Distance to the Core, Productivity and Selection of Export Products-Destinations

Cardoso-Vargas, Carlos Enrique

January 2017

Distance to the Core, Productivity and Selection of Export Products-Destinations

Carlos-Enrique Cardoso-Vargas*

This version, January 2017

Abstract

This document examines and quantifies the effect that productivity and firm-internal selection have on the sale of new products to new destinations To quantify the influence of the firm-internal selection, we used a measurement of distance to the core which reflects, by means of an index, the degree that commercial distance merchandise sold has vis-à-vis the core product. The results show that decreasing the distance for products far from the core would require a great deal of effort on the part of firms in terms of quality or cost. It was also determined that if the distance between a product to be exported and the core product is doubled, its probability of generating a new product-country commercial link decreases 7.72 percentage points. That possibility decreases even further to destinations with consumers with high purchasing power. In the internal selection made by companies with regard to their products, there are factors influencing the selection of merchandise other than the core product. They move in opposite directions. On the one hand, there is a positive effect emanating from productivity and firm size, as well as an opposite effect due to market access and core-product price. The findings have implication for the possibilities of diversifying markets and expanding export-product portfolios.

Key words: international trade, heterogeneity of firms, behavior of companies

JEL Classification: F14, F13, D21

* Director of Tax Policy at the Secretary of Finance of Mexico City. The author is thankful for the valuable comments and recommendations by two anonymous reviewers and by Ana Miriam Chavarin. Moreover, he owes a debt of gratitude to Gerardo Durand and Gabriel Romero from the *Instituto Nacional de Estadística y Geografía (INEGI)* and to the personnel of the *Secretaría de Economía* for access to the data used in elaborating this document, which was rendered anonymous so as to comply with the requisites of confidentiality set forth by Mexican law. The points of view and conclusions presented are the exclusive responsibility of the author.

Distance to the Core, Productivity and Selection of Export Products-Destinations

Although a strategy of diversifying export markets is nothing new, it is one of the key topics on the public-policy agendas of both developed and developing countries. At present, it is widely accepted that having an ample portfolio of destination counties helps attenuate the volatility of export revenues (Haddad et al. 2009), in addition to a stable flow of foreign resources having an impact on higher levels of growth in countries (Hesse, 2009). Moreover, broad access to different foreign markets contributes to exporting firms´ realization that they can generate positive externalities for the rest of the domestic firms (Al-Marhubi, 2000).

A wide range of research has shown that firms' size and productivity plays a relevant role in their entry into export activities (Bernard and Jensen, 1995; Robert and Tybout, 1997; Bernard and Jensen, 1999; Bernard et al., 2007). These findings have been taken up again by Melitz (2003) to show that the relationship between productivity and exports is the result of a self-selection process in which only the most productive firms are capable to overcome the high entry costs involved with exporting.

Recent studies that examine firms' export decisions find that differences in firms´ productivity are a factor explaining the number of export markets that can be served (Lawless, 2009). Firms begin selling to a single destination abroad and, should they survive, gradually increase their commercial transactions to other marketplaces, where the geographical pattern of expansion and survival depends on the first country exported to (Eaton et al., 2008). Such entry and exit behavior by companies into a particular export market may be related to shocks in their productivity (Arkolakis, 2011). Thus, firms' productivity may explain a great deal of the observed variation in exporters´ share of different markets (Eaton et al., 2011).

While the theoretical and empirical literature on heterogeneous firms has underscored the self-selection of firms in foreign marketplaces, models for heterogeneous multi-product firms, in turn, also emphasize the within-firm selection of products across destinations. These models establishes that firms have product-specific competencies permitting them to produce certain goods (*core products*) more successfully than other products, be it in terms of efficiency (Eckel and Neary, 2010; Arkolaki et al., 2014; Mayer et al., 2014) or quality (Manova and Zhang, 2012; Eckel et al., 2015).

These core products account for a high percentage of company exports (Bernard et al., 2011), while the rest of the goods (*fringe products*) produced are commercialized to a lesser degree and, therefore, are more susceptible to being discontinued (Iacovone and Javorcik, 2010). These differences may be related to tougher competition in an export market inducing a firm to skew its export sales toward its best-performing products (Mayer et al., 2014).

These new findings reflect that, in decisions on diversifying a product-country portfolio, not only is the self-selection of companies in foreign marketplaces involved, but also the within-firm selection of products and destinations.

In this document, we analyze and quantify the effect of productivity and firm-internal selection on selling new products to new destinations. To quantify the influence of firm-internal selection, we

created a measure of distance to the core, which, by an index, reflects the degree of commercial remoteness of the merchandise sold vis-à-vis the core product.

As a starting point, we look into the influence that distance to the core and productivity have on export prices for merchandise, both in firms competing on cost as well as on quality. Then, we examine the effect distance to the core and productivity have on the firms´ capacity to create new commercial links and, finally, the role played by productivity and export prices in choosing a product to be sold, and also the markets.

These aspects are relevant because of their implication for economic policy. One of the major factors in getting more new products to new destinations is the difference existing between the core product and the rest of the products exported, since the latter may be priced so as not to compete successfully in other marketplaces. According to this logic, reducing the gap between the core product and the rest of the goods would be desirable. However, if the effort required by firms is too great in terms of efficiency or quality, it would be more feasible to reallocate resources to the core product or goods quite close to it and base strategy on this nucleus of products to expand product-destination commercial links.

Though interesting to know about what commercial destination is the most probable for exported merchandise to generate new commercial transactions, even more so is the possibility of distinguishing the probability that different goods from firms have with regard to their distance from the core product. Moreover, understanding the factors affecting companies' selection of a product and the destination permits public-policy designers to understand to what degree there are possibilities of market diversification and to extend their export-product portfolio.

As a guideline for analysis, we developed a partial-equilibrium heterogeneous-firm model based on Melitz (2003), characterizing two strands of the literature. The first is that the efficiency of firms decreases as products are further from the core (Bernard et al., 2011; Mayer et al., 2014; Arkolakis et al., 2014) and the second is that quality decreases as distance from the core increases (Chen and Juvenal, 2016). This model yields two testable predictions to be evaluated empirically. For the first prediction, we follow Eckel et al. (2015), distinguishing firms competing in quality, as those producing in sectors of differentiated goods, from firms doing so in cost, as producers of homogeneous goods.

In this document, we use a large database that combines export flows at the level of firm-product-country and product data from 2004-2010, the result of merging data from Mexican customs and a sampling of (non-*maquiladora*) manufacturing firms in Mexico that was gathered by the Instituto Nacional de Estadística y Geografía (INEGI) in its Annual Industry Survey (*Encuesta Industria Anual*). The advantage of this source of information is that it adequately reflects the link between productivity and export activity, as set forth in the theoretical model employed.

Mexico represents an interesting case for this evaluation, not only because of the importance of its exports internationally,[1] but also because it is an economy whose sales abroad represent close to 30% of GDP),[2] in addition to more than 80% being concentrated in the neighboring U.S.[3]

[1] The World Trade Organization classified it 14th among principal exporters worldwide, above the developed economies of Spain, Australia and Switzerland, as well as Latin America's principal exporter.

[2] Mexican exports came to represent 25.4% of GDP in 2003, and 30.0% in 2010 (World Bank, 2013).

Therefore, this document contributes to the empirical literature in several ways: it quantifies the effect of distance to the core and productivity on the price of goods exported. Concretely, we find that, for companies competing on the basis of quality, doubling their productivity would raise the relative price of exported products 14.7%. Meanwhile, a similar increase in the magnitude in the productivity of firms competing in costs would bring about a 7.8% decrease in the relative price. When we consider only new products sold, the percentage goes up in the first case and goes down in the second. We also observe that differentiated products located in the 90th percentile vis-à-vis those located in the 10th have a price 55.3% lower.

Generally speaking, if the distance between a product to be exported and the core product is doubled, its probability of generating a new commercial product-country link decreases 7.72 percentage points. Moreover, creating a commercial transaction is less probable if the product is rather far from the core in commercial areas consisting of a large number of consumers, compared to other marketplaces. This finding is repeated when distinguishing between countries having high purchasing power and those that do not. In tune with this explanation, when we take into account price, we observe that products with a high relative price are inclined to generate new product-country combinations, especially in very large marketplaces.

Finally, companies with more productivity and bigger size may opt to choose to sell goods well beyond their core product. However consumer demand and product prices are decisive elements in the internal selection made by the company as to products and destinations

In light of these findings, the diversification of the product-country portfolio, it would seem, could appear different ways. The first, by commercializing products with lower quality or efficiency in less-competitive marketplaces, though firms would probably obtain fewer profits as to sales of their core product by implementing this strategy. The second would be by focusing efforts on products quite close to the core, which would imply reallocating resources toward those products and discontinuing remaining goods. This last option could allow firms to get into other markets and successfully compete in those with high-income consumers. However, because of their proximity to the U.S., it is quite possible that sales would be directed to that market, thereby eroding part of the efforts at diversifying sales destinations and increasing concentration on said market all the more.

Another would be to increase productivity and firm size for the purpose of increasing efficiency or the quality of the different products offered abroad. However, this strategy could result paradoxical. In virtue of the fact firms would be capable of increasing the number of products they could sell abroad, but the main destination would likewise probably be the market consisting of the U.S. and Canada. Therefore, this type of strategy must be accompanied by incentives reducing costs for companies and increasing their access to other large marketplaces. Otherwise, the results would be slight in terms of diversification.

This study is structured in the following manner: in Section II, we describe the related literature; in Section III, we develop a model and derive the predictions to be evaluated; in Section IV, we

[3] During the period 2003-2010, sales to the U.S. averaged 83% of total exports. Of the remaining 17% of sales abroad, 15% was concentrated into 40 destination markets and 2% was made up of exports to 196 other countries (INEGI, 2012).

describe constructing the database, variables and empirical approximation used; Section V is used to describe the findings of the evaluation; and, finally, in Section VI, we present our conclusions.

II. Related Literature

This study is related to various aspects of the literature. First of all, it related to models of heterogeneous firms (Lawless, 2009; Eaton et al., 2008; Arkolakis, 2011; Eaton et al., 2011, which follow the seminal study of Melitz (2003), showing the relationship between the productivity of firms and the patterns of commerce observed. These studies document that the differences in the productivity of firms permit explaining many aspects related to exporters´ entry in different marketplaces. On this issue, the theoretical model developed in this manuscript is consistent with these studies, since only the most productive firms have the capacity to face up to the fixed costs implied in their entry into exporting activity. In addition, the existence of different levels of productivity between firms and destination-specific transport costs implicitly determine the markets companies can serve.

This study is likewise related to recent publications that have gone into firms´ export behavior, considering multi-product and multi-destination companies. Some of the research has explored the hypothesis that companies have a core competency permitting them to produce certain goods (*core products*) more successfully. This idea and the use of detailed information on commercial flows at a product level allowed to explain of the different commercial patterns observed, which were not feasible to justify with standard models of heterogeneous firms à la Melitz.

