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The innovation strategy in the exports of Colombian Firms: A Resource Base View

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Abstract

On theory the internationalization of firms are the combinations of macro level and micro level specific resources. This research is aiming to understand the relationship between the technological innovation of firms (R&D, new processes product upgrade and new products/services) and the internalization by exports, to find which technological innovation increase the amount of export on the Colombian firms. The study support previously examined relationships between R&D (both internal and external), product, process innovations, and the degree of (export intensity) and advance on contemplating the internal and external exports. Empirical analyses carried out on this relationship provide useful implications for innovation policies i.e. public supports that aim at stimulating innovation performance and at encouraging innovative efforts in Colombian firms.

Keywords: technological resources, innovations, R&D, Colombia.

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Introduction

The role of innovation has been one of the keys for companies to keep competitive against other companies within different markets (internationalizations). Innovation plays, in concert with internationalization, a key role on the company's competitive advantage. These are not derived exclusively from the products and services per se that the firm sells, but the organization's capability to constantly innovate, cleverly market and continuously learn and implement knowledge to improve their products, which will be a determinant factor in the achievement of their targets. In different literature we have seen innovation and internationalization as two main sources of companies' competitive advantages (Filatotchev et al. 2009; Zucchella et al. 2007; Denicolai et al. 2015). Recently, researchers have found different results on the impact that innovation has on the export and the internationalization of companies. Some of those detected a positive result like (Gourlay et al. 2005; Lopez et al., 2005; Wang et al. 2013 ; Yi et al. 2013). However, the negative impact of these factors on the exports has also been studied and documented on researches such as (Harris et al., 2009; Love et al., 2009; Zhao et al., 2002). On the last decades we have observed a considerable increase on the firms' participation of developing economies among different activities adding a considerable added value to the chains. According to the World Trade Organization (2018), the share of emerging countries in total world exports increased from 31% in 2000 to over 43% in 2016.

The increase on the exports is also tightly linked to the flexibilization of the policies implemented by some developing economies. Small and medium sized companies in countries such as Colombia have been benefiting from the change on the local environment of doing business as it can be noticed on the increase of the domestic value added (henceforth D.V.A.). This represents, indeed, an important percentage of the income from trade in a country's exports and thus acts as an important guideline for policy development (Caraballo et al., 2016), we can observe that Colombia is the second country in the world with a 91.1% of D.V.A. in gross exports (OECD, 2018). Namely, the high country's volume of exports is not necessarily reflected in its economic growth as it was in the past, since only the domestic part of the country's total exports contributes to its GDP. (UNCTAD, 2013). Although, in the last years we have seen a clear increase of the opportunities in local and international markets, we have seen a furious competition in the domestic markets as it is the case of developing countries which have opted to reduce their margins. As a result, the reduction of this dependence could potentially put their future at risk, by doing so, they try to go to other markets to reduce that dependency[1]. That is the reason why innovation has come to the fore as an important factor to be able to diversify and report better performances in exports.[2] Even dough there is an improvement on the Colombian firm performance, the firms should align their innovation strategies with the local context. There is an existing gap on the empirical research regarding which type of innovation should Colombian firms use to increase their exports base on a technological innovation.

[1] John Child and Suzana B. Rodrigues, 2005, The Internationalization of Chinese Firms: A Case for Theoretical Extension?

[2] Gorodnichenko, Y., J. Svejnar, and K. Terrell. 2010. Globalization and innovation in emerging markets.American Economic Journal: Macroeconomics 2 (2): 194–22

