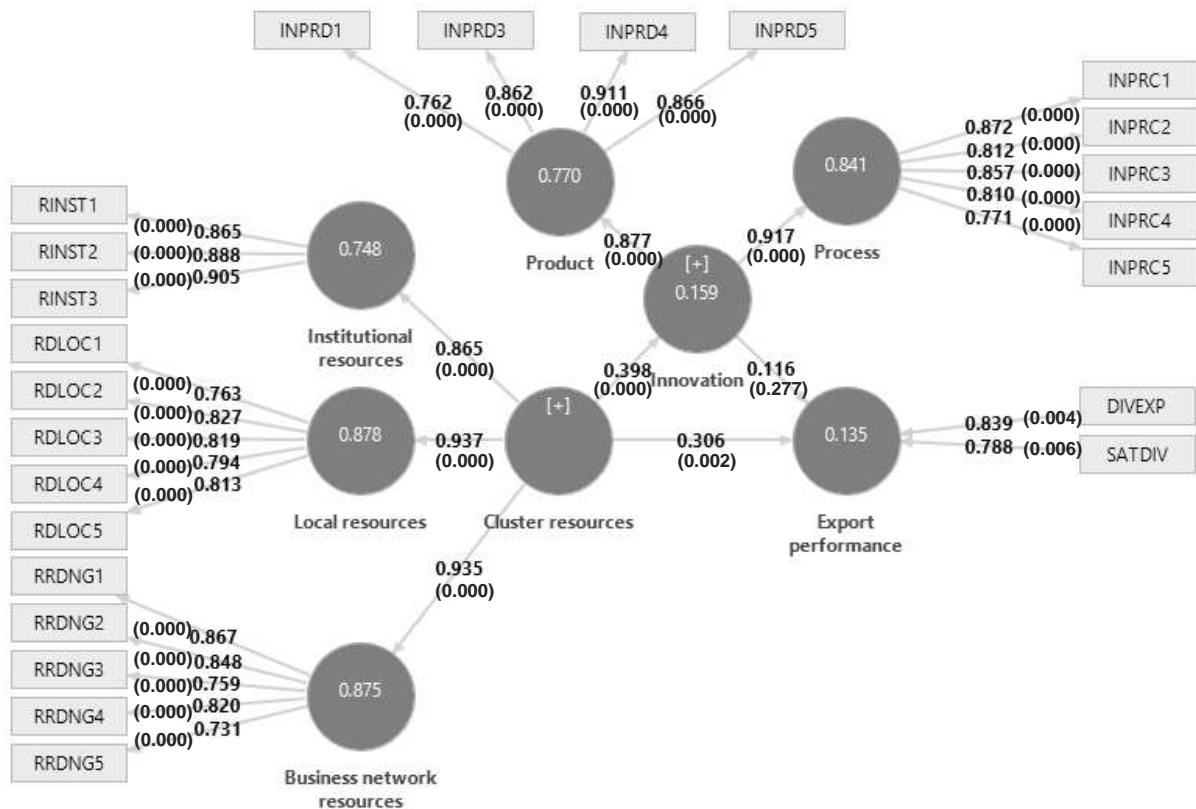


Figure 3. Structural Model – Effect of Cluster Resources and Innovation

Source: Research data.

Effect of cluster resources

According to Figure 3, the result points to the evidence that there is an association between accessing the cluster resources and export performance. The more companies can benefit from institutional, local and business network resources, the more likely they can record a higher export performance. This points to a heterogeneity among companies regarding the level of export performance, with a factor loading of 0.306 (p-value = 0.002). We measured the export performance by two main variables: increase of market shares and market diversification.

This means that a higher access to the cluster resources increases the international market shares and the satisfaction with the diversification of foreign markets. These results indicate the access to cluster resources provides the advantages of localization. The results show that all the resources have been found statistically significant and positively correlated, but business network and location resources have shown relatively more loading factor than institutional resources according to the managerial perception. The differences in the factor loading can be explained by several reasons. It seems that firms are more likely to benefit in a larger manner from business network and location resources than institutional resources. Firms can explore business networks using their own capacities. The more firms can be involved with their business partners, the more likely to assess specific market opportunities. Firms that are committed in the network can, therefore, better benefit from knowledge and the growth strategies of their suppliers and customers in the international market. This means that the knowledge, technology and growth are not restricted to the domestic market, but rather to the experiences and knowledge gathered in a larger scale. The second reason is that the factor location resources (professionals, infrastructure and local market) has a high impact on costs and efficiency. Thus, firms can take advantages from the different externalities of the location, particularly those that provide conditions to benefit from the economies of scale, either from the upstream, or the downstream side of the value chain. Finally, institutional resources are not directly related to the competitiveness of firms. These resources use to be important triggers to promote external growth and mechanisms of cooperation governance, however their impacts are relatively low particularly in the short run perspective. Institutional resources can drive and promote the commitment of firms with export and internationalization activities, however, their impacts on performance are more likely to be limited.