Eckel and Neary (2010) worked out a model of oligopolist, multi-product, flexible-manufacturing companies, in which companies face increasing marginal costs to supply additional products beyond their core competence. The model shows that an increase in competition can induce companies to concentrate on products quite close to their core competence, leading to a decrease in varieties exported. In turn, Mayer et al. (2014), with a model of monopolistic competition, points out that destination markets where competition is tougher make companies skew their exports toward their products of highest productivity/quality, so that they internally alter their portfolio of products to be sold abroad.

The model developed in this document, considers that firms set their prices according to their efficiency or quality. In the first case, given the level of productivity, product prices go up according to how the firm adds goods beyond its core product. In the second case, prices go down as distance from the core increases. Both situations allow deriving two predictions: one on export prices and the other on the decision to expand products to export markets.

For the prediction on prices, we are close to Eckel et al. (2015), who, by a extended version of the Eckel and Neary model (2010) and data from Mexican companies, document that firms in sectors of differentiated goods exhibit quality-based competence (prices drop as distance from the core competence increases). However, in the case of homogeneous goods, the relationship between price and distance to the core is the opposite.

This study expands on the literature by using not only the productivity of firms, but also the idea that multi-product companies have a *core competence*, analyzing how the distance exported products have vis-à-vis the core explains differences in prices for goods as well as the selection of

products for the marketplace. All of this by a highly tractable model. In the empirical part, this document quantifies the aforementioned aspects and uses them to obtain conclusions on the possibility that firms can diversify their portfolio of products and countries.

III. Theoretical Framework

In this Section, we formulated a partial-equilibrium, heterogeneous-firm model, in which firms are heterogeneous in productivity, as in Melitz (2003), and in the "attributes of the products"[4] sold by the company. With these ingredients, we distinguish two directions in the literature: when firms set their export prices based on competition in costs (Bernard et al., 2011; Mayer et al., 2014; Arkolakis et al., 2014) and competition in quality (Manova and Zhang, 2012; Chen and Juvenal, 2016). The findings of the model permit obtaining a testable prediction that firms set prices for their merchandise as a function of distance from the core and their productivity. Moreover, it is possible to derive a second testable prediction regarding the relationship distance from the core and productivity on decisions to export.

General Assumptions

In this document, we assume the world is made up of $i = 1, \dots, J$ symmetric countries and, in each one of them, we find two goods: a local good (H) and the foreign good (F). The first is produced under constant returns to scale and perfect competition, which is taken as numeraire. The second is produced under increasing returns to scale and imperfect competition and is traded with other countries.

Demand

Consumers in all countries share identical and homothetic preferences to consume both goods. The utility function of the representative individual in country *j* is defined as a Cobb-Douglas function, as follows:

$$U_j = H_j^{1-\mu} F_j^{\mu}, 0 < \mu < 1 \tag{1}$$

Terms $(1-\mu)$ and μ represent the percentage of expenditures for local goods and foreign goods, respectively, made by consumers living in j. In turn, F_j is a good that comprises different varieties of foreign goods with a constant elasticity of substitution (CES) between each variety.

$$F_j = \left[\sum_{i=1, i \neq j}^{J} \left[q_{ij}(\omega) \gamma_i(\omega) \right]^{\rho} \right]^{1/\rho}, 0 < \rho < 1 \tag{2}$$

In this expression, $q_{ij}(\omega)$ is the amount of variety ω elaborated in i and consumed in j, $\gamma_i(\omega)$ reflects the quality of the goods. Meanwhile, $= \frac{1}{1-\rho}$, the elasticity substitution between

[4] This term can be associated with the quality of the product or the reputation of the brand of item

varieties of the goods differentiated, which is assumed to be strictly greater than one.[5] In addition, considering that the available income of consumers in country j for the two type of products is R_j and, solving for the maximization of the representative consumer utility, we obtains demand in j for the variety produced in country i.

$$q_{ij}(\omega) = \frac{p_{ij}(\omega)^{-\sigma}\gamma_i(\omega)^{1-\sigma}}{P_j^{1-\sigma}}\ \mu R_j \tag{3}$$

In which, P_j represents the price index for foreign goods in j, which depends on the prices of varieties sold in j.

$$P_j = \left[\sum_{i=1, i\neq j}^{N} p_{ij}(\omega)^{1-\sigma}\gamma_{ij}(\omega)^{\sigma-1}\right]^{\frac{1}{1-\sigma}} \tag{4}$$

Production and Behavior of the Firm

Firms are multi-product and produce goods using work as input, which, as standard in the literature, is assumed to be the sole production factor. Moreover, there is a continuum of consumers/workers in all countries that offer their unit of work time inelastically. Without loss of generality, wages are normalized to one.

Firms are heterogeneous along two ways: in productivity (φ_i), as in Melitz (2003) and in quality (γ_i). Therefore, each firm elaborates products with different levels of productivity and quality. Firms face a marginal cost, in units of work, in producing a good that decreases in productivity, but increases in quality

$$C_i(\omega) = \varphi_i(\omega)^{-1}\gamma_i(\omega)^{\theta} \tag{5}$$

In which θ reflects the cost elasticity of quality, which is supposed to be $0 \leq \theta < 1$ so as to ensure the concavity of the function of profits and permit the marginal cost to increase with quality, but not excessively.[6]

As in Aw and Lee (2014), when ranking the varieties elaborated by each firm as a function of its productivity and quality, such that products with a highest level in each one of those variables are ranked first $(\mathrm{n} = 1)$, goods with the second highest level in said aspects are ranked second $(\mathrm{n} = 2)$ and so on, yielding:

$$\varphi_i^n(\varphi_k, n) = \varphi_i n^{-\alpha_1},\ \ 0 \leq \alpha_1 < 1 \tag{6.1}$$

[5]Though varying in their methodologies used, different studies provide evidence in favor of this supposition in different countries. For the U.S.-Canada (Head and Ries, 2001) and for a cluster of countries (Erkel-Rousse and Mirza, 2002).

[6]In the empirical evaluation done by Yan Aw and Lee (2015), they found evidence of the parameter θ being less than one.

$$\gamma_i^n(\gamma_i, n) = \gamma_i n^{-\alpha_2}, \quad 0 \leq \alpha_2 < 1, \qquad n = 1,2,3, \ldots \tag{6.2}$$

The preceding expressions characterize two strands of literature: the first is that the efficiency of firms decreases as n increases (Bernard et al., 2011; Mayer et al., 2014; Arkolakis et al., 2014) and, second, that quality decreases as n increases (Manova and Zhang, 2012; Chen and Juvenal, 2016). By incorporating (6.1) and (6.2) in (5), the marginal cost of a firm´s for n^{th} product is equal to:

$$C_i^n(\varphi_i, \gamma_i, n) = \varphi_i^{-1} \gamma_i^{\theta} n^{\alpha_1 - \theta\alpha_2}, \quad n = 1,2,3, \ldots \tag{7}$$

Such that, at a given level of productivity and quality, the firm´s marginal cost can increase or decrease as a function of rank n and, with regard to the dominant effect, be it α_1 or α_2. If $\alpha_1 > \theta\alpha_2$, goods closest to the company's "core" product $(n = 1)$ would result in high efficiency and, therefore, a relatively lower marginal cost. On the other hand, if $\alpha_1 < \theta\alpha_2$, products with better quality would have low efficiency and their marginal cost will be higher.

To sell to destination j, firms should incur two types of transaction costs. The first are fixed costs $(\mathrm{F_{ij}})$, in work units, considered to include entry costs as well as the operation, promotion, and distribution and training costs incurred by a firm to export to j. The second are transport costs, which are assumed to be like an iceberg, that is, if a unit of goods is shipped to another country, only a fraction arrives at the final destination, such that $p_{ij} = p_i \tau_{ij}$, in which p_i in the price in country i and τ_{ij} are shipping costs.

In particular, company profits the n^{th} product sold can be expressed as:

$$\pi_{ij}^n = p_{ij} q_{ij} - \left(\varphi_i^{-1} \gamma_i^{\theta} n^{\alpha_1 - \theta\alpha_2}\right) q_{ij} \tau_{ij} - F_{ij} \tag{8}$$

Solving the problem of maximizing profits for the n^{th} product, we obtain the optimum price for that good:

$$p_i^n = \frac{\gamma_i^{\theta} n^{\alpha_1 - \theta\alpha_2}}{\rho \varphi_i} \tag{9}$$

With $\alpha_1 > \theta\alpha_2$, more efficient firms are capable of charging low prices for products with a low n so as to attract a greater number of foreign consumers. Meanwhile, when $\alpha_1 < \theta\alpha_2$, producers of high-quality goods with a good reputation among consumers can set high prices which diminish as the numerical value of n increases.[7, 8]

[7]Using data from Chinese customs brokers, Manova and Zhang (2012) provide evidence on exporting companies charging high prices for core products.

[8]According to Eckel et al., (2015), the first case would correspond to cost-based competence, in which core products would be sold at a low price to further induce their purchase, while the second corresponds to a quality-based competence.

Incorporating (3), (6.2) and (9) in (10), firms i with capacity (φ_i, γ_i) have the following function of profits when selling the n^{th} product to destination j.

$$\pi_{ij}^{n} = (\rho\varphi_i)^{\sigma-1}\tau_{ij}{}^{1-\sigma}\frac{\mu R_j}{\sigma P_j^{1-\sigma}}\gamma_i^{(\sigma-1)(1-\theta)}n^{(\sigma-1)[\alpha_2(\theta-1)-\alpha_1]} - F_{ij} \tag{10}$$

Firms wishing to sell a particular product to destination j may do so if $\pi_{ij}^{n}(\varphi_i, \gamma_i, n) \geq 0$. As in Melitz (2003), we suppose free entry of companies into the marketplace. Therefore, with a zero-profit condition for a firm in i who wants to export to destination j, it is such that:

$$\varphi_i = \left(\frac{\mu R_j}{\sigma P_j^{1-\sigma}}\right)^{1-\sigma}(\rho)^{-1}\, t_{ij}\, \gamma_i^{(1-\theta)}n^{\alpha_2(1-\theta)+\alpha_1}F_{ij}{}^{\frac{1}{\sigma-1}} \tag{11}$$

From the preceding, we can observe that a cut-off φ_i is required for a given level of quality (γ_i), and a value n allows $\pi_{ij}^{n}(\varphi_i, \gamma_i, N) = 0$. Such that firms with productivity φ_i^* greater than φ_i can serve market j, obtaining positive profits. Meanwhile, a firm with productivity under φ_i cannot do so, because export costs to destination j may be greater than the profits obtained by selling to this marketplace.

Testable Prediction 1

By applying logarithms to equation [9], we have:

$$lnp_i^n = a + (\alpha_1 - \theta\alpha_2)ln\, n - ln\, \varphi_i \tag{12}$$

Where $a = ln\left(\frac{\gamma_i^{\theta}}{\rho}\right)$. From equation (12), if $\alpha_1 > \theta\alpha_2$, the price of goods would be of an increasing order with regard to the core product, in virtue of the fact firms are relatively more inefficient when producing goods further from the firm´s core competency (Bernard et al., 2011; Mayer et al. 2014; Arkolakis et al., 2014). This logic shows that firms would compete on the basis of a decrease in production costs so as to set lower prices for consumers.