Literature Review

There is ample research on the macroeconomic level explaining the relationship between country's export and the innovation/creativity. Researches had uniformly agree on the correlation on the nations exports are positively associated with its Knowledge accumulation/innovative activities (for more recent studies see Fagerberg, 1988; Greenhalgh, 1990; Verspagen et al. 1997; Narula et al., 1998; Leon-Ledesma, 2005; DiPietro et al., 2006; and Salim et al., 2009)[3] In 1991, with Barneys Resource Base View (RBV), a sustainable competitive advantage is based on intangible resources from the firm that unique and hard for other companies to copy or imitate. Among the different resources that a company can have, the technological resources are key, as technological resources are considered the ones with greatest value in the firms, with those the company can create innovative capabilities that leverage their knowledge to keep competing in a market that is constantly changing on economic, political and technologies with shorter product cycle life. (Cho et al. 2005; Lopez et al. 2005). Innovation implies newness and it is understood as a multidimensional process (Chetty et al. 2010). Additionally, innovation is considered to be an important source of competitive advantage for firms to compete in the global market as product innovation enables to the competitive advantage in foreign markets (Pla-Barber et al. 2007; Acs et al 2008). Firms are trying to achieve competitive advantage in order to help them obtain a better and a stable position in the marketplace through innovation (Ramadani et al. 2011). All different types of innovation imply a sort of competitive advantage, while the companies have to be able to exploit the benefits of innovation with a sufficient degree of internationalization (Kafourus et al. 2008; Kylläheiko et al. 2011; Mlakar and Ruzzier 2011). [4]

According to López Rodríguez and García Rodríguez (2005), the firm can obtain two competitive advantages through innovation. In one hand lowering costs by creating new and more efficient production processes, and product innovations through the creation and introduction of new products and technologies, develop a market niche with new products/services, differentiate themselves and/or substitute incumbents with better quality, cheaper prices or other means that customers value (Richard et al., 2009; Wiklund et al. 2005, D'Angelo 2012 ; Filipescu et al. 2009 ; Lopez et al. 2005 ; Prange and Bruyaka 2016). In accordance with this, Cassiman and Golovko (2011) among others, claim that product or service technological innovations allows a firm to compete more effectively against local and foreign rivals lead to internationalization. Innovation could be defined as when the firm capture a new opportunity on the market and starts a process for a product or service which will lead to a new development using their technological resources (OECD, 1991), which leads to development, production and marketing tasks, in other words is the generation, acceptance and implementation of creative ideas within an organization (Hurley et al, 1998). Not every innovation has to create something new in some cases companies improve their product or technologies, so the implementation of an innovative product or service does not automatically imply highly innovative firms (Garcia et al 2002, p. 117).

[3] R&D, Innovation and Exporting Richard Harris (SERC, CPPR, University of Glasgow) John Moffat (SERC, CPPR, University of Glasgow) 2011

[4] Mitja Ruzzier & Jana Hojnik & Aleš Lipnik, 2013. Relationship between Innovation and Internationalization of Slovenian Internationalized Companies, MIC 2013: Industry, Science and Policy Makers for Sustainable Future; Proceedings of the 14th International Conference, Koper, 21–23 November 2013

There is also well-documented evidence on how the size of firms affects the probability of entering foreign markets, as larger firms are expected to have more (technological) resources available, financial and non-financial capabilities for starting export activities (Aw et al, 1995; Roberts et al., 1997; Bleane et al., 2002; Cassiman et al., 2007; Gourlay, 2004; Kneller et al., 2007; Iyer, 2010, to name just a few). On the side of the innovation perspective, large sized firms have to innovate more, with the emphasis on process innovation. Considering that SMEs suffer from the structural phenomenon labelled 'liability of smallness' (Gassmann et a., 2007) they cannot be presumed to be well endowed with tangible assets. This assumption could be justified on the grounds that larger firms (*cet. par*.) are better tuned to exploit economies of scale and scope in the process of conducting R&D (Schumpeter, 1950; Cohen et al., 1989). Another reason for expecting a positive relationship between size and R&D is if size allows the spreading of fixed costs and risk over output (Cohen et al., 1996; Legge 2000).

Different studies have shown that technology capabilities and innovations are pushing companies to export. Salomon and Shaver (2005) found evidence that investments in research and development affect the export performance. Pla-Barber and Alegre 2007 have found a positive link between innovation and the intension to export, Chih-Hai et al., 2004 have found that R&D, technology importing, and training investments all have positive effects on the export decision for small and medium sized enterprises in Taiwan. We can see that the introduction of new technology in some cases takes the firm to offer a new product/service or enhancing a given production process that in turn facilitates competitive advantage in both local and international markets. However, some companies do not only require internal technological resources like R&D, parallel to that they might need extra capacities on their innovation strategy. It can be complemented with licensing agreement, contracting external R&D, M&A of other firms or hiring specialist (Rigby et al. 2002). In general, scholars agree as to the accelerating effect of external technology acquisition on the innovation development process, which in turn provides companies with a greater competitive advantage and improved export performance (Leone et al., 2012; Wang et al. 2013).