Thus, the hypothesis H1 of the positive association between cluster resources and export performance is supported. This result is in line with other studies, like Belso-Martínez (2006), Mittelstaedt, Ward and Nowlin (2006), and Fernhaber, Gilbert and McDougall (2008). In general, the cluster's resources as institutional, local resources and business network are important sources to contribute for development of internal resources and capabilities of firms (McCann & Folta, 2008; Molina-Morales & Martínez-Fernández, 2004).

The relationship between resources in cluster and innovation in structural model demonstrates a factor loading of 0.398 (p-value = 0.000). These evidences indicate that companies with higher performance of innovations in products and processes are more likely to have better access to greater intensity of clusters resources (Delgado *et al.*, 2010).

These evidences are in line with other empirical studies (F. B. Rodríguez & Valencia, 2008; Hervás-Oliver & Albors-Garrigós, 2009; Lai *et al.*, 2014; Tristão *et al.*, 2013), and support the hypothesis **Access to cluster resources positively influences the degree of innovation** (H2). Thus, Companies benefit from different regional clusters externalities, such as institutional, local and business network resources. These represent important mechanisms for the firms' integration with external agents to promote the development of own internal resources. The role of such externalities mechanisms has been found highly significant in influencing as well the innovation performance, as the export performance of firms in international markets.

This result is in line with the findings of Hervás-Oliver and Albors-Garrigós (2009), which point to the complementarity of external with internal resources to obtain innovation benefits. We assess the impacts of using external mechanisms as a factor of innovation performance of firms, however, we consider that the role of internal resources on the process of innovation development is still a determinant driver.

Effect of innovation

The results of modeling represented in Figure 3 indicate positive factor loading with 0.116 in the relationship between innovation and export performance (p-value = 0.277). These results show, however, no evidence about the impacts of innovation in product and services on the export performance of firms when measured by market diversification and the satisfaction of market diversification. This

finding is not in line with the results of other studies (Alegre *et al.*, 2012; Becker & Egger, 2013; Cassiman, Golovko, & Martínez-Ros, 2010; Tavassoli, 2013).

Therefore, the hypothesis **Innovation positively influences the export performance** (H3) is not supported, in line with the results of Mais, Carvalho and Amal (2014). This result may reflect, first, the use of a perception variable (satisfaction), instead of other measurement variables of export performance as export intensity (Alegre *et al.*, 2012; Tavassoli, 2013) which was excluded from the model because of its low internal consistency, and even the propensity to export (Becker & Egger, 2013; Cassiman *et al.*, 2010; Tavassoli, 2013). This result can be understood as characteristic of emerging countries, because their export performance is less associated with innovation, but likely more to cost specific leadership. On the other hand, this result can also reflect the limitations of using a subjective variable of the product and process innovation. Future studies can consider using the number of patents as a variable to capture innovation performance of firms (Archibugi & Pianta, 1996).

Effect of mediation of innovation

According to Figure 3, the indirect effect of cluster resources on the export performance through innovation occurs by the accumulation of factor loadings discussed in the hypothesis 2 and 3 together. Thus, while the relationships between cluster resources and innovation has recorded a factor loading of 0.398, and statistically significant at 1% (p-value <0.001), the association between innovation and export performance with a factor loading of 0.116, was not statistically significant (p-value = 0.277). Finally, we could find no indirect effect between cluster resources and the export performance. This mediating relationship recorded a factor loading of 0.046, but was not statistically significant (p-value = 0.183).

To ensure the validity of mediation, when the construct innovation was included in the relationship between cluster and export performance resources, the direct effect of cluster resources should be reduced to zero (Hair *et al.*, 2009; Iacobucci, Saldanha, & Deng, 2007), which has been not shown in the model.

On the other hand, it seems that the spillovers of regional clusters resources on the innovation performance generate no direct effects on the international competitiveness of firms (export performance). So these results suggest that the effects of cluster direct effect on export performance, and are uniform among firms no matter their level of innovation performance.