In the situation in which $\alpha_1 < \theta\alpha_2$, the price of merchandise will reflect decreasing behavior vis-à-vis the core product, that is to say, as the item distances itself from the core, its price will be lower. This behavior points to the fact that firms would be selling goods with different levels of quality, since higher prices are associated with high-quality goods (Verhoogen, 2008; Crinò and Epifani, 2012; Manova and Zhang, 2012). In contrast to competition based on cost, in this case, it would be possible to expect productivity would have a positive relationship to price, since more productive firms are capable of setting higher prices in virtue of the fact they can produce higher-quality goods (Crinò and Epifani, 2012).

Testable Prediction 2

From the expression (10), we may establish the exporting status of firms E_{ij}^{n} takes on the value of one if $\pi_{ij}^{n} \geq 0$ and zero in any other case, then the probability of a firm from i exporting from *j* to is expressed as:

$$P\left[E_{ij}^{n} = 1\right] = P\left[(\rho\varphi_i)^{\sigma-1}{\tau_{ij}}^{1-\sigma}\frac{\mu R_j}{P_j^{1-\sigma}}\gamma_i^{(\sigma-1)(1-\theta)}n^{(\sigma-1)[\alpha_2(\theta-1)-\alpha_1]} - \sigma F_{ij} + \varepsilon_{ij} > 0\right] \quad (11)$$

The first term on the right of (11) establishes that the decision to export to a specific market j on the part of a firm in i depends positively on its level of productivity (φ_i), such that more productive firms will have the capacity to serve foreign markets. Similarly, the probability of exporting will also be boosted both by total spending on imported goods in destination country $\left(\frac{\mu R_j}{P_j^{1-\sigma}}\right)$, as well as by the quality of the products elaborated by firm $\left(\gamma_i^{(\sigma-1)(1-\theta)}\right)$. In turn, the possibility of entering into exporting activities decreases due to shipping costs $\left({\tau_{ij}}^{1-\sigma}\right)$ and due to specific fixed costs in entering into each destination market (F_{ij}).

Moreover, the possibility of exporting a certain number of products to a particular destination increases (decreases) according to whether said goods are close to (far from) the firm´s core product, which is independent of whether the value of α_1 exceeds $\theta\alpha_2$ or vice-versa. Finally, the term ε_{ij} represents a random term denoting those non-observable aspects of firms in their decisions to export.

IV. Description of Data, Variables and Empirical Approximation

In this section, we describe sources of information and how the database was constructed, as well as the variables used and the empirical approximation employed for the predictions from the theoretical model.

IV.1 Constructing the Database

The information used in this study comes from foreign-trade data from the Secretary of the Economy, whose sources are Mexican customs. The extract of information consist of aggregate export flows at company level, destination country, product (8-digit, disaggregate tariff code of the Harmonized System: HS)[9] and year for the period 2003-2010. The data was merged with a random sample of manufacturing companies in the Annual Industrial Survey (*Encuesta Industrial Annual: EIA*), which is elaborated and processed by the National Institute of Statistics and Geography (*Instituto Nacional de Estadística and Geografía: INEGI*) of Mexico.[10] The EIA contains

[9] The Harmonized System (HS) is a nomenclature of products implemented by the World Customs Organization (WCO), whose purpose is to set up a system for classifying goods traded worldwide.

[10] To maintain confidentiality, the processing of information was done at INEGI installations under the suprvision of its personnel. The final database used only took into account anonymous information.

information on employees, sales and revenue derived from production of manufacturing establishments (excluding *maquiladoras*) with fewer than 15 employees, from among 21 manufacturing industries. The period used by the EIA encompasses 2003-2009 and, from this source, we obtained the information on labor productivity (value-added[11]/number of employees), size of the company (number of employees) and location of the productive plant.

For the purpose of analysis, the resulting database was restricted as follows: i) only firms coinciding in the EIA and trade data were considered and, since information on trade flows is aggregate at the level of firm, for companies with more than one establishment in the EIA, the match between both databases was done with the plant showing greater commercial activity; ii) so as to avoid an excess of null trade flows, only those countries were considered that represent up to 95% of the export operations of firms and iii) data corresponding to 2003 was eliminated from the database, since it was taken as reference for constructing the dependent variable.

Likewise incorporated into the database is information relative to the distances between Mexico and the various destination countries of firms' exports, as well as the data on total imports by destination countries. For the former, values were calculated by computing the great-circle formula, using location data (longitude and latitude) for country capitals[12] from the CEPII (*Centre d'Études Prospectives et d'Informations Internationales*) database.[13] Meanwhile, import figures (6-digit Harmonized System) were obtained from the U.N.´s COMTRADE database.

The final database is comprised of 3,524 companies exporting to at least one of 79 possible destination countries during the period 2004-2010. This is an unbalanced panel because of the imperfect matches with the variables included.

For the empirical evaluation of the predictions from the preceding Section, this database was considered adequate for several reasons. It encompasses detailed information on trade flows and production for Mexican manufacturing companies, permitting constructing variables derived from the theoretical model. Due to its temporal dimension, it is possible to estimate different econometric techniques in panel format and to incorporate various fixed effects by means of those controlling non-observable characteristics. Sales abroad by the firms considered represent, on the average, 20.1% of Mexican manufacturing exports.

IV.2 Empirical Approximation and Constructing Variables

IV.2.1 Testable Prediction 1

In estimating equation [12], the information used is at the firm-product-year level. The selection of the dependent variable entailed a few disadvantages. We do not have sale prices for each of the products exported by the firms and, if we had such, their comparison could lead to erroneous results. For example, if a firm sells two different products A and B, a comparison of their prices would not provide any information if one was made more efficiently or had better quality than the

[11] The value-added was calculated by means of the difference between total revenue derived from production, minus total inputs.

[12] To calculate distances between Mexico and the U.S., we considered the distance between the municipality where the firm is located and the centroid referring to the center of the U.S.

[13] http://www.cepii.fr/anglaisgraph/bdd/distances.htm.

other. This is due to the fact that one should compare similar merchandise, so as to be able to distinguish differences in cost and quality.

To take these aspects into account, the following variable is calculated, referring to the relative price of the product:

$$ln\ relative\ price_{it}^{n} = ln\left(\frac{price_{it}^{n}}{average\ price_{t}^{n}}\right)$$

where $price_{it}^{n}$ is the price of product n exported by firm i in time t, and the denominator is the average price of the same product sold from Mexico. In turn, the price is approximated as the unit value (export sales/amount) and is calculated for each firm-product-year combination.

In constructing the independent variable, we followed Mayer et al., (2014) and Eckel et al., (2015), identifying the core product of firms as that merchandise with the greatest level of export sales each year. In next place is the product with the second highest level of sales, and so on. By using this criterion, it is possible to set up a ranking for the exported products of each firm annually. However, the incorporation of this measurement in the estimates may create biases and incorrect interpretations, since it is an ordinal variable that must be treated by regressions taking this characteristic into account. Moreover, the ranking presupposes that the distance between all the places on the scale are equal, that is, the distance between position 1 and 2 is equal to the distance between 4 and 5.

So as to deal with such inconveniences, in evaluating this prediction, we used two types of variables. The first are dummies, individually identifying the firms' two top products, as in Eckel et al., (2010) and, the second, measuring the distance of each product with respect to the core product, being calculated as:

$$Ln\ distance\ to\ the\ core_{it}^{n} = ln\left[101 - \left(\frac{export\ sales_{it}^{n}}{export\ sales_{it}^{core}} x100\right)\right]$$

where $export\ sales_{it}^{n}$ refers to the export sales of product n by firm i in time t, while $export\ sales_{it}^{core}$ represents sales abroad of the core product of firm i, which is defined as the product most exported. As can be seen inside the brackets, this variable considers the commercial distance between the product sold and the firm's core product, normalized within a scale of 1-101 points, in which the first places are held by varieties close to core products.

To identify firms in cases such as $\alpha_1 < \theta\alpha_2$ o $\alpha_1 > \theta\alpha_2$, we followed Eckel et al., (2015), who, using the classification of goods proposed by Rauch (1999), find, for the case of Mexico, evidence of a quality-based competence in manufacturing firms from sectors of differentiated goods and of cost-based competence for companies producing homogeneous goods. To classify products from the database (8-digit HS) into differentiated and homogeneous goods, we use the table proposed

by Rauch (1999) at a 4-digit SITC level Rev. 2[14] and a correspondence table between the Harmonized System 2007 and SITC Rev. 2[15] to link both sources of information.

As proxy of the term (φ_i), we use labor productivity calculated as value-added over the number of employees at the level of firm. The expression (γ_i) was approximated by incorporating fixed effects at the level of product, considering it reasonable that the quality of products does not vary notably over time. Also in the evaluation, fixed effects for year are included to take into account those unobservable aspects affecting company prices, such as the 2009 crisis. Moreover, a dummy variable is used to distinguish the new products firms export, which take on value 1 if the firm sold the product in t, but not in $t-1$ and is zero in any other case.

The estimate of this equation [12] is done by Ordinary Least Squares (OLS) and, to attend to the problem of endogeneity between prices and productivity, we let this last variable lag one period. To attend to the problem of clustering described by Moulton (1986, 1990), appearing when microdata is used in regressions with regard to aggregate variables, which leads to the standard error being underestimated. To deal with this problem, which occurs in all the estimates, standard errors are corrected by clustering at the firm level.

IV.2.2 Testable Prediction 2

In estimating the expression [13], we used a database constructed with all the positive flows of firm-product-country exports combined with the different years encompassed by the study. This definition was used so as to not create too large a database that could not be handled for lack of computational resources.[16]

The dependent variable E_{ijt}^{n} is a dummy taking the value 1 if firm i began to export product n to destination j in time t and did not do so in $t-1$, and has the value zero in any other situation. This definition permits centering the evaluation on cases in which firms begin exporting a specific product to a particular market.

The measure of productivity is approximated similar to the preceding prediction. The expression $\left(\frac{\mu R_j}{P_j^{1-\sigma}}\right)$, approximates the imports made by destination countries at a 6-digit HS level.[17] For the case of fixed costs (σf_{ij}) y $\left(\gamma_{\mathrm{i}}^{(\sigma-1)(1-\theta)}\right)$, we do not have information available that considers this level of detail, such that they are approximated by means of using fixed firm-product-destination effects, under the assumption these variables not change considerably over time. [18]

[14] Rauch´s (1999) classification was obtained from: http://econweb.ucsd.edu/~jrauch/rauch_classification.html. Rauch classifies goods into three types: differentiated products, reference price and homogeneous merchandise. On Rauch´s table, the three types are called "n" (differentiated goods), "r" (reference priced goods) and "w" (homogeneous goods). There are two versions of this classification: one conservative and one liberal, though there are few differences between them. In this document, differentiated goods are those catalogued as “n” and the rest homogeneous.

[15] The table of correspondences between the Harmonized System 2007 and SITC Rev. 2 is from http://wits.worldbank.org/es/product_concordance.html. By means of this table, we could classify almost all the products from the database and the rest of the goods were assigned the type of item with a low level of discretionality.

[16] The number of firm-product lines is 129,206, such that, making the combination firm-product x country x year, would have implied obtaining 129,206 x 79 countries x 7 years = 71,450,918 lines.

[17] The selection of this (6-digit) disaggregation in the import flows is due to the fact it is the most detailed level, where the nomenclature of products is homogeneious internationally. In addition, using this variable, in contrast to the GDP of destination countries, allows us to better capture the demand of local consumers for the different products imported.