The positive effect of innovation, through internal or external R&D (inputs) or the introduction of new product/s or process/es (outputs) on export performance is commonly accepted by different researchers. Caldera (2010), on his research using data from the ESEE–Spain, emphasized a positive effect of firm innovation on the probability of participation in export markets. Also, Basile (2001) found that Italian firms that have process and product innovations are more likely to start with exporting. López Rodríguez and García Rodríguez (2005) using a sample from manufacture in Spain found that product innovations, patents and process innovations have positive and significant effects on both the decision to export and international business intensity. Cassiman and Golovko (2011) emphasize that product innovation improves productivity levels, which pushes firms to enter the export markets, as well as being directly related to the probability of export in a firm's operations. While the studies by Cavusgil and Naor (1987) and Alonso and Donoso (1994) do not find statistical evidence as regards this relation. There are also some controversial and negative effects like, the one on Roper and Love (2002) where levels of innovation intensity are higher but the proportion of sales attributable to new products is lower, there is some evidence of a negative relationship between the scale of innovation activity and export performance. Damijan, Kostevc, and Polanec (2008) on companies in Slovenia, they did not find any significant relation between the innovation of product and the propensity to export.

Since in most of the empirical studies there exists a positive and significant relation on the technological resources (input/output) on the exports of a firm, we raise the following hypotheses:

H1.1: The *technological innovation input, internal and external Research & Development has a positive effect on the degree on internationalization.*
H1.2: The *technological innovation output, product/service and process innovation has a positive effect on the degree on internationalization.*

Research Methodology

The OECD determined as a basis for the measurement and interpretation of development and technological innovation, the Oslo Manual: Guide for the collection and interpretation of data on innovation (2005). Likewise, the Frascati Manual (OECD, 2002) as a proposal for a practical standard for research and experimental development surveys, gives some recommendations and methodological guidelines, especially to improve R & D statistics. In the case of developing countries, the Ibero-American Network of Researchers on Science and Technology (RICYT) designed the Bogotá Manual. With the conceptual and methodological orientation of these manuals, countries can measure, under conditions of international comparability, variables that directly and indirectly affect the creation of new products, processes, marketing techniques and forms of organization, and / or their substantial improvement, as well as the impact on the economy of the countries.

Based on the above references, in the Survey Development and Technological Innovation - EDIT, technological development and innovation refer to a spectrum of own achievements of companies competing in an economy with defined borders, where innovation includes the set of new or significantly improved products (goods or services) introduced to the market; new or significantly improved processes implemented in the production of the company; new organizational methods, or new marketing techniques, applied in the respective operations of the company. The EDIT Manufacturing Industry is a biennial survey, that is to say that the reference period corresponds to the two years immediately prior to the data collection, which goes from the first day of January 2015 until December 31 of 2016.

The main indicators and / or results established and the one used on this research are: Number of innovations carried out by industrial companies, according to type of innovation., Number of companies that rated the importance of innovations carried out by industrial companies, and of the obstacles when innovating. The distribution of the total amount invested by the companies in scientific, technological and innovation activities, according to: type of activity developed, type of capital of the companies and type of innovation in each year of the reference period. The number of people employed by the company by the highest level of education attained, in each year of the reference period. The number of industrial companies that cooperated with different partners in the realization of innovated activities, according to type of partner and type of innovation. The number of intellectual property registrations and quality certifications; according to type of registration and type of certificate.