We can, therefore, consider that innovation does not operate as mediator in the relationship between cluster resources and export performance. This result provides no support for the hypothesis **Innovation mediates the influence of cluster resources on the export performance of firms** (H4).

Furthermore, these results also suggest that innovation, in the Brazilian case, has no direct, either indirect effects on export performance. That is to say, according to the survey respondents' perception, the fact that access to resources in clusters results in higher importance to determine the export performance compared to innovations in products and processes. We understand that innovation, as suggested by the theories, may have a positive effect on the export and internationalization of firms. However, in the case of emerging economies (the Brazilian case), the patterns of internationalization is mainly driven by local and regional factor endowments, based in large extent by natural resources and labor intensive industries. These local advantages may have higher impacts on the export performance of firms. However, we also suggest that in the case of Brazil the relationship between innovation and export performance and internationalization is rather pointing to reverse relationship, by which it is more likely that the internationalization of firms that drive innovation performance. This can be explained by the different opportunities firms can explore to transfer knowledge through their foreign subsidiaries, or through a mechanism of learning process when interacting with customers, suppliers and competitors in the global markets.

Effect of moderation of technological intensity

The model estimates show that the access to resources in clusters to obtain a heterogeneous export performance and innovations is uniform among industries, and that the level of technological intensity of the industry does not matter. The same can be observed in the relationship between cluster resources and innovation. Such effect seems to be homogeneous among different industries, as can be seen in Table 2 below.

Table 2

Effect of Moderation of Technology Intensity

	Low Tech. Int.		Average Tech. Int.		T-Student	
	Original Sample (O)	P-value	Original Sample (O)	P-value	T	P-value
Direct effect						
Cluster resources -->Export performance	0.271	0.070	0.345	0.046	0.317	0.752
Cluster resources -->Innovation	0.401	0.002	0.410	0.032	0.172	0.864
Innovation -->Export performance	0.111	0.559	0.250	0.147	0.533	0.595
Indirect effect						
Cluster resources -->Export performance	0.045	0.537	0.103	0.293	0.092	0.338

Note. Source: Research data.

These results suggest that industries with high or low knowledge intensity can benefit from shared resources of clusters to increase the export performance and innovations. In addition, neither industry benefit from innovations in products and processes to increase the export performance.

These evidences do not corroborate with the findings of the studies of J. Bell *et al.* (2004), J. L. Rodríguez and Rodríguez (2005) and Stoian *et al.* (2011), which shows the effect of technological intensity on export performance. We performed a Student T test, which certified that the average observed did not point to a statistically significant difference among the industries. Therefore, the hypothesis **The technological intensity of the sector moderates the relationship between cluster resources, innovation and export performance** (H5) cannot be supported. In contrast with other studies of developed economies, this evidence indicates similar benefits in cluster's resources for firms independently of industry and technological intensity.

Control variables

Besides the results presented by the general model of export performance determinants, we attempted to investigate whether there are control variables that may present constraints to the model. According to Figure 4, among all the control variables, only international experience was found positive and statistically significant at 10% with a loading factor of 0.411 (p-value = 0.076), as can be seen in the Figure 4. This finding indicates that experience in international markets has a direct effect on the export performance of firms in accordance with studies of Papadopoulos and Martín (2010) and Stoian *et al.* (2011). This result may suggest that firms with higher international experience, may benefit better from the regional clusters resources and the corresponding institutional, geographical, and network externalities.

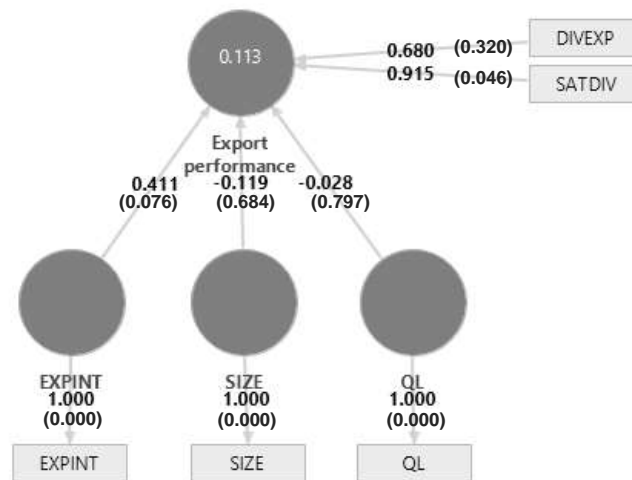


Figure 4. Effect of Control Variable

Source: Research data.