[18] With the inclusion of these effects, we also control other aspects that are assumed to not vary widely over time, such as export strategies or preferences for selling particular products to certain destinations.

In the case of transport costs (t_{ij}), the literature on international trade traditionally approximates them from the physical distance between the different locations involved. However, their incorporation in the estimates causes problems. This variable, varying solely among destinations, leads to cancel out its influence within the estimate by incorporating fixed firm-product-destination effects. This problem was resolved by creating a new variable, consisting of imports divided by destination countries divided by the physical distance implied in reaching those markets. Therefore, the new variable functions as an indicator of market access, involving both the purchasing capacity of the consumers in destination countries as well as the distance[19] to reach those buyers.[20]

One major aspect likewise to be taken into account in the evaluation is the size of the firms,[21] which, according to the empirical evidence (Bernard and Jensen, 2004), is a factor influencing firms' decisions to export.

In virtue of the fact the empirical evaluation [13] involves estimating a model from a panel with a large number of fixed effects defined by each firm-product-country combination, the use of a Probit model would lead to a problem of incidental bias in parameters,[22] as described by Lancaster (2000). One possible solution would be to use a linear-probability model. However, this type of regression may also produce inconsistencies, since estimated probability is not always between zero and one. To make up for these disadvantages, we use a conditional logit model as proposed by Chamberlain (1980).[23]

Moreover, in estimating [13], there are other aspects requiring attention, such as the problems of endogeneity and clustering. Bernard and Jensen (1999) show the existence of double causality between export capacity and productivity. To solve the matter of double causality, we follow Bernand and Jensen (2004) and the variables lag one period in time. For the problem of clustering, standard errors are corrected clustering at the level of destination country.

IV.3 Descriptive Statistics

On Table 1a, we describe the composition of the new trade flows identified in the database. One of the outstanding characteristics is that the core product concentrates 7.2% of the total flows and 43.4% of sales abroad. As the ranking advances, we can observe a markedly decreasing order in the percentage of new product-country pairs in any of the geographical areas considered,

[19]In this study, calculation of the physical distance between Mexico and the country where the good is sold was done by applying a great-circle formula, measuring the shortest trajectory between two points on a spherical surface, taking into consideration the location (longitude and latitude) of the points. In contrast to Euclidan distance, which calculates distance between two points in a straight line, this measurement replaces straight lines with curved ones. This makes it possible to obtain more closely approximate distances between two locations, considering the geography of the Earth.

[20]The creation of the new variable does not modify the essence of expression (11), since it can be expressed within this equation by simple algebraic substitution.

[21]In terms of theoretical model used in this document, this factor is present implicitly. If one considers the need for workers used by the firm is $l = C_i^n(\varphi_i, \gamma_i, n)q_{ij} + \mathrm{F_{ij}}$, this, together with (3), (6.2), (7) and (9), yield the following expression:

$$l = (\varphi_i P_j)^{\sigma-1}\left(\frac{\rho}{\tau_{ij}}\right)^{\sigma}\mu R_j \gamma_i^{(\sigma-1)(1-\theta)} n^{(\sigma-1)[\alpha_2(\theta-1)-\alpha_1]} + F_{ij}\,,$$

Where one can see that $\frac{\partial l}{\partial \varphi_i} > 0$, with more productive firms also being the biggest employers of labor.

[22]When the temporal dimension is short, the imprecision in estimating a large number of fixed effects contaminates the other parameters of the estimate due to the non-linearity of the model.

[23]The technique proposed by Chamberlain (1980) uses a conditional estimate of maximum-likelihood to correct the problem of inconsistency in the parameters.

reinforcing the idea of a firm-internal selection of products-markets. This behavior is even more marked when considering the sum of the first five products of the firms in this sample, concentrating 24.3% of total flows and 84.3% in terms of export value. These percentages are even greater when taking into account the first ten products, concentrating 37% of flows and 94.1% of export sales.

Table1a: Composition of New Product-Destination Pairs from the Database

	Flows					Export sales				
	NAFTA	Latin America	Asia	Europe	**All**	NAFTA	Latin America	Asia	Europe	**All**
Top 1	1.3%	3.5%	1.1%	1.3%	**7.2%**	20.0%	10.2%	6.7%	6.4%	**43.4%**
Top 2	1.3%	2.7%	0.7%	0.8%	**5.5%**	10.0%	4.0%	2.7%	3.9%	**20.6%**
Top 3	1.2%	2.2%	0.5%	0.6%	**4.5%**	4.6%	2.8%	1.0%	1.1%	**9.6%**
Top 4	1.1%	1.8%	0.4%	0.5%	**3.8%**	3.1%	1.4%	0.7%	1.0%	**6.2%**
Top 5	1.1%	1.6%	0.3%	0.4%	**3.3%**	1.8%	1.0%	0.9%	0.7%	**4.5%**
Top 6	1.0%	1.4%	0.3%	0.4%	**3.0%**	1.9%	0.8%	0.2%	0.3%	**3.3%**
Top 7	0.9%	1.3%	0.2%	0.3%	**2.7%**	1.0%	0.6%	0.3%	0.5%	**2.5%**
Top 8	0.8%	1.2%	0.2%	0.3%	**2.5%**	0.7%	0.6%	0.3%	0.3%	**1.8%**
Top 9	0.8%	1.1%	0.2%	0.3%	**2.3%**	0.5%	0.3%	0.3%	0.1%	**1.3%**
Top 10	0.8%	1.0%	0.2%	0.3%	**2.2%**	0.4%	0.3%	0.1%	0.1%	**0.9%**
+ 10	21.3%	30.8%	3.8%	7.1%	**63.0%**	2.7%	2.0%	0.6%	0.6%	**5.9%**
All	31.5%	48.4%	7.7%	12.4%	**100.0%**	47.0%	24.1%	13.8%	15.1%	**100.0%**
1-5	6.0%	11.7%	2.9%	3.7%	**24.3%**	39.6%	19.5%	12.0%	13.2%	**84.3%**
1-10	10.3%	17.6%	3.9%	5.3%	**37.0%**	44.2%	22.1%	13.2%	14.5%	**94.1%**

Source: Self-elaborated with new trade flows from the database. Note: NAFTA area comprises the U.S. and Canada

On Table 1b, we describe the descriptive statistics of the main variables used in the database. The data reflects differences in levels of productivity and firm size among the different geographical areas considered. The mean for productivity and firm size is greater when destination markets are further away. This can be clearly seen if comparing the area made up of the U.S. and Canada vis-à-vis Asia. In the first case, we obtain a mean in the logarithm of productivity and size of 6.609 and 6.014, respectively. In turn, Asia averages 6.799 for the logarithm of productivity and 6.178 for the logarithm of firm size. This suggests that, to enter markets further away, firms must make an additional effort in productivity, permitting them to face the transport costs implied in reaching remote marketplaces. Moreover, this data points toward the idea of a selection between firms and destination, as has been noted in the empirical literature on heterogeneous firms.

Table 1b: Descriptive Statistics on Variables Used

U.S. and Canada	**Mean**	**Standard deviation**	**Maximum**	**Minimum**
Ln Firm size	6.014	1.166	8.856	0.000
Ln Productivity	6.609	1.019	13.576	1.058
Ln Market access	5.542	1.949	11.766	-7.766
Ln Distance to core	4.369	0.930	4.595	-2.805
Latin America	**Mean**	**Standard deviation**	**Maximum**	**Minimum**
Ln Firm size	5.927	1.238	8.856	0.000
Ln Productivity	6.657	1.028	13.443	2.733
Ln Market access	0.249	2.119	7.347	-15.472
Ln Distance to core	4.189	1.210	4.595	-3.286
Asia	**Mean**	**Standard deviation**	**Maximum**	**Minimum**
Ln Firm size	6.178	1.136	8.856	0.000
Ln Productivity	6.799	0.993	13.443	3.007
Ln Market access	1.110	2.304	8.429	-15.528
Ln Distance to core	3.840	1.595	4.595	-1.420
Europe	**Mean**	**Standard deviation**	**Maximum**	**Minimum**
Ln Firm size	6.134	1.072	8.856	0.000
Ln Productivity	6.819	0.977	13.443	3.360
Ln Market access	2.342	1.898	8.179	-8.050
Ln Distance to core	4.030	1.421	4.595	-2.716

Source: Self-elaboration with new trade flows from the database. Note: NAFTA area comprises the U.S. and Canada. The variable *market access* is calculated as $Ln\ imports_{ijt}/Ln\ distance_{jt}$.

Moreover, the figures for *market-access* reflect that the more the demand by consumers for imported goods and the shorter the distance to those buyers, the more feasible is the commerce to those destinations.

In turn, the variable *distance to core* shows that, on the average, products sold on the joint U.S-Canadian marketplace have greater distancing with regard to the core product, compared to other commercial areas. This may be due to the existence of a greater skewness toward the top product of firms on that marketplace, as a function of greater demand by consumers. The latter, in conjunction with that described on Table 1b, suggest that, in the diversification of markets, it is important to take not only the productivity of the firms into account, but also within-firm selection of product-destinations.

V. Results

In this Section, we present the results from the empirical evaluation of the testable predictions resulting from the theoretical model. The findings are presented in three sections, divided, in turn,

into two parts. In each one of them, we present the estimates made and analyze the coefficients obtained. At the end of each section, we summarize and discuss the main results obtained.

V.1 Relative Price Distance to the Core and Productivity

In this Section, we examine Testable Prediction 1 empirically. The evaluation was done in two parts: in the first, we deal with the problem at hand, distinguishing between differentiated and non-differentiated goods; in the second, we differentiate between new products and the rest of the products sold abroad. To complement the estimate reported in both parts, we include additional regressions of a sample of *maquiladora* companies.

V.1.1 Productivity, Top-Selling Products, Homogeneous and Differentiated Goods

In the first column of Table 2, we present the results of the estimate of equation [12], considering all commercial flows by the companies in the sample that trade homogeneous goods. Coefficients for dummy variables for the top-selling product and the other two products are statistically significant and show that each of the top-selling products registers lower prices in comparison to the rest of the products. But when comparing the top-two and top-three products to the core, one can see an increase in price as products move further from the core, in tune with the case in which $\alpha_1 > \theta\alpha_2$. One also perceives a relationship between the measurement of price and productivity, signaling that more productive firms in the non-differentiated products' sector have a greater possibility of efficiently producing products close to the core product and competing with low prices in top-selling products. Concretely, one can see that, should productivity double, the relative price of products would go down 8.9%.

In Column 2, we add variables referring to company size and fixed effects at an industry level, since larger companies can generate greater economies of scale and be more productive compared to small-sized ones. In turn, by means of fixed effects, one controls non-observable characteristics between the different industries not varying to a great degree over time, but affecting relative price. With this specification, we observe a reduction in estimated coefficients, but their sign and significance remain.

In the following two columns, we replicate the previous regressions, but considering only differentiated goods. In Column 3, we see a slightly decreasing pattern in prices, as products are further from the core. There is a positive relationship between productivity and relative prices, pointing to the fact more productive firms that trade differentiated goods have greater capacity to choose investing in higher-quality goods. Kugler and Verhoogen (2012), and Verhoogen (2008), show that this relationship is due to the existence of a complementarity between high-quality inputs and productivity, allowing them to produce higher-quality goods. In particular, one finds that if productivity is doubled, the relative price of the product goes up 13.1%.