This research takes as a framework the census of industrial companies that have establishments with 10 or more employed persons or that, failing that, register an annual production value equal to or greater than a value that is specified for each reference year

corresponding to the directory of companies of the Annual Manufacturing Survey (EAM). The statistical operation that is developed is of the Census type, since all the industrial companies that meet the inclusion parameters determined for the universe of study are taken. The EDIT includes a geographical coverage of the national total. The disaggregation with which the results are delivered is at the national level. The statistical operation uses the International Standard Industrial Classification to characterize companies according to their economic activity. For the publication of the EDIT Manufacturing Industry for its eighth version, period 2015-2016, the classification ISIC Rev. (four-digit code) 4, A.C., was used. The next variables were taken from the survey to show some of factors to be considered on our data

Variables:

Dependent variable The primary internationalization strategy for SME is exports, and this has three dimensions according to different studies: geographic scope, degree or scale (intensity), and speed (Wolf et al., 2000, Zucchella et al. 2007) The Internationalization it will be measure by the export intense or degree of internalization, that is represented by the percentage of total exports(indirect/direct) over the total sales. Considering the research from He (2013), firms in developing countries tent to not export directly and the use other agency's or cluster to run their exports, therefore the study considers both indirect and direct export by the amounts from enterprise survey.

Independent Variables:

Technological innovation:

Regarding Filipescu (et al. 2013) and López and García (2005) there are 3 types of technological innovation that we can identify in the firms between input and outputs: Research and Development intensity, that is measure by the expenditures that company made through a year over the total sales, this can be seen by different strategies on the firm, when they do it inside or when they acquire technology outside or create collaboration with partners. Second, Process innovation where the company change the operations and production to make it more efficient, this could be divided by 3 mains streams a) methods of manufacturing goods or offering services; b) logistics, delivery, or distribution methods for inputs, products, or services; and c) supporting activities such as maintenance systems or operations for purchasing, accounting, or computing. Third the product innovation where the introduction or upgrading of a new product or service, significant improvements include capabilities or new functions, technical specifications, components and materials, incorporate software and user friendliness. From the enterprise survey we use different type of question made to firms regarding technological innovation and their decision during 2 years. All question answered by yes/no where they take value of 1 if yes, they took innovation or no with value 0. This will help us to collaborate our hypothesis on how the innovation affect the degree of internationalization of small and medium firms.

An innovation is defined in this survey and under the Oslo Manual (OECD, 2005), as a new or significantly improved product (good or service) introduced in the market, or a new or significantly improved process introduced in the company, or a new organizational method introduced in the company, or a new marketing technique introduced in the company: a) an innovation is always new for the company. It is not necessary to be new in the market in which the company operates, b) changes of an aesthetic nature, and simple changes in organization or management do not count as innovation, c) both the goods and the services that the company introduces to the company, are considered as products. Services, unlike

goods, are usually intangible or difficult to store and their production and marketing processes can occur simultaneously, d) the supply of a service can have as a complement, or require support, the supply of a good; and in reverse. The companies Indicated whether during the period 2015 and 2016 introduced any of the following innovations. YES = 1 NO = 0.

1. New goods or services for the company, the national market or the international market.
2. Goods or services significantly improved for the company, the national market or the international market.
3. New or significantly improved methods of production, distribution, delivery, or logistics systems, implemented in the company, New organizational methods or marketing techniques

The companies Indicate the value invested in 2015 and 2016, in each of the following scientific, technological and innovation activities, for the introduction of new or significantly improved goods or services, and / or the implementation of new or significantly significant processes improvements, new organizational methods, or new marketing techniques. The following values were transformed to take values of 1 if they invested or 0 otherwise.

Internal R & D activities
Systematic creation works carried out within the company in order to increase the volume of knowledge and its use to devise and validate new or significantly improved services, goods or processes. (Corresponds only to the investment amounts associated with the research and development stage, prior to the production of new or significantly improved services, goods or processes).

Acquisition of R & D (external)
Acquisition or financing of the same activities as those indicated above (R & D internal) but carried out by other public or private organizations (includes research organizations).

Control variables:
This research will control the next variables base on the empirical literature: firm size, industry type, firm age, and ownership.

Industry type: According to Lopez (2005) is an important factor as can influence the company's decision on investment or the profit to start with technological actions. The export industry is characterized by a use of intensive knowledge and technologies capabilities to produce more goods that others. Due to the local intense competition, small firms have to find new niche market abroad. This variable will be control by type of industry in the ISIC 4 classification, expecting a positive impact on the export degree.