This evidence confirms that unlike the company's size and geographical agglomeration, the most experienced companies internationally access in greater intensity the cluster resources to get higher export performance. Therefore, the larger the international experience of firms, the higher its capacity to explore the positive impacts of economies of agglomeration on export performance.

Conclusion

This research investigates the relationships between clusters resources, innovation and export performance on different levels of technological intensity and pattern's control variables – international experience, location quotient and organizational size - with data from Brazilian companies.

The results of the structural modeling have demonstrated that the regional clusters resources are sources of new information, knowledge and other external resources of firm, and the access to these resources enables firms to become more competitive in the international scenario. Additionally, empirical evidence has shown that the regional clusters resources have been important source for firms obtaining innovations in product and process, in a complementary way with own firm resources (Hervás-Oliver & Albors-Garrigós, 2009). So, firms that access complementary resource in larger intensity have high export performance and innovations. Although the results are relatively limited by the size of sample and types of industries, it seems that the agglomeration economies can provide particular location bound advantages to support the internationalization of firms (export performance), as well as a mechanism for firms to access the different externalities related to industrial clusters to improve their innovativeness.

Since our sample is limited to manufacturing industries, we can conclude that in this case, the regional cluster externalities can, in some extent, provide additional advantages for firms to improve their productivities by having access to specialized and skilled labor force, as well by having access to different suppliers and related industries that may represent important sources for further improvement of productivity and innovation. Firms that can benefit from such externalities are more likely, through the mechanisms of agglomeration, to improve their export performance and enter different foreign market (foreign market diversification).

Despite the innovations in products and processes has been found positively correlated with the access to the cluster externalities, the direct effect of innovation on export performance was not statistically significant. This is in line with the findings of other studies, like Mais *et al.* (2014). This

finding can be explained in several ways. First, in the case of firms from emerging economies, their export performance is less related to their innovation capacity, and very likely to cost specific leaderships. In such case, the gains in transaction cost, and gains of productivity due to high agglomeration (downstream and upstream economy of scales) economies can contribute to sustain high performance in foreign markets. On the other hand, although regional cluster resources can provide incentives (institutional and industry related) to innovation for firms in the manufacturing industries, such innovations in products and processes are less likely to represent specific advantages to develop differentiation strategies in foreign markets. Therefore, such innovations are less export promoting factor.

Evidences were found that the relationships between constructs are not sensitive to technological intensity. So, companies with the high or low technological intensity can benefit from shared resources in clusters, thus increasing the innovation and export performance. Despite these results, our finding is constrained by the limitations of our sample. More research is necessary to distinguish between companies with high technological and low technological intensity using firm data.

On the other hand, international experience is an important driver that contributes to the export performance. Firms with higher export experience are more likely to benefit in greater extent from cluster resources as also highlighted by Papadopoulos and Martín (2010). This finding is relevant because companies achieve higher export performance gradually with experience in the foreign market. This may be an important contribution for International Business Literature. It seems that companies with high export performance (we also suppose companies with internationalization level) are very likely to access more intensively the cluster resources. This provides an important insight for the still strong correlation between export performance and the local source of competitiveness that support such internationalization.

These evidences show theoretical and practical implications. Regarding theoretical implications, this study contributes to the development of behavior perspective of international business area by revealing the experience of firms as an important driver of export performance (and internationalization) in an emergent context as well. Besides that, the cluster resources bring a new contribution to behavioral perspective of international business areas as an antecedent of export performance. Especially for emergent countries, the cluster externalities can be seen as valuable resource for firms to complement internal resources by raising competitive potential and entering new international markets.

This study also contributes to the approach of regional clusters to provide a scale validated for measurement of clusters resources. Here the cluster resource construct was classified into institutional, local and business networking resources. To extend the cluster approach, this study also points to a perspective of investigation that establish the complementary relationship between firm resources and location resources to innovation and export performance.

We suggest three major practical implications: First, the relationship of companies with external resources for the absorption of knowledge and development of internal resources; Second, the fundamental role of public policies to encourage the development of industrial clusters and strengthening of regions; and recognize that international experience of firms can help to get success in external market.