In Column 4, the findings do not produce any substantial differences in parameters relative to the dummy variables. Nevertheless, the magnitude of the productivity increases, which may be due to taking into account the heterogeneity existing between the firms in different industries.

Table 2: Relationship between Relative Price, Products and Productivity for Firms with Two or More Items Exported

Dependent variable: $ln\ Price_{it}^{n}$

	(1)	(2)	(3)	(4)	(5)	(6)
	Original sample				Additional sample (*maquiladoras*)	
	Differentiated		Homogeneous		Homogeneous	Differentiated
Top product	0.111**	0.107**	-0.313**	-0.268**	-0.168**	0.186**
	(4.61)	(4.45)	(-8.37)	(-7.06)	(-4.40)	(6.17)
Top 2nd	0.0888**	0.0878**	-0.220**	-0.177**	-0.161**	0.128**
	(4.35)	(4.30)	(-6.85)	(-5.53)	(-4.50)	(5.11)
$Ln\ productivity_{it}$	0.129**	0.148**	-0.0894**	-0.0798**		
	(19.58)	(21.32)	(-7.93)	(-6.75)		
$Ln\ \ firm\ size_{it}$		0.00675		0.00420		
		(1.21)		(0.41)		
Constant	-2.450**	-2.778**	-0.454**	-0.904**	-0.974**	-1.695**
	(-56.29)	(-44.21)	(-5.95)	(-8.26)	(-37.75)	(-100.25)
Fixed-effects:						
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	No	Si	No	Si	No	No
R2	0.158	0.165	0.255	0.263	0.319	0.180
F-test	47.37	40.18	21.13	15.23	10.89	10.63
Observations	199,964	199,964	50,812	50,812	29,229	108,340

Statistics in parentheses. Statistics are constructed using standard errors clustered at the firm level. Independent variables referring to productivity and size of firm are lagged-one-period. The marks **, * and + indicate a significance level of 1%, 5% and 10%, respectively Estimates by means of Ordinary Least Squares (OLS). The dependent variable is generated at the firm-product-year level. Sub-indexes for variables identify firms (i), products (n) and time (t).

One relevant aspect regarding the preceding regression is to prove whether the results can be extended to different types of manufacturing companies. For Mexico, this stands out in virtue of the fact a large number if its manufacturing companies export under the regime of trade processing goods, that is, assembling or transforming imported inputs (free of customs duties and receiving tax incentives) to produce export products. It is here we can place the firms exporting under the program known as *maquila*.[24]

To take this situation into account, additional estimates were made with a random sample of 1,254 firms catalogued as *maquiladoras* and which were based on trade-flow information from Mexican customs. Notwithstanding the fact that, in this estimate, we did not control for productivity, size of firm or fixed effects of the industry, the results were, generally speaking, in the same direction. For example, in Column 6, referring to differentiated goods, we observe a positive and significant correlation between the two top products and the relative price, as well as

[24]Since 2007, the *maquila* program and the one known as PITEX (*Programa de Importación Temporal para Producir Artículos de Exportación*) were merged into a single program called IMMEX (*Programa de la Industria Manufacturera Maquiladora de Exportación*).

a decreasing relationship in the effect on price when moving from the core product to the top two. Similarly, when considering the sample of homogeneous products, parameters show a negative correlation between the firm´s two products sold the most and price, exhibiting moreover a slightly increasing relationship in prices when comparing the second product to the core.

V.2 New Product and Their Distance to the Core Product

In Column 1 of Table 3, we present the coefficients obtained when considering the variable measuring the distance to the core and the variables used in Columns 2 and 4 of Table 2. Quantitatively, the parameters estimated for the variable of productivity in the case of differentiated and homogeneous goods are fairly similar to those obtained in Table 2.

When analyzing the estimated coefficient of the distance to the core for differentiated products, we can observe a decreasing relationship between said distance and price. This indicates that, if a product doubles its commercial distance from the core, it will imply a relative price 3% lower. Another way of illustrating this is to compare the reduction in relative price, due to the volatility of the measurement of distance to the core for firms located in the 10th percentile, to those located in the 90th percentile of distribution. To that end, we calculate: $\left[\left(\frac{\exp\left(m+\beta_x * X_{90}\right)}{\exp\left(m+\beta_x * X_{10}\right)}-1\right) x100\right]$, where m and β_x are the mean in logarithms and the coefficient of the measurement of distance to the core, respectively, while X_{10} and X_{90} are the values of the measurement of distance in the 10th and 90th percentiles, in that order. The calculation shows that the price of a product in the 90th percentile is approximately $55.3\% = \left[\left(\frac{\exp\left(4.25+(-0.0303\ x\ 98.9)\right)}{\exp\left(4.25+(-0.0303\ x\ 72.3)\right)}-1\right) x100\right]$ less with regard to an item in the 10th percentile. This implies that if a firm wants to raise the price of its products furthest from its core product, it would imply a major effort. In the case of homogeneous goods (Column 2, Table 3), we find that, if the distance of a product to the core is doubled, its relative price would be 5.3% greater than the core.

In Columns 3 and 4, we did the same regressions as in the preceding columns, but with the interaction of the variables of distance to the core and productivity with a dummy variable identifying new products exported during the years under analysis. In the case of differentiated goods (Column 3), we see that, in contrast to the rest of the products sold, new merchandise traded by firms showed a higher relative price, accompanied by an increase in productivity. On the contrary, new products sold by firms in the sector of non-differentiated goods underwent a reduction in relative price compared to the rest of the merchandise traded. This behavior was likewise related to an increase in productivity.

Table 3: Relationship between Relative Price, Distance to the Core and Productivity
Dependent Variable: $ln\ Price_{it}^{n}$

	(1)	(2)	(3)	(4)	(5)	(6)
	Original sample				Additional sample (*maquiladoras*)	
	Diff.	Homog.	Diff.	Homog.	Diff.	Homog.
$Ln\ distance\ to\ the\ core_{it}^{n}$	-0.0303**	0.0535**	-0.00784	0.0611**	-0.0237**	0.0442**
	(-5.74)	(6.65)	(-1.32)	(7.07)	(-3.09)	(4.90)
$Ln\ productivity_{it}$	0.147**	-0.0785**	0.137**	-0.113**		
	(21.31)	(-6.65)	(14.64)	(-7.37)		
$Ln\ firm\ size_{it}$	0.00621	0.00848	0.0103+	0.00920		
	(1.12)	(0.83)	(1.85)	(0.90)		
Dummy (new product)			0.489**	-0.230+	0.662**	0.206**
			(6.76)	(-1.80)	(12.97)	(3.40)
$ln\ distance\ to\ the\ core_{it}^{n}$ X dummy (new product)			-0.118**	-0.0455**	-0.118**	-0.0441**
			(-12.24)	(-3.18)	(-10.14)	(-3.09)
$Ln\ productivity_{it}$ X dummy (new product)			0.0186+	0.0664**		
			(1.93)	(4.04)		
Constant	-2.632**	-1.198**	-2.757**	-1.008**	-1.671**	-1.194**
	(-40.95)	(-10.72)	(-36.09)	(-7.58)	(-46.17)	(-27.21)
Fixed effects:						
Year	Yes	Yes	Yes	Yes	Yes	Yes
Product	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	No	No
R2	0.165	0.261	0.166	0.261	0.182	0.318
F	41.77	15.18	46.43	14.86	38.15	10.12
N	199,678	50,676	199,678	50,676	108,198	29,165

Statistics in parentheses. Statistics are constructed using standard errors clustered at the firm-product level. Independent variables referring to productivity and size of firm are lagged-one-period. The marks **, * and + indicate a significance level of 1%, 5% and 10%, respectively. Estimates by means of Ordinary Least Squares (OLS). The dependent variable is generated at the firm-product-year level. Sub-indexes for variables identify firm (i), products (n) and time (t).

By way of comparison, the last two estimates of Table 3 consider the sample of *maquiladora* companies. For differentiated goods, the results reported in Column 6 show the same direction as those reported in Column 3. In the case of homogeneous goods, we find that relative prices were greater for new products with regard to the rest of the goods, which is the opposite of that reported in Column 4.

In summary, in this Section, we found that productivity plays a relevant role in prices for exported products, both for the firms competing in an environment based on quality, as well as for those doing so based on cost. This role is all the more important when introducing new varieties into foreign markets. Results show that the differences existing between the core product and the rest of the products are closely correlated to the differences between their relative prices. Said relationship is important for firms in the sectors of differentiated goods and those of

homogeneous ones, such that decreasing the distance in products quite far from the core would imply a great deal of effort in terms of quality and cost, respectively. In this situation, what would make most sense for the firm would seem to be to stop selling those products and reallocate resources to the top product or goods close to the star product, which would suppose less effort.

V.2 Productivity, Distance to the core and the Decision to Export

V.2.1 New Products to New Markets

In the first column of Table 4, we report the results of the estimate of Testable Prediction 2, referring to firms' decisions to export. The sign of the coefficients is in tune with those obtained in equation [13] and significant at 1%. The findings reflect that larger and more productive firms have a greater possibility of creating new commercial product-country links. Moreover, the less costly it is to reach a large number of external consumers, that is, the greater the ease of access to external markets, the greater the possibility of selling new varieties to more markets.

In contrast, the greater the distance between a particular piece of merchandise and the firm's core product, the lower the possibility of success in creating a new product-country commercial transaction. Specifically, we find that if the merchandise to be exported doubles its distance with regard to the core, the probability of sale abroad decreases 7.72 percentage points.[25]

To verify the consistency of the initial estimate, we gradually introduce various controls related to firms' exporting behavior. The first is firm´s persistence in exporting activity (Roberts and Tybout, 1997; Bernard y Jensen, 2004), since, despite facing a shock in productivity or changes in the international environment, the large majority of exporters remained in the following period. So as to take this characteristic into account, in Column 2 of Table 4, we incorporate the logarithm of the value of exports at a firm-year level, lag one period. The coefficient obtained shows that the experience of having exported a previous year increases the probability of selling a new product-country combination abroad. With the inclusion of this measurement, variables for size, productivity and market access decrease in magnitude, since the effect of firms´ persistence in exporting behavior is discounted. Meanwhile, the measurement of distance with regard to the core product shows a slight increase, without changing its sign or losing its significance.

Another aspect affecting the possibility of introducing an additional product or service into a different market is the familiarity firms have with certain sales destinations, such that commercial transactions are easier in countries where firms have more contact than with markets less familiar to them. In Column 3, we introduce, in the original estimate, a dummy variable that takes the value of 1 if the firm exported to the same country the previous year and zero in any other case. The result of this variable shows that prior experience in a sales market, compared to not having exported to that destination, increases the possibilities of placing new products.

[25] According to Train (2003), the change in probability that a firm i choses alternative Z (start exporting a new product-country pair), given a shift in an observable variable $X_{i,z}$ entering the representative utility of that alternative (and holding the representative utility of other alternatives constant) is $\beta_X * P_{iz}(1 - P_{iz})$, with P_{iz} being the average probability firm i chooses alternative Z (start exporting). Based on an average probability to start exporting a new product-country pair of 21.5%, our estimates suggest that the derivative of starting exporting, with respect to one position further away from to the core product, is 7.72%= -0.458*0.215* 1-0.215).