Firm size: As it was mentioned before, the "liability of smallness" limit the access to key resource as financial, making the need to be more innovated and flexible, increasing the chance to become an exporter. Also, a higher number of employees implies that the company has more knowledge and experience that can also increase the chances to export (Shirokova et al. 2013), by that using a logarithm on the number of employees, the effect should be negative on the exports.

Tax incentive: Arbeláez and Parra (2011) consider that public financing is highly relevant for investment in innovation and R&D and that public instruments are effective promoters of total innovation. Singapore and Ireland, for their part, stand out for their long-term focus and commitment, proactivity in the allocation of financial incentives, and for the high salary remuneration of public officials, which has improved the prioritization of strategies, the transparency of the processes, and the effectiveness of its results. In Colombia, Law 1429 of 2010, regulated by Decree 4910 of 2011, established a series of tax benefits for small businesses, in order to promote the formalization and generation of employment, therefore we expect a positive direction on this variable.

Companies belonging to a conglomerate: On the other hand, the companies that belong to a group perceive with less intensity the obstacles to innovation. Especially in relation to those related to costs and knowledge, since it is possible that the parent companies can offer their subsidiaries facilities to access financial resources and international markets (Desai, Foley and Forbes, 2008; D`Este et al., 2012b). Firms belonging to a business group are expected to be more likely to export, since the group allows firms to overcome the problem of lacking resources necessary to export, such as finance, physical or human capital. Moreover, if business group is international, the firm could easier surpass the barriers early mentioned (Roper et al. 2006). In our analysis we used a dichotomous variable, which takes the value 1 in case the company belongs to a foreign or national group and 0 otherwise.

Tabla 1 the TI	Base	model_2	model_3	model_4	model_5	model_6	model_7
VARIABLES	DOI	DOI	DOI	DOI	DOI	DOI	DOI
Rd Internal		2.1382***					2.4461***
		(0.6972)					(0.6894)
Rd External			9.1282				9.4964
			(7.7530)				(6.4180)
New product				-2.2863			-2.7151
				(1.8919)			(1.9281)
Improve product					-3.0070		-3.8012*
					(2.0499)		(2.0214)
New process						-0.1122	-0.1028
						(1.9407)	(1.9017)
Firm Size_ln	-3.8415***	-3.1677**	-3.7563***	-3.6701***	-3.6912***	-3.8377***	-2.5850**
	(1.2697)	(1.2578)	(1.2680)	(1.2764)	(1.2755)	(1.2793)	(1.2582)
Tax benefit	3.5315**	2.9123*	3.5777**	3.6927**	3.7752**	3.5383**	3.3767*
	(1.6895)	(1.7393)	(1.6950)	(1.6938)	(1.6852)	(1.6876)	(1.7245)
Conglomerate	12.4483**	11.6727**	11.6879**	12.6832**	13.1391**	12.4570**	11.9302**
	(5.4050)	(5.3092)	(5.5763)	(5.4145)	(5.3943)	(5.4006)	(5.3810)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	34.5718***	32.2374***	33.8510***	34.3788***	34.3544***	34.6415***	30.7112***
	(6.8791)	(6.8233)	(6.8556)	(6.8718)	(6.8899)	(6.9995)	(6.8810)
Observations	520	520	520	520	520	520	520
R-squared	0.0491	0.0696	0.0516	0.0515	0.0529	0.0491	0.0827

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Analysis and Results

Running a Pearson correlation on the variables we found a medium correlation between some of independent variables and the dependent variable, Correlations between dummy variables were tested by contingency tables with Chi-squared tests. To test the relationship between continuous and dummy variables, we applied ANOVA statistical analyses. The variability of a variable is unequal across the range of values we develop hierarchical linear regressions with robust errors having on consideration an industry fixed effect (FE) in all of our models. In order to check for multicollinearity, we run a VIF test for every technological innovation variable separate (new product, improve produce, new processes, internal R&D and external R&D). In order to check the explanatory of each independent variable and to avoid multicollinearity we start by running the model with only control variables as "Base model".