Considering that Brazilian managers perceived institutional resources relatively as less favorable to innovation and export performance, and recognize the asymmetric access to cluster's resources among firms (Hervás-Oliver & Albors-Garrigós, 2007), several questions remain important for future researches: (a) What is the relationship between innovation, network and export performance? (b) How local context, particularly institutional context, can moderate this relationship between cluster, innovation and export performance.

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APPENDIX A

Descriptive Statistics

Table A1

Industries

Industries	Frequency	Percentage	Cumulative percentage
Textile	29	29.00%	29.00%
Wood / Furniture	16	16.00%	45.00%
Metal	15	15.00%	60.00%
Metallurgical	12	12.00%	72.00%
Food	8	8.00%	80.00%
Electromechanical	7	7.00%	87.00%
Plastics	5	5.00%	92.00%
Non-metallic mineral	3	3.00%	95.00%
Paper / graphic	2	2.00%	97.00%
Chemistry	2	2.00%	99.00%
Footwear	1	1.00%	100.00%

Note. Source: Research data.

Table A2

Foundation (in Years)

Foundation	Frequency	Percentage	Cumulative percentage
Over 50 years	30	30.00%	30.00%
From 41 to 50 years	13	13.00%	43.00%
From 31 to 40 years	11	11.00%	54.00%
From 21 to 30 years	17	17.00%	71.00%
From 11 to 20 years	19	19.00%	90.00%
10 years old	10	10.00%	100.00%

Note. Source: Research data.

Table A3

Export Time (in Years)

Experience	Frequency	Percentage	Cumulative percentage
Over 50 years	4	4.00%	4.00%
From 41 to 50 years	8	8.00%	12.00%
From 31 to 40 years	10	10.00%	22.00%
From 21 to 30 years	14	14.00%	36.00%
From 11 to 20 years	31	31.00%	67.00%
10 years old	33	33.00%	100.00%

Note. Source: Research data.

Table A4

Technological Intensity - OECD (2003)

Intensity	Frequency	Percentage	Cumulative percentage
High	0	0.00%	0.00%
Medium-High	8	8.00%	8.00%
Medium-Low	25	25.00%	33.00%
Low	67	67.00%	100.00%

Note. Source: Research data.

APPENDIX B

Confirmatory Factor Analysis

Table B1

Technological Intensity – OECD (2003)

Variable	Construct 2 ^a order	Standard load	R ²	Cronbach's alpha	AVE	Composite reability	P-value
RINST1	<--- Institutional resource	0.865	0.748	0.863	0.785	0.916	***
RINST2	<--- Institutional resource	0.887	0.787				***
RINST3	<--- Institutional resource	0.905	0.819				***
RDLOC5	<--- Local resource	0.813	0.661	0.863	0.646	0.901	***
RDLOC4	<--- Local resource	0.793	0.629				***
RDLOC3	<--- Local resource	0.823	0.677				***
RDLOC2	<--- Local resource	0.828	0.686				***
RDLOC1	<--- Local resource	0.760	0.578				***
RRDNG6	<--- Business network resource	0.558	0.311	0.852	0.582	0.892	***
RRDNG5	<--- Business network resource	0.749	0.561				***
RRDNG4	<--- Business network resource	0.793	0.629				***
RRDNG3	<--- Business network resource	0.771	0.594				***
RRDNG2	<--- Business network resource	0.826	0.682				***
RRDNG1	<--- Business network resource	0.844	0.712				***
INPRD1	<--- Product innovation	0.766	0.587	0.867	0.657	0.905	***
INPRD2	<--- Product innovation	0.679	0.461				***
INPRD3	<--- Product innovation	0.859	0.738				***
INPRD4	<--- Product innovation	0.886	0.785				***
INPRD5	<--- Product innovation	0.844	0.712				***
INPRC1	<--- Process innovation	0.865	0.748	0.895	0.705	0.923	***
INPRC2	<--- Process innovation	0.824	0.679				***
INPRC3	<--- Process innovation	0.859	0.738				***
INPRC4	<--- Process innovation	0.818	0.669				***
INPRC5	<--- Process innovation	0.830	0.689				***
INTEXP	<--- Export performance	0.038	0.001	0	0	0	0.125
SATEXP	<--- Export performance	0.353	0.125				0.595
DIVEXP	<--- Export performance	0.830	0.689				0.000
SATDIV	<--- Export performance	0.679	0.461				0.029

Note. Source: Research data.

* $p\text{-value} < 0.10$; ** $p\text{-value} < 0.05$; *** $p\text{-value} < 0.01$.