Table 4. Logit Estimate on the Decision to Export New Products to New Markets

Dependent variable: $Dummy\ E_{ijt}^{n}$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$Ln\ firm\ size_{it}$	0.447**	0.321**	0.433**	0.426**	0.315**	0.441**	0.304**
	(8.03)	(4.40)	(6.93)	(7.84)	(5.70)	(7.95)	(5.99)
$Ln\ productivity_{it}$	0.180**	0.0918**	0.185**	0.177**	0.162**	0.180**	0.156**
	(5.75)	(2.72)	(5.32)	(5.71)	(5.12)	(5.71)	(5.13)
$Ln\ access\ to\ markets_{jt}$	0.0933**	0.0764**	0.0867**	0.0858**	0.0951**	0.0924**	0.0813**
	(4.89)	(4.34)	(4.75)	(4.72)	(5.02)	(4.85)	(4.76)
$Ln\ distance\ to\ core_{it}^{n}$	-0.458**	-0.573**	-0.467**	-0.449**	-0.420**	-0.458**	-0.415**
	(-7.36)	(-4.64)	(-7.26)	(-6.94)	(-7.68)	(-7.39)	(-7.24)
$Ln\ export\ sales_{it}$		0.143**					
		(7.83)					
Dummy market experience (t-1)			0.732**				0.619**
			(17.75)				(14.01)
Dummy product experience (t-1)				0.593**			0.480**
				(13.80)			(9.58)
$Ln\ number\ of\ products_{it}$					0.379**		0.279**
					(14.85)		(8.11)
$Ln\ spillover_{ijt}$						0.174**	0.101**
						(5.50)	(7.93)
Pseudo R2	0.0275	0.0198	0.0373	0.0349	0.0297	0.0281	0.0401
Observations	914,446	650,925	914,446	914,446	869,618	914,446	869,618

Statistics in parentheses. Statistics are constructed using standard error clustered at the level of destination country. All independent variables, except distance to core, are lagged-one-period. The variable access to markets was calculated as $Ln\ imports_{ijt}/Ln\ distance_{jt}$. The marks **, * and + indicate a significance level of 1%, 5% and 10%, respectively. The dependent variable is generated at firm-product-country-year level. All regressions include fixed firm-product-country effects and fixed year effects. Sub-indexes for variables identify firms (i), products (n), countries (j) and time (t).

Similarly, to take into account the experience in selling a particular product, Column 4 considers a dummy variable having value 1 if the product belongs to a portfolio of merchandise sold one year earlier and zero in any other case. In comparison with the regression of the first column, the coefficients presented in Column 4 do not show variation with regard to their magnitude or changes in their significance. In turn, the dummy variable suggests that experience in selling a product is relevant to expanding export markets.

An additional factor that can affect the generation of commercial relations is the number of products traded by companies, such that firms with a greater number of products exported are more probable to incorporate more products in different marketplaces (Bernard, et al. 2011). To control this heterogeneity among firms within the estimate, we include the logarithm of the number of products exported lag on period. The parameter calculated (Column 5) reflects a positive relationship between this measurement and the possibility of exporting. Moreover, the coefficients of the variables relative to the size of firms and productivity undergo a decrease with regard to the first estimate, since bigger and more productive firms have a more capacity to sell a greater range of products.

One aspect that has maintained the interest of a variety of studies is the existence of a possible positive and significant effect on the probability a company sells abroad due to its geographical proximity to other exporting companies. This suggests the existence of positive externalities known as export *spillovers,* which contribute to reducing the fixed costs incurred by companies entering into exporting activities. To delve further into this, in Column 6, we report the findings taking into account the possible existence of export *spillovers* emanating from the agglomeration of other exporting firms close-by (Clerides, et al., 1998; Greenaway and Kneller, 2008), using as a measurement $ln(1 + \#\ of\ exporters)$. The number of exporters is calculated as the sum of all the firms located in the same municipality that sold the same product to the same country one year earlier. This measurement is product-destination specific, as is considered in Koenig, et al., (2010) and Harasztosi (2014). In this case, we find evidence suggesting that news product-country pairs are positively influenced by the concentration of other neighboring exporters. As for the rest of the variables, no substantial changes are found with regard to the original estimate.

Column 7 brings together all the variables used as control, without considering the variable measuring persistence in exporting activity, whose influence is included by incorporating the dummy relative to prior experience in sales to a destination country. By means of this specification, we find a reduction in the magnitude of the coefficients relative to size, productivity and access to markets, which are purged by the presence of other variables influencing firms' decisions to export. Meanwhile, the parameter of the variable referring to distance to the core did not undergo any substantial modifications in size nor was its significance modified.

V.2.2 Distance to the Core and Probability of Selling to Different Destination

To complement the estimates made, in this Section, we make a distinction of the effect that relative prices and distance from the core have on the probability of exporting to different geographical areas, in which the variable excluded is the area made up of the U.S. and Canada. In Column 1 of Table 5, we introduce a term of interaction between distance to the core and a dummy variable that considers different commercial areas. In the following column, we report the estimate considering the relative price.

Results show that a firm´s core product shows greater possibilities of success in generating a new product-country commercial link in any of the different commercial areas. Moreover, the probability of selling a product far from the core in the area of NAFTA members, as are the U.S. and Canada, is lower compared to the rest of the geographical areas, Similarly, products with relatively higher prices have a greater probability of establishing a new commercial relationship on the marketplace of NAFTA countries than in other areas. This indicates that firms selling in a large marketplace of consumers, such as the U.S. and Canada, face stiffer competition, so their exports are focused on products close to the core (Mayer, et al., 2014), permitting them to set more competitive prices and obtain greater revenue from commercialization compared to other markets.

In the case of the sample of *maquiladora* companies (Columns 3 and 4), we also find that these types of firm are capable of creating new product-country relationships, insofar as they export merchandise close to their core. This situation prevailed in all geographical markets in which they sell. When we analyze export decisions considering relative price, one can see behavior quite similar to that reported in Column 2, that is, products with a relatively higher price are more

probable to produce a new commercial combination in the NAFTA area, compared to the rest of the markets.

Another reading of the findings is that new commercial transactions are more feasible to be successful due to export of products quite close to the core, since that merchandise provides firms with the possibility of competing in large marketplaces. To delve further into this aspect, in Columns 5 and 6, we use a dummy variable differentiating between countries that are members of the Organization for Economic Co-operation and Development (OECD) and those that are not.

The coefficient of the dummy variable shows no difference in effect existing in the measurement of the distance to the core between countries belonging to the OECD and non-members. On the contrary, we observe that merchandise with a relatively high price increases the probability of creating new commercial ties with OECD countries compared to other destination. Just as in the regressions of Columns 2 and 4. This situation can be explained because a higher price could be a reflection of greater quality, which would be well valued on markets where consumers have a high per-capita income.

In summary, evidence points to products with greater possibilities of generating new commercial ties being those that are close to the firm's core product. This situation can be found in any of the geographical areas considered and, comparatively, this phenomenon is found more intensely in the NAFTA region. Similarly, goods with a higher relative price are candidates more inclined to create a new product-country combination in any of the geographical areas compared. However, the probability will be greater in destinations with high purchasing power.

Table 5. Logit Estimate of Decision to Export and Different Destinations

Dependent variable: $Dummy\ E_{ijt}^{n}$

	(1)	(2)	(3)	(4)	(5)	(6)
	Sample under study		Sample maquiladoras		Sample under study	
$Ln\ distance\ to\ core_{it}^{n}$	-0.778**		-1.032*		-0.355**	
	(-3.96)		(-2.41)		(-21.92)	
$Ln\ distance\ to\ core_{it}^{n}$ x *Latin America*	0.406*		0.623			
	(2.07)		(1.46)			
$Ln\ distance\ to\ core_{it}^{n}$ x *Asia*	0.493*		0.672			
	(2.51)		(1.57)			
$Ln\ distance\ to\ core_{it}^{n}$ x *Europe*	0.436*		0.627			
	(2.22)		(1.47)			
$Ln\ firm\ size_{it}$	0.305**	0.157*			0.314**	0.162*
	(6.01)	(2.28)			(6.07)	(2.34)
$Ln\ productivity_{it}$	0.156**	0.168**			0.160**	0.170**
	(5.19)	(3.24)			(5.02)	(3.22)
$Ln\ relative\ price_{it}^{n}$		0.219**		0.216**		0.176**

		(52.44)		(52.23)		(61.69)
$Ln\ relative\ price_{it}^{n}$ *x Latin America*		-0.0440**		-0.0463**		
		(-8.56)		(-10.24)		
$Ln\ relative\ price_{it}^{n}$ x *Asia*		-0.0501**		-0.0489**		
		(-8.94)		(-5.48)		
$Ln\ relative\ price_{it}^{n}$ x *Europe*		-0.0392**		-0.0498**		
		(-6.58)		(-7.30)		
$Ln\ distance\ to\ core_{it}^{n}$ x OECD					-0.125	
					(-1.16)	
$Ln\ relative\ price_{it}^{n}$ x OECD						0.0272*
						(2.34)
Pseudo R2	0.0411	0.585	0.0551	0.622	0.0395	0.586
Observations	869,618	841,698	373,319	361,389	857,673	829,887

Statistics in parentheses. Statistics are constructed using standard errors clustered at the level of destination country. All independent variables, except distance to core and relative price, are lagged-one-period. Estimates also included as variables: $Ln\ export\ sales_{it}$, $Ln\ number\ of\ products_{it}$, $Ln\ spillover_{ijt}$, dummy market experience (t-1), dummy product experience (t-1) and $Ln\ access\ to\ markets_{jt}$. The variable access to markets is calculated by $Ln\ imports_{ijt}/Ln\ distance_{jt}$. The marks **, * and + indicate a significance level of 1%, 5% and 10%, respectively. The dependent variable is constructed at firm-product-country-year level. All regressions include fixed firm-product-country effects and fixed year effects. Sub-indexes of variables identify firms (i), products (n), countries (j) and time (t).

V.3 What Factors Explain the Selection between Products and Markets

In this Section, we delve further into the role played by the observable characteristic of firms and the factors related to demand having a bearing on the internal selections firms make about their products and different sales destinations. First, we examine the selection of products within firms and then we evaluate that strategy considering products and large areas for commercializing products. In both cases, we utilize only the new product-country export flows that were carried out during the period under analysis.

V.3 Core Products vs. Non-Core Products

For this exercise, we estimate a multi-logit model in which the exporting firm is faced with four alternatives to export a product as a function of different observable and non-observable variables. The category of comparison is the exporting of their core product and the next two options are the sale of their second or third top product. The last is the commercialization of the rest of the goods making up their portfolio of goods sold abroad.

The initial regression shows that, as firms are bigger, they have a greater possibility of choosing products different from the core to commercialize on other markets. Productivity does not seem to be a discriminatory criterion for products in second or third place, but this is not the case for the rest of goods, where more productive firms are capable of selling more merchandise. According to the results of the first Testable Prediction, firms competing on cost, by means of increasing productivity, will be able to increase efficiency in producing a greater number of goods,

while firms competing on price, an increase in productivity might lead to increases in the quality of the goods being commercialized.