For inputs and outputs, we check separate each technological innovation on export intensity to avoid multicollinearity of independent variables that measure innovative technological behavior (main effect) .The baseline models include only control variables and are aimed at testing whether the addition of the independent variables adds further explanatory power to the model. The results of the regression analysis, particularly the increasing adjusted R-squares, show that the explanatory power of the estimated models increases with the addition of the independent variables and interaction terms.

Hypotheses test:

For each type of technological innovation (both inputs and outputs), the main effects models represent the direct effects on export intensity of independent variables that measure innovative technological behavior, apart from the effects of controls. In order to test our hypothesis1.1 and 1.2 we use the same model, adding an independent variable of a R&D internal and external, respectively, to see the effect on the export intensity. The results of the regression analysis, particularly the increasing adjusted R-squares, show that the explanatory power of the estimated models increases with the addition of the independent variables and interaction terms. For the output we also run a regression with base model (only control variables) and the independent variable (new product, improve product and new process.

Research and Development Internal and External:

On table 1, For internal R&D shows a positive and significant effect for DOI in the main effect, confirming different researchers with the same result on developing countries. For the H1.2 we found a positive effect but is not significant on the DOI, so we reject the hypothesis. For the control variables we found that for the number of employees has a negative and significant effect and the tax benefit and partner also maintain a constant positive effect on internal and external R&D on both DOI and LN of exports.

Technological innovation outputs

Contrary to our expectation we found that regarding the hypothesis about the outputs (New Product, improve product and new process), we observe a negative effect on all of them and non-significant effect on either of those, so we reject H1.2. We also check the all the technological innovation variables together and we found that R&D internal and Improved produce are significant, below we will analyst this result deeper. For the control variables we found that for the number of employees has a negative and significant effect and the tax

benefit and partner also maintain a constant positive effect on internal and external R&D on both DOI and LN of exports.

Conclusion and Analysis

Different indicator and measurements were used to explore and analysis the impact that technological inputs and outputs innovation has on the degree of internationalization (also confirmed with the natural log of exports) among manufacturing exporter in Colombia. As we expected the R&D intensity is positive and significant for internal R&D on the effect on the DOI (as measured by the ratio of export sales to total sales) in Colombian companies, therefore we confirmed H 1.1. These results are confirmed by earlier studies, which focus on firm innovative behavior export performance relationship (Lopez and Garcia 2005; Pla and Alegre 2007; Ganotakis and Love 2011; D'Angelo 2012; Wang et. Al. (2013). Chih-Hai Yang et. Al(2004) concludes that the impact of R&D is significantly positive on export propensity in all SMEs, while the role of technology imports and training investment are evidenced for only small firms, implying that external technological sources and other R&D-related activities are particularly important on the formation of technological capability for small firms. Signh (2009) also found that R&D expenditure and business group affiliation positively affect export sales. Banri Ito & Ayumu Tanaka, 2016, suggest that the external R&D strategy is complementary to the in-house R&D strategy and is crucial for promoting the innovations of internationalized firms. Some studies say that the empirical results indicate that external technology acquisitions positively influence Chinese firms' export performance. Moreover, the exporting performance of using external technology varies depending on the sources (domestic and foreign). The exporting firms that acquired technology from foreign countries outperformed those relied on domestically developed technology".

Regarding with the technological innovation outputs, for introducing a new product, improve product or having a new process there is not a significant effect on the DOI, then we have to reject the H 2.1, H2.2, H2.3, but we have to have in mind that in the New product the direction is constantly negative. Some other researcher in developing countries like (Zhao and Zou 2002) show that the negative effects from some of the technological effects on the DOI can be due to an import substitution, as the local companies can increase the competitiveness and market share in the local market by innovating, then the firms can compete more successfully in terms of product diversification and/or lower production cost in the local market. In some developing countries like china this is supported by the local demand for new products or improve products and services has increased heavily due to major changes in governmental policy stimulating local consumption, companies may have started selling more in the local market. Therefore, the export intensity could decrease. We can see a similar behavior in Colombian policy, the increasing amount of middle class with higher Purchasing power parity.

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