When incorporating the variable access to markets (Column 2, Table 6), one perceives it is not a discriminatory criterion for selecting between the core product and those in second and third place in the firm's ranking. However, it does represent a criterion of selection with regard to the rest of the goods that the firm commercializes, in virtue of the fact that the demand by consumers abroad for the core product has an influence on choosing the latter instead of the goods that are in the last positions with regard to the core.

Table 6: Multi-Logit Estimate on the Selection of Export Products

Dependent variable: $Dummy\ E_{ijt}^{n}$

	(1)	(2)	(3)	(4)	(5)	(6)
Alternative excluded: Core product						
Alternative 2: Sell second top product						
$Ln\ firm\ size_{it}$	0.0268*	0.0192	0.0124	0.00878	0.0222	-0.0279
	(2.23)	(1.63)	(0.96)	(0.69)	(1.38)	(-0.78)
$Ln\ productivity_{it}$	0.0318	0.0264	0.0239	0.0302	0.0359	-0.00273
	(1.29)	(1.15)	(1.04)	(1.36)	(1.07)	(-0.06)
$Ln\ access\ to\ markets_{jt}$		-0.00239	-0.0140	-0.0125	-0.00803	-0.0303
		(-0.31)	(-0.90)	(-0.83)	(-0.51)	(-1.56)
Dummy market experience (t-1)			0.259	0.265	0.304+	0.103
			(1.60)	(1.63)	(1.92)	(0.50)
$Ln\ relative\ price_{it}^{n}$				-0.0643**	-0.0664**	-0.0529*
				(-7.54)	(-7.17)	(-2.00)
Alternative3: Sell the third top product						
$Ln\ firm\ size_{it}$	0.0694**	0.0606**	0.0494**	0.0463**	0.0560**	0.0294
	(4.84)	(4.60)	(2.64)	(2.71)	(3.05)	(0.75)
$Ln\ productivity_{it}$	0.0648	0.0554	0.0511	0.0594	0.0416	0.0886
	(1.34)	(1.15)	(1.09)	(1.31)	(1.11)	(1.14)
$Ln\ access\ to\ markets_{jt}$		0.00275	-0.0199	-0.0182	-0.0154	-0.0307
		(0.53)	(-1.13)	(-1.07)	(-0.98)	(-1.13)
Dummy market experience (t-1)			0.515*	0.520*	0.573*	0.354
			(2.08)	(2.10)	(2.36)	(1.35)
$Ln\ relative\ price_{it}^{n}$				-0.0592**	-0.0581**	-0.0575+
				(-6.38)	(-6.18)	(-1.74)
Alternative 4: Sell the rest of products						
$Ln\ firm\ size_{it}$	0.696**	0.713**	0.660**	0.657**	0.689**	0.555**
	(27.11)	(32.54)	(31.44)	(31.48)	(26.38)	(13.73)
$Ln\ productivity_{it}$	0.391**	0.385**	0.371**	0.376**	0.395**	0.328**
	(15.63)	(14.60)	(16.51)	(16.36)	(15.11)	(9.49)
$Ln\ access\ to\ markets_{jt}$		-0.0727**	-0.151**	-0.149**	-0.145**	-0.169**
		(-10.43)	(-7.69)	(-7.91)	(-8.01)	(-6.02)
Dummy market experience (t-1)			2.003**	2.001**	2.060**	1.750**
			(9.35)	(9.22)	(9.03)	(8.86)
$Ln\ relative\ price_{it}^{n}$				-0.0678**	-0.0851**	0.0253
				(-3.47)	(-4.20)	(0.77)
Pseudo R2	0.115	0.123	0.180	0.180	0.185	0.174
Observations	249,887	222,401	222,401	217,364	173,347	44,017

Statistics in parentheses. Statistics are constructed using standard errors clustered at the level of destination country. All independent variables, except relative price, are lagged-one-period. The variable access to markets was calculate as $Ln\ imports_{ijt}/Ln\ distance_{jt}$. The marks **, * and + indicated a significance level of 1%, 5% and 10%, respectively. All regressions include fixed year and industry effects. The dependent variable is generated at the firm-product-country-year level and only considers new export flow made during the period under study. The constant is omitted for reasons of space on the Table. Sub-indexes of variables identify firms (i), products (n), countries (j) and time (t).

In contrast to the two previous regressions, the experience of having previously sold to a market *j* boosts the possibility of selling products other than the core (Column 3) to that same destination. Therefore, firms can place merchandise beyond their core into markets they already know. In turn, relative price turns out to be a criterion relevant for exporting a new product, since, as the relative price of goods increases, one opts for choosing the core product over the rest of the merchandise (Column 4), given that, with this merchandise, the firm will be able to compete successfully at different destinations.

In the last two estimates, we present the findings both for firms selling differentiated products, as well as those selling homogeneous ones. In Column 5, the coefficients presented are completely similar to those appearing in the previous column. Meanwhile, the next regression shows that firms will have more possibilities to sell their products not fitting into the category of most sold, vis-à-vis its core product, if it increases its productivity, its size and has experience in the market where it is going to sell. However, that feasibility is reduced if demand for the core product increases. Finally, increases in relative price are not considered an element of decision-making due to the fact these firms compete in cost more than in quality.

V.3 Selection of Products within Markets

For this exercise, we created four new alternatives. The first is that the core product be sent to the NAFTA market. The rest of the options are the sale of non-core products to the NAFTA area, the exporting of the core product to other non-NAFTA countries, and the sale abroad of non-core products in destinations other than the NAFTA area.

In Column 1, Table 7, we present the results of the multi-logit estimate where the alternative of comparison is core product exported to the NAFTA area. The initial estimate shows that, as firms are bigger and have higher productivity, they have greater possibilities of placing non-core products in the NAFTA area.. Similarly, these types of firms will have a wide-ranging capacity to sell their core and non-core products beyond the U.S. and Canada. This suggests that, in order for firms to obtain positive profits in selecting any of the options other than that of comparison, they must generate economies of scale and be more productive.

On the other hand, growth in access to markets in destination countries implies a reduction in the probability of having commercial transactions other than the sale of their core product outside the NAFTA market. This is in tune with the results obtained in the evaluation of Testable Prediction 2, where the size of the market is relevant to the decision to sell a new product to different destinations.

In the third column of Table 7, relative price is incorporated into the regression. A reading of the findings reveals that said variable is important in selecting the first option over the rest of the alternatives. This behavior can be attributed to the fact that, regularly, the core product is sold to large markets, where only the most successful products can enter and compete at those destinations.

Table 7: Multi-Logit Estimate on the Choice of Export Product and Destination

Dependent variable: $Dummy\ E_{ijt}^{n}$

	(1)	(2)	(3)	(4)	(5)
Alternative excluded: Export core product to the NAFTA area					
Alternative 2: Export non-core product to the NAFTA area					
$Ln\ firm\ size_{it}$	0.635**	0.650**	0.647**	0.629**	0.646**
	(23.21)	(26.38)	(24.94)	(34.64)	(24.83)
$Ln\ productivity_{it}$	0.390**	0.376**	0.387**	0.264**	0.387**
	(11.80)	(11.73)	(12.83)	(9.05)	(13.31)
$Ln\ access\ to\ markets_{jt}$		-0.0510**	-0.0462**	-0.0301**	-0.0461**
		(-4.28)	(-4.87)	(-5.08)	(-3.94)
$Ln\ relative\ price_{it}^{n}$			-0.0803**	-0.0814**	-0.0806**
			(-8.96)	(-9.34)	(-8.50)
Dummy medium technological intensity				0.418**	
				(23.14)	
Dummy high technological intensity				1.241**	
				(24.96)	
Dummy differentiated good					-0.0221
					(-0.38)
Alternative 3: Export core product to non-NAFTA area					
$Ln\ firm\ size_{it}$	0.0173	0.146**	0.151**	0.103	0.136*
	(0.37)	(2.72)	(2.73)	(1.60)	(2.51)
$Ln\ productivity_{it}$	0.181**	0.199**	0.206**	0.174**	0.228**
	(3.32)	(3.54)	(3.79)	(3.38)	(4.31)
$Ln\ access\ to\ market_{jt}$		-1.108**	-1.105**	-1.070**	-1.125**
		(-7.21)	(-7.27)	(-7.37)	(-7.13)
$Ln\ relative\ price_{it}^{n}$			-0.0262+	-0.0287+	-0.0338*
			(-1.71)	(-1.75)	(-2.16)
Dummy medium technological intensity				0.146	
				(1.33)	
Dummy high technological intensity				0.505**	
				(3.02)	
Dummy differentiated good					0.782**
					(4.07)
Alternative 4: Export non-core product to non-NAFTA area					
$Ln\ firm\ size_{it}$	0.666**	0.804**	0.808**	0.766**	0.791**
	(15.94)	(18.94)	(18.07)	(14.42)	(18.38)
$Ln\ productivity_{it}$	0.518**	0.565**	0.573**	0.497**	0.601**

	(8.66)	(14.20)	(15.66)	(12.35)	(17.75)
$Ln\ access\ to\ market_{jt}$		-1.209**	-1.206**	-1.181**	-1.229**
		(-7.74)	(-7.80)	(-7.97)	(-7.66)
$Ln\ relative\ price_{it}^{n}$			-0.0559**	-0.0585**	-0.0634**
			(-5.34)	(-5.31)	(-5.82)
Dummy medium technological intensity				0.543**	
				(4.72)	
Dummy high technological intensity				1.662**	
				(11.44)	
Dummy differentiated good					0.915**
					(4.88)
Pseudo R2	0.0529	0.559	0.558	0.551	0.565
Observations	249,887	222,401	217,364	217,364	217,364

Statistics in parentheses. Statistics are constructed suing standard errors clustered as destination-country level. All independent variables, except relative price, are lagged-one-period. The variable access to markets was calculated as $Ln\ imports_{ijt}/Ln\ distance_{jt}$. The marks **, * and + indicate a significance level of 1%, 5% and 10%, respectively. All the regressions include fixed year and industry effects. The dependent variable is generated at firm-product-country-year level and only considers new export flows carried out during the period under study. The constant is omitted for reasons of space on the Table. Sub-indexes of variables identify firms (i), products (n), countries (j) and time (t).

In the next column, we consider a variable that identifies products according to their technological intensity, following the classification proposed by OECD. Analyzing the coefficients obtained, we observe that, in comparison with low-intensity products, those with higher technological levels increase the possibility that the core product and non-core product can be sold in destinations beyond NAFTA. Similarly, non-core products with greater technological intensity have a greater probability of getting into the North American market.

So as to control differences among products, in Column 5, we include a variable distinguishing between homogeneous and differentiated goods. The result shows that, in contrast to homogeneous goods, those classified as differentiated are more feasible to be commercialized abroad. This applies both to the core as well as to non-core products in countries other than the U.S. and Canada. For the NAFTA area, the type of good is not an element discriminating between choosing the core product or the rest of the products. This can be explained because core products, independently of whether they are differentiated or homogeneous, are the first option to be sold to the NAFTA market before non-core markets.

The statistical evidence obtained in this Section points to the fact that size and productivity are relevant factors in the decision made by firms when selecting from among their portfolio of export products. Therefore, more productive firms will be able to select products other than their core product to create new commercial links. However, that election is conditioned by the size of the destination market and the relative price of the product, restricting the options that firms have regarding products not too far from their core.

VI. Conclusions

In this document, we analyze and quantify the effect that companies' productivity and firm-internal selection have on the sale of new products to new destinations. This, for the purpose of enriching the understanding of the process of diversifying the product-country portfolio, as well as providing elements so public-policy designers perceive to what degree possibilities exist to diversify markets and expand portfolios of export products.

To quantify the influence of the firm-internal selection, we created a measurement of distance to the core which reflects, by means of an index, the degree of commercial distance that merchandise sold has with regard to the core product.

In this study, we showed that companies' self-selection of foreign marketplaces is not the sole factor influencing the process of commercial diversification, but that, likewise, the internal selection by companies regarding their export products and destinations is crucial to the result of said process.

As a starting point, we delved into the effect that distance to the core and productivity have on the export prices of merchandise, both for firms competing on the basis of cost, as well as for those doing so on the basis of quality. Subsequently, we examined the effect of distance to the core and productivity on the capacity firms have to create new commercial ties and, finally, the role played by productivity and export prices in choosing a product to be sold, as well as the marketplaces.

As to the effect distance to the core and productivity have on the export prices of merchandise, we found that, for companies competing based on quality, there is a positive relationship between productivity and relative prices, in tune with their strategy of competition. An increase in productivity permits them to improve the quality of the products they produce. Concretely, we found that doubling productivity would boost the relative price of products exported 14.7%. Moreover, by using a measurement of distance to the core, we observed that differentiated products located in the 90^{th} percentile, compared to those in the 10^{th} percentile, have a price 55.3% lower. This implies that if a firm wants to raise the price for the products furthest from their core product, the effort would not be insignificant.

In turn, an increase of similar magnitude in the productivity of firms competing on cost would result in a 7.8% decrease in the relative price. Moreover, if the distance to the core of a product is doubled, its relative price would be 5.35 times greater than the core.

Regarding the influence of distance to the core and productivity on the capacity firms have to create new commercial link, it was found that larger and more productive firms have a greater possibility of creating new commercial product-country ties. In addition, as it is less costly to reach a large number of external consumers, that is, the greater the ease of access to external markets, the higher the possibility of selling new varieties to more markets.

Also more specifically, it was found that if the distance between an export product and the core product is doubled, the probability of generating new commercial product-country ties decreases 7.72 percentage points. This possibility decrease all the more when one attempt to export products far from the core in commercial areas consisting of a large number of consumers with

high purchasing power. The latter is due to the fact products with a higher relative price are the ones most inclined to generate new product-country combinations, especially in large marketplaces.

Finally, when evaluating the internal selection made by companies with regard to their products, it was found that more productive and bigger companies can opt to choose to sell goods beyond their core product. In contrast, proximity to a large marketplace and the efficiency or quality of a top product restricts the possibility of choosing merchandise further from the core.

In light of the results, the diversification of the product-country portfolio could seem to manifest itself in different ways. First, by commercializing products with lower prices or efficiency in less competitive marketplaces, though it is probable firms will obtain fewer benefits regarding sales of their core product, and it is probable those commercial ties may not be permanent. The second, by focusing efforts on products very close to the core, which would imply reallocating resources toward those products and discontinuing the remaining goods. This last option might permit them to get into different markets and compete successfully in those with consumers with high purchasing power. In the case of Mexico, access to a large number of consumers because of its proximity to the U.S. and Canada would mean directing sales toward these destinations, which would erode part of the efforts to diversify sales destinations and would increase the already high concentration in said marketplace.

Another option is to increase productivity and the size of companies in order to boost efficiency or the quality of other products offered abroad. However, the result of this strategy might be paradoxical. On the one hand, firms would be capable of increasing the number of types of merchandise they could sell abroad, but the main destination would quite probably also be NAFTA.

Along this same line, the design of diversification policies centered on improvements in productivity and increases in the size of companies, moreover, should consider measures to increase access to other large marketplaces, since, otherwise, in terms of diversification, results would be slight.

An increase in productivity might be achieved by means of a strategy to finance exporting companies for training, acquiring infrastructure and improving logistics, thereby permitting them to improve their productive processes and invest in quality. As for increasing the size of companies, mergers, acquisitions, take-overs and cooperative agreements among companies constitute recurring ways of increasing their size, such that strategy must be based on encouraging these activities among exporting firms. Improving access to large marketplace implies implementing policies reducing fixed costs, which may have a favorable repercussion in the area of deconcentrating sales destinations.

VII. Bibliography

Al-Marhubi, F. (2000). “Export Diversification And Growth: An Empirical Investigation.” Applied Economics Letters 7: 559–62.

Arkolakis C. (2011), “A unified theory of firm selection and growth”. Unpublished manuscript, Yale University

Arkolakis, C., S. Ganapati & M. A. Muendler (2014), “The Extensive Margin of Exporting Products: A Firm-level Analysis”, manuscript, Yale University.

Aw, B. & Y. Lee (2015), “Demand, Costs and Product Scope in the Export Market”, manuscript, Pennsylvania State University.

Bernard A.B., S. Redding & K. Schott (2011), “Multi-product firms and trade liberalization”. Quarterly Journal of Economics, Vol. 126, pp. 1271–318.

Bernard, A. & J. B. Jensen (2004), “Why do firms export”, The Review of Economics and Statistics, Vol. 86(2), pp. 561–569.

Bernard, A. y J.B. Jensen (1999), “Exceptional exporter performance: cause, effect or both?”, Journal of International Economics, Vol. 47, pp. 1–25.

Bernard, A., & J.B., Jensen, (1995). “Exporters, jobs, and wages in U.S. Manufacturing, 1976–1987”. Bookings Papers on Economic Activity, Microeconomics. Washington DC.

Bernard, A., J. B. Jensen, S. Redding, & P. Schott (2007). "Firms in International Trade" Journal of Economic Perspectives, Vol. 21(3), pp. 105-130.

Chamberlain, G. (1980), “Analysis of covariance with qualitative data”. Review of Economic Studies, Vol. 47, pp. 225-238.

Chen, N. & L. Juvenal (2016), “Quality, trade, and exchange rate pass-through”, Journal of International Economics, Vol. 100, pp. 61-80.

Clerides, S., S. Lach, & R. Tybout (1998), “Is Learning by Exporting Important? Micro-Dynamic Evidence from Colombia, Mexico and Morocco”, Quarterly Journal of Economics, Vol. 113(3), pp. 903-947.

Crinò, R. & P. Epifani (2012), “Productivity, Quality and Export Behaviour”, The Economic Journal, Vol. 122, pp. 1206–1243.

Eaton J., S. Kortum & F. Kramarz (2011), “An anatomy of international trade: evidence from French Firms”. Econometrica, Vol. 79, pp. 1453–98.

Eaton, J., M. Eslava, M. Kugler & J. Tybout (2008), “Export Dynamics in Colombia: FirmLevel Evidence”, in: Helpman, E., Marin, D., Verdier, T. (Eds.), The Organization of Firms in a Global Economy. Harvard University Press, Cambridge, MA.

Eckel, C. & J. P. Neary (2010). “Multi-product Firms and Flexible Manufacturing in the Global Economy”, Review of Economic Studies, Vol.77, pp. 188–217.

Eckel, C., L. Iacovone, B. Javorcik, & J. P. Neary (2015), “Multi-product Firms at Home and Away: Cost- versus Quality-based Competence”, Journal of International Economics, Vol. 95, pp. 216–32.

Erkel-Rousse, H. & D. Mirza (2002), “Import Elasticities: Reconsidering the Evidence”, Canadian Journal of Economics, Vol. 35(2), pp. 282–306.

Greenaway, D. & R. Kneller (2008), “Exporting, productivity and agglomeration”, European Economic Review, Vol. 52, pp. 919–939.

Haddad, Mona E. & Lim, Jamus Jerome & Saborowski, Christian, (2010). "Trade openness reduces growth volatility when countries are well diversified," Policy Research Working Paper Series 5222, The World Bank.

Harasztosi, P. (2016), “Export spillovers in Hungary”, Empirical Economics, Vol. 50 (30), pp. 801-830.

Head, K. & J. Ries (2001), “Increasing Returns Versus National Product Differentiation as an Explanation for the Pattern of US-Canada Trade”, American Economic Review, Vol. 91(4), pp. 858–876.

Hesse, H., (2008), “Export Diversification and Economic Growth”, Working Paper No. 21, Commission on Growth and Development, World Bank, Washington, D.C.

Iacovone L. & B. Javorcik (2010), “Multi-product Exporters: Product Churning,. Uncertainty and Export Discoveries,” Economic Journal, Vol. 120, pp. 481-499.

INEGI (2014). Balanza Comercial de Mercancías de México, información revisada enero, 2014. Instituto Nacional de Estadística y Geografía. Aguascalientes, México.

Koenig, P., F. Mayneris, & S. Poncet (2010), “Local Export Spillovers in France”, European Economic Review, Vol. 54, pp. 622-641.

Kugler, M. & E. Verhoogen (2012), “Prices, Plant Size, and Product Quality.” Review of Economic Studies, Vol. 79 (1), pp. 307–339

Lancaster, T. (2000), “The incidental parameter problem since 1948”, Journal of Econometrics, Vol. 95, pp. 391-413.

Lawless, M. (2009). “Firm Export Dynamics and the Geography of Trade”, Journal of International Economics, Vol. 77(2), pp. 245-254.

Manova, K. & Z. Zhang (2012), "Export Prices Across Firms and Destinations". Quarterly Journal of Economics, Vol. 127 (1), pp. 379-436.

Mayer, T., M. Melitz & G. Ottaviano. (2014), "Market Size, Competition and the Product Mix of Exporters", American Economic Review, Vol. 104(2), pp. 495–536.

Melitz, M. (2003), "The impact of trade on intra-industry reallocations and aggregate industry productivity". Econometrica, Vol. 71, pp. 1695–725.

Moulton, B. (1986), "Random Group Effects and the Precision of Regression Estimates", Journal of Econometrics, Vol. 3(3), pp. 385–397.

Moulton, B. (1990), "An Illustration of a Pitfall in Estimating the Effects of Aggregate Variables on Micro Unit", The Review of Economics and Statistics, Vol. 72(2), pp. 334-338.

Rauch, J. (1999). "Networks versus markets in international trade", Journal of International Economics. Vol. 48, pp. 7–35.

Roberts M. & J. Tybout (1997) "The Decision to Export in Colombia: An Empirical Model of Entry with Sunk Costs", The American Economic Review, Vol. 87(4), pp. 545-564.

Train, K, (2003) Discrete Choice Methods with Simulation. Cambridge University Press, Cambridge.

Verhoogen, E. (2008), "Trade, quality upgrading and wage inequality in the Mexican manufacturing sector", Quarterly Journal of Economics, Vol. 123, pp. 489–530.

World Bank (2013). World Development Indicators 2013. Washington, DC. World Bank. https://openknowledge.worldbank.org/handle/10986/13191